

# INFORMATIONAL PROPOSAL (For information only, not to be used for bidding)

NEBRASKA DEPARTMENT OF ROADS  
LETTING DATE : June 17, 2004

METRIC

CALL ORDER: F10 CONTRACT ID: 2901X

CONTROL NO./SEQ. NO.: 21901 /000 PROJECT NO.: EACNH-6-7(166)  
CONTROL NO./SEQ. NO.: 21902 /000 PROJECT NO.: EACNH-6-7(167)  
CONTROL NO./SEQ. NO.: 21903 /000 PROJECT NO.: EACNH-6-7(168)  
CONTROL NO./SEQ. NO.: 22106 /000 PROJECT NO.: BH-5164(1)

TENTATIVE START DATE: 07/19/04 CONTRACT TIME: 1595 CALENDAR DAYS

LOCATION: US-6, WEST DODGE ROAD EXPRESSWAY 120TH - 108TH,  
WB & EB BRIDGES & SOUTH BRIDGE ROAD, OMAHA  
IN COUNTY: DOUGLAS

BIDDER

GROUP 1 GRADING  
GROUP 1A MSE WALLS  
GROUP 3 CONCRETE PAVEMENT  
GROUP 4 CULVERTS  
GROUP 6 BRIDGE AT STA. 780+08.432  
GROUP 6A BRIDGE AT STA. 780+08.432  
GROUP 6B BRIDGE AT STA. 879+72.083  
GROUP 6C BRIDGE AT STA. 879+72.083  
GROUP 6D BRIDGE AT STA. 3001+99.455  
GROUP 6E BRIDGE AT STA. 86+88.67  
GROUP 6F BRIDGE AT STA. 1001+88.49  
GROUP 8 SPECIALTY  
GROUP 8B ELECTRICAL  
GROUP 8C SIGNING  
GROUP 10 GENERAL ITEMS

THIS PROPOSAL CONTAINS A DBE GOAL OF 6.0 %.

SEE SPECIAL PROVISIONS FOR GROUP TIES

## NOTES

THE TOTAL AMOUNT OF WORK WHICH WILL BE ACCEPTED IN  
THIS LETTING IS LIMITED TO \$\_\_\_\_\_.

THE NUMBER OF \_\_\_\_\_ CONTRACTS WHICH WILL BE  
ACCEPTED IN THIS LETTING IS LIMITED TO \_\_\_\_\_.

## **NOTICE TO ALL BIDDERS**

To report bid rigging activities, call: 1-800-424-9071

The U.S. Department of Transportation (DOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m. eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

## **LETTING QUESTIONS**

Prior to the letting, any questions pertaining to the Special Provisions or the plans for this project should be directed to Construction Division personnel at (402) 479-4568 or (402) 479-4529.

**REQUIRED CONTRACT PROVISIONS  
FEDERAL-AID CONSTRUCTION CONTRACTS**

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**ATTACHMENTS**

**A. Employment Preference for Appalachian Contracts  
(included in Appalachian contracts only)**

**I. GENERAL**

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piece-work, station work, or by subcontract.

2. Except as otherwise provided in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;  
Section IV, paragraphs 1, 2, 3, 4, and 7;  
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. **Selection of Labor:** During the performance of this contract, the contractor shall not:

a. discriminate against labor from any other State, possession, or territory of the United States (except for employment

preference for Appalachian contracts, when applicable, as specified in Attachment A), or

b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

**II. NONDISCRIMINATION**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

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and EACNH-6-7(168), and BH-5164(1)

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve

such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. **Training and Promotion:**

a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Execu-

Form FHWA-1273 (Rev. 3-94)

tive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

**8. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.

b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.

c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

**9. Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

(4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

### III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

### IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

#### 1. General:

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more

than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

**2. Classification:**

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry;

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

**3. Payment of Fringe Benefits:**

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

**4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

**a. Apprentices:**

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for

the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

**b. Trainees:**

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

**c. Helpers:**

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

**5. Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**6. Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

**7. Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

**8. Violation:**

**Liability for Unpaid Wages; Liquidated Damages:**  
In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

**9. Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

**V. STATEMENTS AND PAYROLLS**

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

**1. Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

**2. Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form

desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;

(3) that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

**VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR**

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR 635) the contractor shall:

a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of

Form FHWA-1273 (Rev. 3-94)

the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

#### VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).

a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

#### VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees

on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

#### IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

#### NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

18 U.S.C. 1020 reads as follows:

*"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or*

*Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or*

*Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;*

*Shall be fined not more than \$10,000 or imprisoned not more than 5 years or both."*

**X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL  
WATER POLLUTION CONTROL ACT**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

**XI. CERTIFICATION REGARDING DEBARMENT,  
SUSPENSION, INELIGIBILITY AND VOLUNTARY  
EXCLUSION**

**1. Instructions for Certification - Primary Covered Transactions:**

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant know-

ingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

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**Certification Regarding Debarment, Suspension, Ineligibility  
and Voluntary Exclusion--Primary Covered Transactions**

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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#### **2. Instructions for Certification - Lower Tier Covered Transactions:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

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#### **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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#### **XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

NOTICE OF REQUIREMENT FOR AFFIRMATIVE  
ACTION TO ENSURE EQUAL EMPLOYMENT  
OPPORTUNITY  
(EXECUTIVE ORDER 11246)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area are as follows:

GOALS FOR MINORITY PARTICIPATION IN EACH TRADE

Economic Area	Goal %	Economic Area	Goal %
103 Sioux City, IA:		Non-SMSA Counties . . . . .	5.3
SMSA Counties:		IA Adams, IA Audubon, IA Cass,	
7720 Sioux City, IA-NE . . . . .	1.9	IA Fremont, IA Harrison, IA Mills,	
IA Woodbury, NE Dakota		IA Montgomery, IA Page, IA Shelby,	
Non-SMSA Counties . . . . .	1.2	IA Taylor, NE Burt, NE Cass, NE Colfax,	
IA Cherokee, IA Crawford, IA Ida,		NE Dodge, NE Platte, NE Saunders,	
IA Monona, IA O'Brien, IA Plymouth,		NE Washington	
IA Sioux, NE Antelope, NE Cedar,		144 Grand Island, NE:	
NE Cumming, NE Dixon, NE Knox,		Non-SMSA Counties . . . . .	1.4
NE Madison, NE Pierce, NE Stanton,		NE Adams, NE Arthur, NE Blaine,	
NE Thurston, NE Wayne, SD BonHomme,		NE Boone, NE Boyd, NE Brown,	
SD Clay, SD Union, SD Yankton		NE Buffalo, NE Chase, NE Cherry,	
142 Lincoln, NE:		NE Clay, NE Custer, NE Dawson,	
SMSA Counties:		NE Dundy, NE Franklin, NE Frontier,	
4360 Lincoln, NE . . . . .	2.8	NE Furnas, NE Garfield, NE Gosper,	
NE Lancaster		NE Grant, NE Greeley, NE Hall, NE	
Non-SMSA Counties . . . . .	1.9	Hamilton, NE Harlan, NE Hayes,	
NE Butler, NE Fillmore, NE Gage,		NE Hitchcock, NE Holt, NE Hooker,	
NE Jefferson, NE Johnson, NE Nemaha,		NE Howard, NE Kearney, NE Keith,	
NE Otoe, NE Pawnee, NE Polk, NE		NE Keya Paha, NE Lincoln, NE Logan,	
Richardson, NE Saline, NE Seward,		NE Loup, NE McPherson, NE Merrick,	
NE Thayer, NE York		NE Nance, NE Nuckolls, NE Perkins,	
143 Omaha, NE:		NE Phelps, NE Red Willow, NE Rock,	
SMSA Counties:		NE Sherman, NE Thomas, NE Valley,	
5920 Omaha, NE-IA . . . . .	7.6	NE Webster, NE Wheeler	
IA Pottawattamie, NE Douglas,		145 Scottsbluff, NE:	
NE Sarpy		Non-SMSA Counties . . . . .	5.3
		NE Banner, NE Box Butte, NE Chey-	
		enne, NE Dawes, NE Deuel, NE	
		Garden, NE Kimball, NE Morrill,	
		NE Scotts Bluff, NE Sheridan, NE	
		Sioux, WY Goshen	

GOALS AND TIMETABLES FOR FEMALE PARTICIPATION IN EACH TRADE

Timetables	Goals (Percent)
From April 1, 1980 until further notice	6.9

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is by county.

November 3, 1980

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY  
CONSTRUCTION CONTRACT SPECIFICATIONS  
(EXECUTIVE ORDER 11246)

1. As used in these specifications:
  - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
  - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
  - c. "Employer Identification Number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
  - d. "Minority" includes:
    - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
    - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
    - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice, which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the **Federal Register** in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its action. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:
- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
  - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
  - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
  - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
  - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
  - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
  - g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
  - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
    - Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
  - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
  - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
  - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
  - p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
  - The contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the

work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

**Supplemental Reporting Requirements**

- A. The contractor will keep such records as are necessary to determine compliance with the contractor's equal employment opportunity obligations. The records kept by the contractor will be designed to indicate the number of minority and non-minority group members and women employed in each work classification on the project.
- B. All such records must be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the State Highway agency and the Federal Highway Administration.
- C. The Contractor and each covered subcontractor will submit to the State Highway agency, for the month of July, for the duration of the project, a report (Form PR-1391) "Federal-aid Highway Construction Contractors Annual EEO Report), indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. If on-the-job training is being required by "Standard Federal Equal Employment Opportunity Specifications" the contractor will be required to furnish (Form FHWA 1409) "Federal-aid Highway Construction Contractor's Semi-Annual Training Report".

**Equal Employment Opportunity Policy**

The contractor will accept as his operating policy the following statement which is designed to further the provision of equal employment opportunity to all persons without regard to their race, color, religion, sex, or national origin, and to promote the full realization of equal employment opportunity through a positive continuing program:

It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, or national origin. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training.

Project Nos. EACNH-6-7(166), EACNH-6-7(167)  
and EACNH-6-7(168), and BH-5164(1)

General Decision Number: NE030001 04/16/2004 NE1

Superseded General Decision Number: NE020001

State: Nebraska

Construction Types: Heavy and Highway

Counties: Douglas, Sarpy, Saunders and Washington Counties in Nebraska.

HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects, and railroad construction; bascule, suspension & spandrel arch bridges; bridges designed for commercial navigation; bridges involving marine construction; other major bridges) SAUNDERS COUNTY (EAST OF HWY. #109 EXTENDED NORTH AND SOUTH TO THE COUNTY LINE)

Modification Number	Publication Date
0	06/13/2003
1	02/27/2004
2	03/05/2004
3	04/16/2004

CARP0444-002 10/01/2002

	Rates	Fringes
Carpenter; piledriver.....	\$ 19.95	6.39

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ELEC0022-002 06/01/2003

DOUGLAS AND SARPY COUNTIES; SAUNDERS COUNTY (east of Hwy. #109 and north of U.S. Alternate Highway No. 30 (Route 92)); AND WASHINGTON COUNTY:

	Rates	Fringes
Electrician.....	\$ 25.65	8.87+4%

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\* ELEC0265-001 07/01/2003

SAUNDERS COUNTY (east of Hwy. #109 and south of U.S. Alternate Hwy. No. 30 (Route 92)):

	Rates	Fringes
Electricians:		
Zone 2.....	\$ 21.66	4.5% + 6.55
Zone 3.....	\$ 21.96	4.5% + 6.55
Zone 4.....	\$ 22.36	4.5% + 6.55

ZONE DEFINITIONS:

Zone 1: 0 to 35 miles from the main Post Office in Lincoln, NE  
Zone 2: 36 to 50 miles from the main Post Office in Lincoln, NE  
Zone 3: 51 to 75 miles from the main Post Office in Lincoln, NE  
Zone 4: 76 miles and over from the main Post Office in Lincoln, NE

FOOTNOTE:

Work on scaffolds, hanging scaffolds, boatswains chairs or ladders, etc., in any area where the worker is in a position to fall 40 ft. or more, or where objects above the worker can fall 40 ft. or more: to be paid one and one-half times the straight- time rate of pay.

ZONE DEFINITIONS:

Zone 1: 0 to 35 miles from the main Post Office in Lincoln, NE  
Zone 2: 36 to 50 miles from the main Post Office in Lincoln, NE  
Zone 3: 51 to 75 miles from the main Post Office in Lincoln, NE  
Zone 4: 76 miles and over from the main Post Office in Lincoln, NE

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ELEC1525-001 01/01/2002

LINE CONSTRUCTION:

	Rates	Fringes
Line technicians:		
Cable splicer; Line welder.....	\$ 24.59	27.75%+2.45
Ground person.....	\$ 14.80	27.75%+2.45
Line equipment operator.....	\$ 20.53	27.75%+2.45
Line technician.....	\$ 22.87	27.75%+2.45
Truck driver.....	\$ 16.42	27.75%+2.45

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ELEC1525-002 09/01/2000

	Rates	Fringes
Traffic signal, street light and underground work:		
Cable splicer; Line welder.....	\$ 23.64	27.75%+2.00
Equipment operator.....	\$ 19.74	27.75%+2.00
Ground person.....	\$ 14.23	27.75%+2.00
Line technician.....	\$ 21.99	27.75%+2.00
Truck driver.....	\$ 15.79	27.75%+2.00

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ENGI0571-003 04/01/2003

	Rates	Fringes
Power equipment operators:		
Off-road heavy hauler, Rough Roller dozer, rough blade, Ferguson-type tractors (Workbull with high tecco), asphalt roller.....	\$ 18.46	4.55
Oiler, greaser, air		

compressor, welding machine, pump, roller, forklift, hydrohammer, pug mill, concrete pump, cure and tyne machine, rubber-tired farm tractor.....\$ 14.79	4.55
One and two drum hoists, tugger, trencher, concrete spreader & finishing machine, dozer loader, spread oiler, bantam-type tamper, rubber-tired tractor backhoe, oil distributor-finish roller dozer.....\$ 20.01	4.55
Trimmer, crane, backhoe, mechanic, slip form paver, asphalt plant-concrete plant, laydown machine, concrete pump truck, finish blade, scraper.....\$ 20.73	4.55

FOOTNOTES:

Operation of an articulating, Pitman type boom truck with single axle truck and lift capacity of less than 5,000 lbs., used to put construction materials in place: 90% of the group 2 rate.

When two (2) scraper units or two push cat units capable of operating separately are hooked together in tandem for single operation, the operator shall receive twenty-five cents (\$0.25) over the classification worked.

When air compressors are used for operating the hammer when pulling or driving pile and the compressor operator is required to operate the air valve for such hammer, such compressor operator shall receive the top wage rate.

Operators working in tunnels and caverns under compressed or free air shall receive forty cents (\$0.40) above their classification.

Hazardous waste removal work requiring the wearing of personal protective equipment and/or suits, to be paid as follows:

Class A: \$3.00 additional per hour  
Class B: 2.00 additional per hour  
Class C: 1.00 additional per hour  
Class D: no premium pay.

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IRON0021-003 06/01/2003

	Rates	Fringes
Ironworker.....\$ 22.70		7.02

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PAIN0081-010 06/01/2002

	Rates	Fringes
Painter.....	\$ 19.41	3.77

FOOTNOTES:

Work performed above 75 ft. on suspended staging: \$.50 per hour additional.

Spray machine operator: \$.50 per hour additional.

Nozzle operator for sandblasting and waterblasting (waterblasting more than 10,000 PSI) (including all side arm grinder operators engaged in removing paint or preparing for painting): \$.50 per hour additional.

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SUNE1988-001 12/20/1988

	Rates	Fringes
Cement Mason.....	\$ 13.62	3.00

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SUNE1993-001 08/05/1993

	Rates	Fringes
Sprinkler Installer (lawn).....	\$ 5.15	

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TEAM0554-001 01/01/2003

	Rates	Fringes
Truck drivers:		
All other work.....	\$ 15.47	4.40
Low boy driver.....	\$ 16.72	4.40

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.  
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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.  
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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

**SPECIAL PROVISIONS  
FOR  
FEDERAL AID  
PROJECT NOS. EACNH-6-7(166), EACNH-6-7(167),  
EACNH-6-7(168) AND BH-5164(1)**

**GENERAL CONDITIONS**

Sealed bids for the work contemplated in this proposal form will be received at the office of the Nebraska Department of Roads in Room 104 of the Central Office Building at 1500 Highway 2 at Lincoln, Nebraska, on June 17, 2004, until 1:30 P.M.

Bids submitted by mail should be addressed to the Nebraska Department of Roads, c/o Contract Lettings Section, P.O. Box 94759, Lincoln, NE 68509-4759.

The 1997 Metric Edition of the Standard Specifications for Highway Construction, including all amendments and additions thereto effective at the date of the contract, are made a part of these Special Provisions, through reference.

The Supplemental Specifications to the 1997 Metric Edition of the Standard Specifications for Highway Construction dated July 12, 2001, including all amendments and additions thereto effective at the date of the contract, are made part of these Special Provisions, through reference.

The Required Contract Provisions, Form FHWA 1273, (Rev. 3-94), and the Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity and Standard Federal Equal Employment Opportunity Construction Contract Specifications dated November 3, 1980, are attached to and are a part of this proposal form.

The General Wage Decision issued under the Davis-Bacon and Related Acts is attached to and is a part of this proposal form.

The attention of bidders is directed to the Required Contract Provisions covering subletting or assigning the contract.

GROUPS 1, 1A, 3, 4, 6, OR 6A, 6B OR 6C, 6D, 6E, 6F, 8, 8B, 8C AND 10 ARE TIED TOGETHER AND BIDDING PROPOSAL FORMS FOR THIS WORK WILL BE ISSUED AND A CONTRACT AWARDED TO A CONTRACTOR WHO IS QUALIFIED FOR BRIDGES.

GROUP 6A IS AN ALTERNATE FOR GROUP 6.

GROUP 6C IS AN ALTERNATE FOR GROUP 6B.

BIDDERS ARE TO SUBMIT THEIR LOWEST BID ONLY.

## **PRE-BID MEETING**

On Tuesday, June 1st, 2004, a pre-bid meeting for these projects will be held in the Nebraska Department of Roads' Central Complex Auditorium, 1500 Nebraska Highway 2, Lincoln, Nebraska. The meeting will begin at 1:00 p.m. and is anticipated to last about two hours.

A presentation will be made concerning specifications, constructability, phasing, traffic control and structures. Contractor questions will be addressed. The meeting will be recorded and transcripts will be made available upon request.

Attendance at this pre-bid meeting is not mandatory in order to bid on these projects.

## **DISADVANTAGED BUSINESS ENTERPRISES (S1-8-0801)**

### **A. Policy**

The Contractor agrees to ensure that disadvantaged business enterprises as defined in 49 CFR Part 26 shall have a "level playing field" and equal opportunity to participate in the performance of contracts financed in whole or in part with Federal funds under this contract. Consequently, the disadvantaged business requirements of 49 CFR Part 26 are hereby made a part of and incorporated by this reference into this contract.

### **B. Disadvantaged Business Enterprises Obligation**

The Contractor agrees to ensure that disadvantaged business enterprises as defined in 49 CFR Part 26 have a "level playing field" and equal opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with Federal funds provided under this agreement. In this regard, the Contractor shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 to ensure that disadvantaged business enterprises have a "level playing field" and equal opportunity to compete for and perform contracts. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of FHWA assisted contracts.

Failure of the Contractor to carry out the requirements set forth above shall constitute breach of contract and, after the notification of the FHWA, may result in termination of the agreement or contract by the State or such remedy as the State deems appropriate.

## **USE OF DISADVANTAGED BUSINESS ENTERPRISES (S1-9-0304)**

I. INTRODUCTION: The specific requirements of the use of Disadvantaged Business Enterprises, hereinafter referred to as DBEs, are set forth in these Required Contract Provisions and are imposed pursuant to the *Code of Federal Regulations, Title 49, Part 26 and the Nebraska Department of Roads' Disadvantaged Business Enterprise (DBE) Program*, which are hereby made a part of and incorporated by this reference into this proposal. Copies of these documents are available, upon request, from the Nebraska Department of Roads, Disadvantaged Business Enterprise Office, P.O. Box 94759, Lincoln, Nebraska 68509-4759.

A. Definitions:

1. Whenever "NDOR" is used within these special provisions it shall refer to the Nebraska Department of Roads.
2. Whenever "DOT" is used within these special provisions, it shall refer to the United States Department of Transportation.
3. For the purpose of these special provisions, the following definitions will apply:
  - a. Disadvantaged Business Enterprise (DBE) means a for profit small business concern, as defined pursuant to Section 3 of the Small Business Act and Small Business Administration regulations implementing it, which is independently owned and controlled by one or more socially and economically disadvantaged individuals.
  - b. Owned and controlled means a business:
    - (1) Which is at least 51 percent (51%) owned by one or more socially and economically disadvantaged individuals or women, or, in the case of a public owned business, such individuals must own at least 51 percent (51%) of each class of voting stock and 51 percent of the aggregate of all stock outstanding.
    - (2) Whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged owners.
  - c. Socially and economically disadvantaged individual means a person who is a citizen (or lawful permanent resident) of the United States, and who is:
    - (1) "African American," which includes persons having origins in any of the Black racial groups of Africa;
    - (2) "Hispanic American," which includes persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race;
    - (3) "Native American," which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians;
    - (4) "Asian-Pacific American," which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kiribati, Juvalu, Nauru, Federated States of Micronesia, or Hong Kong;

- (5) "Subcontinent Asian American," which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka;
- (6) A Woman;
- (7) Any additional groups whose members are designated as socially and economically disadvantaged by the SBA, at such time as the SBA designation becomes effective.

## II. DBE CONTRACT GOALS:

- A. DBE goals are set by the NDOR for specific contracts. The specific DBE contract goals are stated on the Required DBE Participation Form included in the proposal. The Contractor must meet or exceed the goal or demonstrate good faith efforts to meet the goal. Requirements for submission of DBE good faith effort information are contained in Section IV of these special provisions.
- B. A current list of certified DBE firms will be posted on the NDOR website ([www.dor.state.ne.us](http://www.dor.state.ne.us)). Only the DBE firms whose names appear on the list will be considered in meeting the contract goal for this project. The DBE firms will be considered only for the items of work listed under the heading, "Nature of Business." DBE firms may request to have additional items of work added to their "Nature of Business," however, no items of work will be added after 5:00 p.m., ten (10) calendar days preceding the letting.
- C. Contractors shall, as a minimum, seek DBE subcontractors in the same geographic area in which they seek subcontractors generally for a given solicitation. If the contractor cannot meet the DBE goals using DBEs from the normal area, the contractor will expand its search to a reasonably greater geographic area.
- D. Contractors are required to make good faith efforts to replace a DBE subcontractor that is unable to perform with another DBE. In order to ensure compliance with this requirement, any substitution of DBE subcontractors after execution of the contract must be approved by the NDOR.
- E. Contractors are also encouraged to use the services of banks owned and controlled by minorities and women; however, this will not be counted toward the contract DBE goal.

III. MEETING DBE CONTRACT GOAL CRITERIA: The award of the contract will be made upon satisfaction of the requirements of these special provisions. The apparent low bidder must either meet or exceed the DBE goals for the contract or satisfy the NDOR that good faith efforts were made to meet the goals.

- A. REQUIRED DBE PARTICIPATION INFORMATION: All bidders are required to submit to the NDOR the "Required DBE Participation Form" with their bid proposal on the form provided in this proposal.
- B. THE REQUIRED DBE PARTICIPATION FORM SHALL INCLUDE:
  - 1. The names and addresses of the DBE subcontractors that will actually participate in meeting the contract goal.

2. A complete description (by item number or group, etc.) of the work each named DBE subcontractor will perform.
  3. The dollar amount of participation by each named DBE subcontractor.
  4. Written and signed documentation from the bidder of commitment to use a DBE subcontractor whose participation it submits to meet a contract goal.
  5. The apparent low bidder must submit written and signed confirmation from each DBE that it is participating in the contract as provided in the prime contractor's commitment, by 5:00 p.m. on the fifth (5<sup>th</sup>) calendar day following the letting.
  6. If the contract goal is not met, evidence of good faith efforts.
- C. The proposal will not be read if the "Required DBE Participation Form" is not included.
- If no DBE participation is intended, the form must indicate that good faith effort documentation will be submitted. A blank form that is signed will be interpreted as meaning no DBE participation is intended and will be read.
- Listing options and/or alternates for DBE subcontractors and/or items or groups of work to be performed is not allowed, and will cause this bid to be declared non-responsive.
- Required DBE information shall not be subject to revision after bids are opened.
- D. The information submitted on the DBE Participation Form will be verified by the NDOR. Errors in addition will be treated in accordance with current NDOR specifications and procedures.
- E. If the use of non-certified firms or the use of DBE firms not certified for the type of work indicated results in under achievement of the goal, the bid will be declared non-responsive.
- F. If, at any time prior to execution of the contract, previously undetected errors result in under-achievement of the goal, the low bidder, along with the other bidders on the project, will be given 5 days from receipt of notification by the NDOR to submit good faith information as outlined in Section IV of these specifications.
- G. REQUIRED SUBCONTRACTOR/SUPPLIER QUOTATIONS LIST: At bid submittal, all bidders must provide to the NDOR the identity of all firms who provided quotations on DOT-assisted projects, including both DBEs and non-DBEs. This information must be on a form provided by the NDOR Contracts Office.

If no quotations were received, the bidder must indicate this in the space provided.

Each bidder will be required to submit one list per letting to cover all projects bid.

IV. GOOD FAITH DETERMINATION: It is the low bidder's responsibility to meet the DBE contract goals or to provide sufficient information to enable the NDOR to determine that, prior to bidding, the low bidder actually made good faith efforts to meet such goals.

- A. The NDOR will, in the "Apparent Low Bidder" listing (available 24 hours after bid opening) identify all projects which contain a DBE goal. The listing will indicate the apparent low bidder's status in attaining the goal, i.e. "Contractor Meets DBE Goal," or "Contractor Requires Good Faith Determination."
- B. If the low bidder's "Required DBE Participation Form" submitted with the bid indicates the DBE contract goal will be met, and the NDOR concurs, the contract will proceed toward award and the low bidder need not submit any further DBE information prior to award.
- C. Good Faith Information Submittal: If the contract DBE goals have not been met, the "Apparent Low Bidders" listing will reflect that the apparent low bidder is required to submit good faith effort information. Complete and accurate documented information to support a good faith efforts determination must be submitted by 5:00 p.m. on the fifth (5<sup>th</sup>) day following the letting.
- D. Any other bidder on the contract who requires a good faith effort submittal must also follow the time frames set forth in "C" above if they wish to be considered for award of the contract. Any bidder who does not meet the submittal deadlines, will be not be eligible for award of the contract. (The only exception is a case where the apparent low bidder who met the goal initially is declared ineligible for the award for reasons other than DBE goal attainment.) If this results in a new apparent low bidder who did not initially meet the goal, all other bidders on the contract indicating good faith effort will be notified, and given 5 days after receipt, to submit complete information to support their good faith efforts. Bidders are cautioned by the NDOR to retain documentation of their good faith efforts until an award is made, or all bids are rejected.
- E. The NDOR will review all information submitted to determine whether the apparent low bidder actually made good faith efforts to meet the contract goal. The decision as to whether the good faith efforts are acceptable will be made jointly by a committee comprised of the NDOR Highway Civil Rights Coordinator, the Contracts Letting Manager, and an at-large NDOR staff member appointed by the Director.

A NDOR determination that the low bidder's information failed to show acceptable good faith efforts shall be cause for declaring the low bid non-responsive. In making a determination, information submitted by other bidders will be considered. If the low bid is declared non-responsive, the above procedure will be applied to the next lowest bid, and other higher bids if necessary, until a bid is found that meets the goal, or establishes that good faith efforts were made to meet it. NDOR reserves the right to reject all bids and readvertise the contract if none of the bids result in a satisfactory level of DBE participation at a reasonable price.

- F. Establishing Good Faith Efforts: To demonstrate good faith efforts to meet the DBE contract goals, documentation shall be maintained and submitted to the NDOR as set forth above. Such documentation may include any or all of the following: This list is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.
  - 1. Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all Certified DBE firms that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE firms to respond to the solicitation. The bidder must determine with certainty if the DBE firms are interested, by taking steps to follow up initial solicitations.

2. Selecting portions of the work to be performed by DBE firms in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform work items with its own workforce.
3. Providing interested DBE firms with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
4. (1) Negotiating in good faith with interested DBE firms. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers, and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation should include the names, addresses, and telephone numbers of DBE firms that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE firms to perform the work.  
  
(2) A bidder using good business judgement would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE firms, is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from DBE firms if the price difference is excessive or unreasonable.
5. Not rejecting DBE firms as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection, or non-solicitation of bids in the contractor's efforts to meet the project DBE goal.
6. Making efforts to assist interested DBE firms in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
7. Making efforts to assist interested DBE firms in obtaining necessary equipment, supplies, materials, or related assistance or services.
8. Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.

- G. If the NDOR's preliminary finding is that the bidder did not demonstrate a satisfactory effort to meet the contract goal, the bidder may appeal the decision by submitting a written request for reconsideration within three (3) days of the decision. The bidder may then present information either in a written narrative supporting its good faith effort submittal, or may appear in person. Any new information not included in the original submittal will not be used in the final determination. The appeal will be heard by a Hearing Officer appointed by the NDOR Director. The Hearing Officer will be an individual who is knowledgeable about the DBE Program and its good faith efforts provision, but who had no part in the initial decision.

The Hearing Officer will hear the appeal within five (5) days of receipt of the written request, and will issue a written decision within three (3) days after the appeal. The reconsideration process is administratively final and has no further appeal.

#### V. COMMERCIALLY USEFUL FUNCTION:

- A. A contractor may count toward its DBE goals only expenditures to DBE firms that perform a commercially useful function in the work of a contract. A DBE firm is considered to perform a commercially useful function when it is responsible for the execution of a distinct element of the work of a contract, and carrying out its responsibilities by actually performing, managing, and supervising the work involved. The DBE firm must also be responsible for materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material, installing (where applicable), and paying for the material.

#### Guidelines:

1. As a general rule, it is expected that workers on a DBE subcontract shall be regular employees of the DBE subcontractor, and shall be listed on the subcontractor's payroll. A regular employee is a person who would normally be working for the DBE firm on any other subcontract with any other prime contractor, and whose immediate past employment has not been with the prime contractor on the present project, or with the renter-lessor of equipment being used on the present project.
2. On DBE subcontracts, the DBE must perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own work force, or the DBE will not be considered to be performing a commercially useful function. (If a DBE subcontracts part of its work to another firm, the value of the subcontracted work may be counted toward DBE goals only if the DBE's subcontractor is itself a DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward DBE goals.)

Operators of leased specialized equipment are included under this provision. In any case, all employees shall be listed on the DBE firm's payroll and paid by that firm.

3. In addition, a DBE subcontractor shall be required to designate a project superintendent/foreman who is a regular employee of the subcontractor, and who shall be active in the day-to-day management of the project.

4. DBE subcontractors who purchase supplies and materials from the prime contractor, which are to be incorporated into the project will not count toward the established DBE contract goals.
5. TWO PARTY CHECKS: The NDOR does not totally prohibit a DBE firm and a prime contractor from using two-party checks to pay for material and/or supplies under certain circumstances, so long as the prime contractor acts solely as a guarantor, and the funds do not come from the prime contractor. Two-party checks cannot be used unless formal written requests to do so from the DBE firm and the prime contractor are delivered to the NDOR DBE Office and written approval is given. If this provision is not strictly followed, the prime contractor will not be allowed credit for the cost of the material and/or supplies toward the DBE contract goal commitment. The NDOR will closely monitor the use of two-party checks to avoid abuse of this practice.

A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, you must examine similar transactions, particularly those in which DBEs do not participate.

When a prime contractor commits to use material and/or supplies provided by a DBE Supplier to meet a DBE contract goal, the DBE Supplier must pay for the material and/or supplies without the use of two-party checks or the cost of the material and/or supplies will not be counted toward the prime contractor meeting the contract goal. The only exception to this policy might be if unanticipated circumstances prevent the DBE Supplier from being able to pay for a portion of the material and/or supplies and the use of two-party checks is the only viable alternative. The NDOR DBE Office will make the final determination on allowing the use of two-party checks in all such circumstances.

#### VI. PROHIBITED PRACTICES:

- A. An area of special concern is exclusive arrangements between the prime contractor and DBE subcontractors. The DBE subcontractors must be willing to contract with more than one prime contractor.
- B. Any subcontracting arrangement which artificially inflates DBE participation is not acceptable. Of utmost concern are the interjection of DBE middlemen or passive conduits and arrangements in which a DBE subcontractor is acting essentially as a broker.

#### VII. ADMINISTRATION OF THE DBE PROGRAM:

- A. The NDOR intends to achieve its annual overall DBE participation goal with a "narrowly tailored" DBE Program that meets the "strict scrutiny" requirements as defined by case law. The NDOR will adhere to all of the rules and regulations of the DOT's DBE Program Regulations as contained in CFR 49 part 26.

It is the intention of the NDOR that DBE subcontractors be independent companies, and function in the same capacity as majority contractors. It is not the intention of the NDOR to be involved with "in name only" DBE subcontractors who are not providing a

commercially useful function to the highway industry. The following will be used in administering the DBE Program.

**Situation #1:**

Prime Contractor "A" subcontracts to a DBE subcontractor, who performs the work with its own workforce (the employees work on a full-time basis for the DBE firm, or were hired from a union hall, employment service, or other hiring sources by the DBE firm, and are supervised by a full-time employee of the DBE), and uses its own equipment, or equipment rented or leased from an equipment dealer. Prime Contractor "A" is not involved in the DBE firm's operation, other than coordinating when the work is to be performed, and/or other normal industry practices of contracts between a prime contractor and a subcontractor.

This is the ideal situation, is totally acceptable, and is within the intent of the DBE Program.

**Situation #2:**

Prime Contractor "A" subcontracts to a DBE firm, that performs the work with its own workforce, (the employees work on a full-time basis for the DBE firm, or were hired from a union hall, employment service, or other sources by the DBE firm for the project, and are supervised by a full-time employee of the DBE). The DBE firm uses equipment owned by a majority contractor, (other than Prime Contractor "A"), on a long-term rent or lease arrangement at rates consistent with normal industry standards, and not leased on an "as equipment is needed" basis. This situation would be no different than the DBE firm leasing or renting equipment from a commercial equipment supplier.

This is totally acceptable, and is within the intent of the DBE Program.

**Situation #3:**

A DBE firm is a subcontractor to Prime Contractor "A." When it is time for the subcontract work to be performed, the work is actually performed using Prime Contractor "A's" equipment, work force, and supervisory personnel. The DBE firm then makes a certified payroll using the names of Prime Contractor "A's" employees. Basically, the subcontract work was performed by Prime Contractor "A." This is a very close association with the prime contractor, and the DBE's owner is not considered to be in control of the DBE firm, or the project in question.

This situation described is not considered to be a commercially useful function, and may be subject to any of the administrative actions as cited in Section VIII, C. below.

Situation #4:

A DBE firm is a subcontractor to Prime Contractor "A." When it is time for the subcontract work to be performed, the work is actually done using the workforce, equipment, and supervisory personnel of a majority contractor, Contractor "B." The DBE firm makes a certified payroll showing Contractor "B's" employees. This condition is not considered to be within the intent of the DBE Program. In reality, majority Contractor "B" is the one that performed the work. The NDOR does not consider this to be a commercially useful function, as Prime Contractor "A" is actually subcontracting to majority Contractor "B," in an unapproved status, rather than the DBE firm.

This situation described is not considered to be a commercially useful function, and may be subject to any of the administrative actions as cited in Section VIII, C. below.

Situation #5:

Prime Contractor "A" is buying supplies from a DBE supplier or contractor to fulfill the DBE goal. This is only acceptable if the DBE firm is a true supplier. The mere fact that the DBE firm purchases the material from another supplier, then adds some cost and sells the material to a prime contractor, does not constitute the DBE as being a supplier. A supplier must have an inventory and be generally recognized as a material supplier.

The above situations are very broad and general. While it is known that many different situations may arise, these are basic guidelines used to administer the DBE Program.

The NDOR is more than willing to discuss particular situations with either DBE firms or prime contractors prior to a letting in the hope of developing DBE firms.

VIII. INVESTIGATORY POWERS, ADMINISTRATIVE PROCEDURES FOR ENFORCEMENT AND PENALTIES

A. INVESTIGATORY POWERS:

1. The NDOR specifically reserves the right and power to investigate, monitor and/or review all actions taken, statements made, documents submitted, by any contractor, subcontractor or DBE firm under the terms of these provisions.

B. ADMINISTRATIVE PROCEDURES FOR ENFORCEMENT:

Whenever the NDOR believes a contractor, subcontractor or DBE firm may not be operating in compliance with the terms of these provisions, the NDOR will conduct an investigation. If the NDOR finds any person or entity not in compliance with these provisions, the NDOR will notify such person or entity in writing as to the specific instances or matters found to be in non-compliance. At the option of the NDOR, the person or entity shall then be allowed a reasonable time to correct any deficiencies noted, and to come into compliance. In the event that the person or entity cannot, thereafter, come into compliance, or fails or refuses to do so, then the NDOR may impose one or more of the penalties hereafter provided for. It is specifically provided by the NDOR that any person or entity will be found to be out of compliance with these provisions if an investigation reveals any violation or act of such serious or compelling nature that the violation or act indicates a serious lack of business integrity or honesty.

C. PENALTIES:

1. In the event the NDOR finds any contractor, subcontractor, or DBE firm, to be out of compliance with these provisions, the NDOR may impose one or more of the following sanctions:
  - a. Termination of the contract.
  - b. The DBE firm may be decertified and/or suspended from participating in the NDOR DBE Program.
  - c. The prime contractor may not be able to count the work performed toward his project DBE goal, and if possible to do so, may need to subcontract other work on the project to DBE subcontractors to achieve the goal.
  - d. The contract items involved may be considered for a monetary reduction equal to the amount of work not done by the DBE subcontractor.
  - e. The prime contractor may be suspended and/or debarred.
  - f. If at any time during the life of the contract, it is determined that the contractor is out of compliance with these provisions, the NDOR may withhold payment of progress payments.
  - g. If at the completion of the project, the contractor is determined to be out of compliance, the NDOR may sustain damages, the exact extent of which would be difficult or impossible to ascertain and, therefore, in order to liquidate such damages, the monetary difference between the amount stated by the contractor and the amount actually paid to the DBEs will be deducted from the contractor's payment as liquidated damages. These damages would be in addition to any liquidated damages assessed in accordance with Subsection 108.08 of the Standard Specifications.
  - h. Referral to the Attorney General for possible prosecution for fraud.
  - i. Other action as appropriate, within the discretion of the NDOR.

**DISADVANTAGED BUSINESS ENTERPRISE (DBE) GOAL  
(S1-9-0603)**

All bidders shall submit written assurance that the minimum goal for Disadvantaged Business Enterprise (DBE) participation will be met. The required DBE Participation Form included in this proposal shall be used. The bidder shall submit the name and address of the DBE(s), a complete description of the participation by the DBE(s), and the dollar value of the participation. If the bidder cannot meet the minimum goal for DBE participation, as specified herein, the bidder shall submit complete documentation of its efforts, following the time limits set forth in IV. A., "Good Faith Information Submittal." These efforts shall include but not be limited to those stated previously in IV. E., "Establishing Good Faith Efforts."

Bidders that fail to meet DBE goals or fail to demonstrate sufficient good faith efforts shall be declared non-responsive and ineligible for award of the contract.

Bidders shall assume the responsibility of determining if they are the apparent low bidders by contacting the Nebraska Department of Roads, Contract Lettings Section in Lincoln, Nebraska. Such information is made public 24 hours after the announced time for opening bids. This information is available from the NDOR Internet web site (<http://www.dor.state.ne.us/>).

The contract shall be awarded to the lowest responsive responsible bidder.

The standard NDOR procedure concerning subcontractors and suppliers shall apply.

The DBE firms identified at the time of bid opening are the firms to whom subcontracts will be issued. The work subcontracted to be done, and the amount to be paid for the work, shall be as identified at the time of bid opening.

If the prime contractor desires to alter this list after execution of the contract, it must demonstrate to the NDOR that the listed DBE firm(s) is unable to perform, and provide the necessary written justification for approval. Justification must also include written documentation from the affected DBE firm(s) stating their position on the prime contractor's request. There must be a solid basis for any change.

Any substitution of the named DBE firms must be approved by the Department of Roads Disadvantaged Business Enterprise Office. Substitution of DBE's will only be allowed when the DBE firm(s) is not able to perform because of default or over-extension on other jobs or other similar justification. A prime contractor's ability to negotiate a more advantageous contract with another subcontractor is not considered as a valid basis for change.

#### VERIFICATION OF DBE GOAL COMMITMENTS

In order to verify achievement of the DBE commitments on each project, the following forms must be completed and submitted to the NDOR DBE Office.

- A. DR Form 411, DBE I. This form shall be filled out and submitted by the prime contractor, indicating the DBE firms used, actual work performed, the total amount of money paid to the DBE firms, and the date on which it was paid.
- B. DR Form 442, DBE II. This form shall be filled out and submitted by the DBE subcontractor, indicating the name of the DBE firm, actual work performed, the total amount of money received from the prime contractor, and the date on which it was received.
- C. The above referenced forms will be sent out by the DBE Office when notification of the project completion has been received. The forms are also available on NDOR's website, [www.dor.state.ne.us](http://www.dor.state.ne.us).

#### **SUBLETTING OR ASSIGNING OF CONTRACT (S1-9-0603)**

Prior to beginning work, a copy of all executed subcontracts, written agreements and/or lease agreements used to meet DBE goals shall be submitted to the construction engineer for forwarding to the minority business office. These copies must contain prices.

**PROMPT PAYMENT CLAUSE:**

The prime contractor shall include a "Prompt Payment Clause" as a part of every subcontract (including second tier subcontracts) for work and material. The "Prompt Payment Clause" will require payment to all subcontractors for all labor and material, for work completed, within twenty (20) calendar days of receipt of progress payments from the NDOR for said work. The "Prompt Payment Clause" will also stipulate the return of retainage within thirty (30) calendar days after the subcontractor achieves the specified work as verified by payment from the NDOR.

The failure by the prime contractor to carry out the requirements of the "Prompt Payment Clause" and/or timely return of retainage, without just cause, is a material breach of this contract, which may result in the NDOR withholding the amount of payment from the prime contractor that should have been paid to the subcontractor, termination of this contract, or other such remedy as the NDOR deems appropriate.

NOTE: The prime contractor may withhold payment only for just cause, and must notify the NDOR in writing of its intent to withhold payment prior to actually withholding payment. The prime contractor shall not withhold, delay or postpone payment without first receiving written approval from the NDOR.

**DBE GOAL CREDIT  
(S1-9-0603)**

It is the intent of the NDOR to assure eligible DBE firms have a "level playing field" and equal opportunity to participate in federal-aid contracts, and maintain the integrity of the DBE program. DBE participation is counted toward goals as follows:

When a DBE firm participates in a contract, only the value of the work actually performed by the DBE firm counts toward the goal.

1. The entire amount of that portion of a construction contract that is performed by the DBE firm's own forces is counted toward the goal. This includes the cost of supplies and materials obtained by the DBE firm for the work of the contract, including supplies purchased or equipment leased by the DBE, but not supplies or equipment the DBE purchases or leases from the prime contractor or its affiliate.

Example: A DBE firm furnishing and erecting steel or concrete superstructure members, furnishing and driving piling for bridge structures, furnishing and placing prestressed concrete deck panels, and furnishing and placing panels for retained earth walls will be considered a commercially useful function for attaining contract goals for disadvantaged business enterprise (DBE) participation unless the supplies or materials are purchased from the prime contractor or its affiliate.

When a DBE subcontractor is responsible for substantially constructing a complete structure the total value of the subcontract may be credited to the DBE goal.

Paragraph 8.a. (5) of Subsection 109.07 in the 1997 English Edition of the Standard Specifications is void and superseded by the following:

When applicable a DR Form 441, "Identification of DBE Goal Achievement".

**B. Manufacturers, Suppliers, and Haulers:**

DBE Manufacturers may be given 100% credit towards the DBE goal for products they produce for the contract.

DBE Suppliers may be given 60% credit towards the DBE goal for products they furnish for the contract.

DBE Haulers may be given 100% credit towards a DBE goal for the delivery fees charged.

A DBE firm certified as both a supplier and hauler may be given 60% credit for supplying a given product and 100% credit for hauling that same product.

See the DBE Goal Credit Table for a guide to DBE credit.

## **DESCRIPTIONS (S1-9-0504)**

Manufacturer - To be certified as a manufacturer, a DBE firm must operate or maintain a factory or establishment that produces, on the premises, the materials, supplies, articles or equipment required under the contract and of the general character described by the specifications.

Supplier - A DBE supplier, or regular dealer, is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles, or equipment of the general character described by the specifications, and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a supplier or regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.

A DBE firm may be a supplier or regular dealer in such bulk products as petroleum products, steel, cement, gravel, stone, or asphalt without owning a place of business if the DBE firm both owns and operates distribution equipment for the products. Any supplementing of a DBE supplier's or regular dealer's own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis.

Rebar Supplier Installer - If a DBE is going to be used only as a supplier, as specified in 49 CFR Part 26.55(e)(2)(ii)(A) and (B), of rebar, the prime contractor will receive credit for 60 percent of the cost of the rebar. The DBE must be responsible for negotiating price, determining quantities, ordering, and paying for the rebar with the DBE's own funds. No two-party checks will be allowed to pay for the rebar.

If a DBE is going to be used only to install rebar, the prime contractor will receive credit for 100 percent of the cost of the installation. The DBE must be responsible for actually performing, managing, and supervising the work.

If a DBE is going to be used to both supply and install rebar, the prime contractor will receive 100 percent credit for both the cost of the rebar and the cost of the installation. However, the DBE must be responsible for negotiating price, determining quantities, ordering, and paying for the rebar with the DBE's own funds; and for actually performing, managing, and supervising the installation of the rebar. No two-party checks will be allowed to pay for the rebar.

The above-cited provisions will be closely monitored by NDOR for compliance. If the provisions are violated in any manner, the Department will impose penalties as prescribed in the contract provision, "USE OF DISADVANTAGED BUSINESS ENTERPRISES," paragraph VIII. C. 1., a. thru i.

Hauler - The DBE firm must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract. There cannot be a contrived arrangement for the purpose of meeting DBE goals.

The DBE firm must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

The DBE firm receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.

The DBE firm may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE firm that leases trucks from another DBE firm receives credit for the total value of the transportation services the lessee DBE firm provides on the contract.

The DBE firm may also lease trucks from a non-DBE firm, including an owner-operator. The DBE firm that leases the trucks from a non-DBE firm is entitled to credit only for the fee or commission it receives as a result of the lease agreement. The DBE firm does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE firm.

For the purposes of the above paragraphs, a lease must indicate that the DBE firm has exclusive use of, and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE firm, so long as the lease gives the DBE firm absolute priority for the use of the leased truck. Leased trucks must display the name and identification number of the DBE firm.

If a DBE firm performs in the manner outlined above, it will be performing a commercially useful function.

Pass-throughs and/or brokering will not be tolerated. A pass-through/brokering situation is one in which a DBE firm contracts to haul materials for a project, then hires another hauler to actually perform on the contract.

### **CERTIFICATION (S1-9-0603)**

Certain DBE's may be certified in multiple classifications as manufacturers, suppliers, and haulers. The certification will be limited by the products being manufactured, supplied, or hauled.

For example, a manufacturer of certain steel products or aggregates, may also be a supplier of products they store or deliver, but do not manufacture.

A supplier of bulk products, such as aggregates or fuel, may also be certified as a hauler.

## DBE GOAL CREDIT TABLE

<b>DBE Manufacturer &amp; DBE Hauler</b>	<b>100% Credit for Materials &amp; 100% Credit for Hauling</b>
<b>DBE Manufacturer &amp; Non-DBE Hauler</b>	<b>100% Credit for Materials &amp; No Credit for Hauling</b>
<b>Non-DBE Manufacturer &amp; DBE Hauler</b>	<b>No Credit for Materials &amp; 100% Credit for Hauling</b>
<b>DBE Supplier &amp; DBE Hauler</b>	<b>60% Credit for Materials &amp; 100% Credit for Hauling</b>
<b>DBE Supplier &amp; Non-DBE Hauler</b>	<b>60% Credit for Materials &amp; No Credit for Hauling</b>
<b>Non-DBE Manufacturer &amp; DBE Hauler</b>	<b>No Credit for Materials &amp; 100% Credit for Hauling</b>

## TRAINING SPECIAL PROVISIONS

This Training Special Provision supplements subparagraph 7e of the Contract Provision entitled "Standard Federal Equal Opportunity Construction Contract Specification (Executive Order 11246)" and is in implementation of 23 U.S.C. 140(a).

As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

The number of trainees to be trained under this contract will be as follows:

<u>No. of Trainees</u>
<u>5</u>

Trainees may be utilized in any group of work included in the contract. Payment will be made under the bid item "Training".

In the event the contractor subcontracts a portion of the contract work, they shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to Department of Roads' Highway Civil Rights Office (EEO Section) for approval, the names of trainees to be trained in each classification and the training program to be used. The contractor also must submit the names and classifications of the trainees to the Project Manager. Furthermore, the contractor shall specify the starting time for each trainee. The contractor will be credited for each approved trainee employed by them on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter. The EEO Section may be contacted at (402) 479-4514 for answers to questions or assistance.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority and women trainees (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that have been taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeymen status or in which they have been employed as a journeyman. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Department of Roads and the Federal Highway Administration. The Department of Roads and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the Department of Roads prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., if the selected training program includes these classifications and the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the F.H.W.A. Division Office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the engineer, reimbursement will be made for training persons in excess of the number specified herein. This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor where they do one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin their training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in this work classification or until they have completed their training program. It is not required that all trainees be on board for the entire length of the contract. Contractors will have fulfilled their responsibilities under this Training Special Provision if they have provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The contractor shall furnish the trainee a copy of the program they will follow in providing the training. The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The contractor will provide for the maintenance of records and furnish periodic reports documenting their performance under this Training Special Provision.

Payment will not be made to the contractor under the item of "Training" for hours of training which were provided prior to the Engineer's approval of the contractor's selected training program by the Department of Roads.

Payment will be made for the item "Training" in accordance with the foregoing provisions. The number of hours included for payment shall be the actual hours of training which was satisfactorily completed.

Payment will be made on estimates based on a summary of the training provided by the contractor and subcontractors, prepared and submitted by the contractor to the engineer. The summary must list each trainee by name, sex, social security number, race, or national origin, work classification, wage rate paid, hours trained during month covered by summary, and total hours of training under this contract. The payroll records which are submitted to the engineer must contain sufficient information (except trainee's race or national origin) for verification of the information shown on the summary.

The established unit price for the item "Training" shall be full compensation for all costs incurred, which includes but is not limited to providing the necessary supervision, labor, equipment, tools and material. Any additional costs due to payment of wages in excess of the minimum rates specified and for the payment of any fringe benefits shall not be paid for directly but shall be considered subsidiary to the items for which direct payment is made.

## **AMENDMENT TO CONSTRUCTION TRAINING REPORT REQUIREMENTS**

The last sentence under Paragraph C. on Page 5 of the Standard Federal Equal Employment Opportunity Construction Contract Specifications dated November 3, 1980 is void. FHWA Form 1409 "Federal-aid Highway Construction Contractor's Semi-Annual Training Report" is not required.

## **CERTIFICATION FOR FEDERAL-AID CONTRACTS (S1-11-0801)**

The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such subrecipients shall certify and disclose accordingly.

## **STATUS OF UTILITIES**

The following information is current as of February 5, 2004.

Utility facilities, aerial and/or underground do exist within the limits of this project. The Contractor should request a utility update at the project preconstruction conference, and/or prior to starting work.

To arrange to have the underground utility facilities located and flagged, contact The Diggers Hotline of Nebraska at 1-800-331-5666.

The Contractor is referred to the utility sheets in the plans, which show the approximate locations of the utility companies' proposed relocations and abandonments together with approximate time frames as to when the relocations are to take place.

The following listed utilities have facilities within the project area, and have provided the information that follows.

**OMAHA PUBLIC POWER DISTRICT:**

Replace existing Omaha Public Power District (OPPD) 3ph 15,000v direct buried underground cable from Sta. 76+50, Lt. to Sta. 80+50, Lt. with 3ph 15,000v direct buried underground cables in existing right of way. Replace existing OPPD 3ph 15,000v direct buried underground cable from Sta. 80+50, Lt. to Sta. 86+00, Lt. with 3ph 15,000v primary cables in 1-5" pvc schedule 40 conduit in existing right of way. Pad mount switchgear # 516 at Sta. 77+80 Lt., switchgear #1893 at Sta. 77+90 Lt., switchgear #518 at Sta. 79+76 Lt., switchgear #851 at Sta. 79+80 Lt. to remain in existing easement. Contractor is to work around this equipment.

Replace existing OPPD 3ph 15,000v direct buried underground cable with 3ph 15,000v direct buried underground cable from Sta. 79+30, Rt. to Sta. 82+00, Rt. in existing right of way. Pad mount switchgear # 517 at Sta. 79+25, Rt. and switchgear #2358 at Sta. 80+15, Rt. to remain in existing easement. Contractor is to work around this equipment.

Existing OPPD 3ph pad mount transformer 8nn 1813 at Sta. 78+78, Rt., to remain in existing right of way. Contractor is to work around this equipment.

Existing primary cable pullbox at Sta. 80+60, Lt. to be replaced with new manhole on new easement.

Existing OPPD pad mount switchgear #36 at Sta. 82+72, Rt. to be replaced in kind on new easement at Sta. 83+13, Rt.

Replace existing OPPD 3ph 15,000v underground cable in 1-4" pvc conduit with 3ph 15,000v primary cable in 1 - 5" pvc schedule 40 conduit from Sta. 83+50, Rt. to Sta. 84+60, Rt. in new and existing right of way.

**METROPOLITAN UTILITIES DISTRICT:**

MUD Furnished Schedule:

1. Starting spring 2004 work on the gas main that runs from 114<sup>th</sup> and Chicago St. to approximately 111<sup>th</sup> and West Dodge Rd.
2. Next start on the water main that goes from 111<sup>th</sup> and West Dodge Rd. to the west.
3. Continue as needed for phasing.
4. The proposed water main crossing the Big Papillion Creek north of West Dodge Rd. is being contracted out with a completion date of June 1<sup>st</sup> 2004.

No water mains can be abandoned until the contractor's plumber has transferred the water services described below to the new mains:

**Station 79+12, 25m Rt. to Station 79+42, 25m Rt. Contractor to connect existing 1" water service line to new Fire Hydrant Lead.**

**Station 79+42, 25m Rt. to Station 79+62, 25m Rt. Contractor to connect existing 6" water service line to new Fire Hydrant Lead.**

**Station 79+50, 23m Lt. Contractor to connect two existing 1" water service lines to relocated Water Main.**

**Station 80+35, 23m Lt. Contractor to connect existing 2" water service lines to relocated Water Main.**

**Station 81+40, 23m Lt. Contractor to connect existing 8" Fire Main to relocated Water Main.**

**Station 82+57, 34m Rt. to Station 82+58, 28m Rt. Contractor to connect existing 1" water service lines to relocated Water Main.**

**Station 83+45, 46m Lt. Contractor to connect existing 1" water service line to relocated Water Main.**

**Station 84+12, 28m Lt. Contractor to connect existing 8" water service line to relocated Water Main.**

**Station 83+15, 50m Rt. to Station 83+26, 167m Rt. (In Chicago Circle) Contractor to connect existing (Size Unknown) water service line to existing 8" Water Main in Chicago Circle.**

**Station 83+82, 28m Rt. to Station 83+91, 34m Rt. Contractor to connect existing 1" water service line to New Fire Hydrant Lead.**

**Station 84+86.5, 46.5m Rt. to Station 85+33.5, 141.5m Rt. (In South Frontage Road) Contractor to connect existing 2" water service line to existing 8" Water Main in South Frontage Road.**

#### **QWEST COMMUNICATIONS:**

Qwest will have completed all relocation work prior to start of the Project. If any of their existing cables need to be moved or lowered due to proximity to other construction, Contractor is to contact Qwest Communications and they will get them moved.

#### **COX COMMUNICATIONS:**

Cox will have completed all of their relocation work prior to start of the Project.

#### **SOUTH BRIDGE PROJECT:**

There are two PVC Conduits attached to the south side of the bridge. One of these conduits has two coaxial cables located in it. As far as can be determined, these cables are abandoned.

### **CONTRACTOR COORDINATION WITH UTILITIES RELOCATIONS**

After the Metropolitan Utilities District (MUD) has relocated their Water Mains, the Contractor will be required to connect several water service lines of various sizes [five 25-mm (1"), two 50mm (2"), one 150-mm (6"), two 200mm (8"), and one unknown size to the new Water Mains before the old Water Mains can be abandoned. Some of these service lines will have to be extended, shortened or relocated. The Contractor is required to have a licensed plumber to do these connections and will have to follow all rules and regulations of MUD for new service connections. These rules and regulations are available from MUD's New Service Department.

Basis of payment shall be measured and paid for on an each basis for the item "Water Service Connection".

This price shall be considered full compensation for furnishing all materials as shown in the plans and for all labor, tools and any incidentals necessary to complete the work.

### **ABANDONED UTILITY TREATMENT**

During the prosecution of the work (i.e. The installation of storm sewer pipe) the Contractor may encounter existing utility lines and/or conduits that have been abandoned. The Contractor should first check to make sure that the utility is abandoned and then remove the utility to the extent necessary to allow the construction to proceed. The ends of any conduits or pipes that are to remain shall be plugged with concrete.

The removal of existing abandoned utilities and the plugging of the ends of remaining conduits and pipes will not be measured for payment and any tools, equipment, materials and labor required to perform this work shall be considered subsidiary.

### **STATUS OF RIGHT OF WAY [Project No. EACNH-6-7(166)]**

The right of way for this project has been acquired and physical possession is held by the State of Nebraska and ready for the contractor's use, except tracts listed below.

Status of unacquired and uncleared right of way tracts is estimated as follows:

<b>TRACT NO.</b>	<b>HEARING DATE</b>	<b>IMPROVEMENTS REMAINING THIS DATE</b>	<b>IMPROVEMENT CLEARANCE</b>
27, 35 – negotiating	None	Tract 27 – Sign (Sta. 82+80 Lt.)	Pay Item
18, 22, 25 – to be condemned	None	Tract 18—signs (Sta. 3006+38 Rt., Sta. 3006+38 Rt., Sta. 3006+72 Rt., Sta. 77+80 Rt.), Tract 25 - sign (Sta. 80+25 Rt.)	Pay Item
29, 32, 37 – to be condemned	4-29-04	None	None
16	None	Signs (Sta. 76+15 Lt., Sta. 76+50 Lt.)	Pay Items

Signs and/or bases may be removed by the owners prior to construction.

All necessary arrangements have been made for the right of way clearance to be undertaken and completed concurrently with the highway construction.

All necessary rights of way, including control of access rights when pertinent, have been acquired including legal and physical possession except for the above.

It is anticipated that all right of way will be acquired and physical possession held by the State prior to the tentative starting date shown elsewhere in this proposal.

The contractor will not be allowed to perform work on any tract listed above until legal and physical possession has been acquired by the State. If necessary, the contractor will be granted an extension of time if a delay is caused because of the above tract(s) not being acquired.

**STATUS OF RIGHT-OF-WAY**  
**[Project No. EACNH-6-7(168)]**

According to the best information available, all necessary right-of-way has been acquired.

**STATUS OF RIGHT-OF-WAY**  
**[Project No. EACNH-6-7(167)]**

According to the best information available, all necessary right-of-way has been acquired.

**STATUS OF RIGHT-OF-WAY**  
**[Project No. BH-5164(1)]**

According to the best information available, all necessary right-of-way has been acquired.

**AWARD AND EXECUTION OF CONTRACT**

The first sentence of Subsection 103.03 in the Standard Specifications is void and superseded by the following:

The bidder to whom the contract is awarded shall furnish within 5 days after the award, a contract bond, in a sum equal to the full amount of the contract.

The first sentence of Subsection 103.04 is void and superseded by the following:

The contract shall be signed by the successful bidder and returned, together with a satisfactory bond, within 5 days from the date of award.

Paragraph 1.a. of Subsection 103.05 is void and superseded by the following:

- a. Fails to file an acceptable performance bond within 5 days from the date of award.

**PLANS AND WORKING DRAWINGS**

The last sentence of Paragraph 5. of Subsection 105.02 in the Standard Specifications is void and superseded by the following:

The Contractor shall furnish the Engineer as many copies of working drawings as are required in each Division specifying submission of working drawing, or seven copies (8 copies if the submission is a precast structure or element), if the quantity is not specified.

Paragraph 6.c. of Subsection 105.02 is void and superseded by the following:

- c.(1) The project number, structure number, control number and project locations as it appears on the plans, shall be shown on each sheet of all shop drawings.
- (2) All shop drawings shall be submitted in Metric working units or, alternatively, in dual Metric and English working units. The base unit of length for Metric units shall be in millimeters.

Paragraph 7. of Subsection 105.02 is void and superseded by the following:

The address for submitting shop plans and working drawings is:

HDR Engineering Inc.  
8404 Indian Hills Drive  
Omaha NE 68114-4049

Attn: Phil Russbach

The Contractor shall also send a copy of the transmittal letter to the following address:

Nebraska Department of Roads  
1500 Nebraska Highway 2  
P.O. Box 94759  
Lincoln, NE 68509-4759

Attn: Construction Division

**SPECIAL PROSECUTION AND PROGRESS  
(Migratory Birds)  
(S1-42-0604)**

The Department of Roads will, to the extent practicable, schedule the letting of projects such that bridge demolition activities or clearing and grubbing can occur outside of the primary nesting season in Nebraska which has been determined to generally occur between April 1 and July 15.

The Contractor shall, to the extent possible, schedule bridge demolition and clearing and grubbing activities for highway projects to occur outside the primary nesting season in Nebraska. However, if circumstances dictate that project construction or demolition must be done when nesting migratory birds may be present, a survey of the number of active nests and species of birds shall be conducted by qualified personnel representing the Contractor, and assisted by the Project Manager (PM), NDOR Environmental Section staff, or the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) - Wildlife Services Office.

The following guidance is provided for compliance with the Migratory Bird Treaty Act for construction of NDOR projects:

1. The Contractor shall submit a plan to the NDOR regarding how he intends to accomplish bridge demolition or clearing and grubbing of the project to avoid conflict with nesting migratory birds.
2. The Contractor must submit a temporary erosion control plan tailored to fit the plan for clearing and grubbing.
3. If construction operations result in unavoidable conflict with nesting migratory bird's eggs or young, which will result in "taking" nests and their contents, the Contractor should notify the NDOR Project Manager (PM). The PM shall notify

the Environmental Section of Planning and Project Development by telephone at 402-479-4410 or 4412.

4. The NDOR Environmental Section will then determine if assistance in conducting the survey will be provided by the NDOR Environmental Section (if available) or from the USDA APHIS - Wildlife Services Office and arrange for assistance with the survey of nest numbers, bird species, etc. Results of the survey shall be maintained by the NDOR until project completion. The Contractor will reimburse the Department of Roads for each survey required at \$1,000 per survey.
5. USDA and NDOR can assist the Contractor in completing Form 37 and Form 3-200 to apply for a depredation permit allowing removal and handling by the Contractor.
6. The Contractor shall submit the completed application materials to the following address: U.S. Fish and Wildlife Service, Office of Migratory Bird Management (Permits), P.O. Box 245486, DFC (60154), Denver Colorado, 80225-0486. A \$25 fee must be submitted with the application. A copy of the permit application shall be submitted to the Nebraska Ecological Services Field Office of the U.S. Fish & Wildlife Service.
7. The U.S. Fish & Wildlife Service Office of Migratory Bird Management (Denver, CO) will process road construction depredation permit applications as soon as practicable, recognizing the concerns for public safety and economic impact of delays.
8. It is the Contractors' responsibility to schedule his work to accommodate the process of conducting a survey(s) and obtaining the necessary permit(s) if avoidance is not practicable. The Contractor shall be responsible for using any legal and practical method to prevent the nesting of birds in order to prevent the need for any survey and prevent the need for additional surveys. Should the construction be delayed through no fault of the Contractor, the Department may consider time extensions to cover the relevant time.

#### **REQUIRED SUBCONTRACTOR/SUPPLIER QUOTATIONS LIST (S1-43-0603)**

At bid submittal, all bidders must provide to the NDOR the identity of all firms who provided quotations on all projects, including both DBEs and non-DBEs. This information must be on a form provided by the NDOR Contracts Office.

If no quotations were received, the bidder must indicate this in the space provided.

Each bidder will be required to submit one list per letting to cover all projects bid.

## **CONTROL OF WORK (S1-43-0901)**

Subsection 105.08 in the 1997 Standard Specifications is void and replaced by the following:

### **105.08 - Authority and Duty of the Inspector**

Department inspectors are authorized to inspect all work performed and all materials furnished. Such inspection may extend to the preparation, fabrication, or manufacture of the materials. The inspector has the authority to reject work or materials until any issues can be decided, including the right to suspend work. The inspector is not authorized to alter or waive the provisions of the contract or act as a supervisor for the Contractor.

### **105.13 – Tentative Acceptance of Portions of the Project**

Paragraph 3.a. of Subsection 105.13 is amended by deleting the word “normal”.

## **LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC (S1-43-1001)**

### **107.14 – Opening of Sections of the Project to Traffic**

Subsection 107.14 Paragraphs 2.b.(1) and (2) are void and replaced by the following:

2.b. (1) Whenever the Department permits the public use of a highway undergoing construction, repair, or maintenance in lieu of a detour route, the Contractor shall not be held responsible for damages to those portions of the project upon which the Department permitted public use, when such damages are the result of no proximate act or failure to act on the part of the Contractor.

(2) If the traveling public should cause damage to the roadway, the Contractor shall assist the State in identifying the responsible party and the Contractor shall as a minimum if present at the time of the damage record pertinent information regarding the accident. (Who caused the damage; when the damage occurred; and how the damage occurred.)

### **107.15 – Contractor’s Responsibility for Work**

Subsection 107.15 is amended by adding Paragraph 1.b.(3) as follows:

(3) The Contractor shall not be held responsible for damage caused by the traveling public on those portions of the project where the Department has permitted public use of the road in lieu of using a detour route and the damage as not the result of any proximate act or failure to act on the part of the Contractor.

**MEASUREMENT AND PAYMENT  
(S1-43-0901)**

109.08 – Acceptance, Final Payment, and Termination of Contractor's Responsibility

Subsection 109.08 Paragraph c. amended by deleting the word "normal".

Subsection 109.08 Paragraph d. is void and replaced by the following:

- d. If the traveling public should cause damage to the roadway the Contractor shall assist the State in identifying the responsible party and the Contractor shall as a minimum if present at the time of the damage record pertinent information regarding the accident. (Who caused the damage; when the damage occurred; and how the damage occurred.)

**LIABILITY INSURANCE  
(S1-43-1103)**

Paragraph 2.a. of Subsection 107.13 in the Standard Specifications is void and superseded by the following:

- a. The General Liability coverage for bodily injury liability shall be not less than \$1,000,000 for injuries, including accidental death, in any one occurrence, and subject to an aggregate limit of not less than \$2,000,000.

Paragraph 2.b. of Subsection 107.13 is void and superseded by the following:

- b. The amount of property damage liability insurance shall be not less than \$1,000,000.

**STEEL COST ADJUSTMENT  
(S1-43-0504)**

Section 109 in the Standard Specifications and Supplemental Specifications is amended to include the following:

Payments will be made to the Contractor for fluctuations in the cost of steel for the following items:

- Piling --- (H, pipe, sheet)
- Structural Steel
- Reinforcing Steel
- Dowel Bars
- Tie Bars
- Reinforcing for Pavement --- (mesh)
- Traffic and Light Poles and Mast Arms

Payments or deductions will only be made for fluctuations in the cost of the steel used in these items. No adjustments will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

Payments may be positive, negative, or non-existent depending on the circumstances. Payments or deductions for the steel cost adjustment will be calculated by the engineer and shown on the Contractor's progress estimate as a contingency item.

The steel cost adjustment (SCA) will be computed according to the following formula:

$SCA = Q \times D$  where

SCA = Steel cost adjustment, in dollars

Q = Quantity of manufactured steel, in pounds (kg)

D =  $SP(L) - SP(M)$ , the steel price adjustment in dollars per pound (kg), where

SP(L) shall be the average of the Consumer Buying Price indices for Shredded Auto Scrap (Chicago) and No. 1 Heavy Melt (Chicago) as published by the American Metal Market (AMM) for the day the work was let. The price shall be adjusted to dollars per pound (kg).

SP(M) shall be the average of the Consumer Buying Price indices for Shredded Auto Scrap (Chicago) and No. 1 Heavy Melt (Chicago) as published by the AMM for the day the steel is shipped from the mill. The price shall be adjusted to dollars per pound (kg).

No steel cost adjustments will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

The Contractor shall furnish sufficient documentation to verify the following:

1. Evidence that increased or decreased steel costs have been passed on to the Contractor.
2. The dates and amounts of steel shipped from the mill to the fabricator.
3. The amount of steel (by weight) incorporated into the various items of work covered by this Special Provision. (NDOR reserves the right to verify submitted quantities.)

Paragraph 8.a. of Subsection 109.07 is amended to include the following:

- (6) The documentation necessary to substantiate the Steel Cost Adjustment.

## **CONSTRUCTION STAKING AND SURVEYING**

Section 114 in the Standard Specification for Highway Construction (SSHC) is amended as follows:

1. Paragraph 3.c. (3), in Subsection 114.01, is void and superseded by the following:
  - (3). Field notes shall be kept in standard, bound field notebooks or in a Department approved computer file. The data shall be clear, orderly, and neat; consistent with standard engineering practices; and in accordance with the Department's notebook procedures, refer to the Nebraska Construction Manual. The Contractor shall provide the notebooks, which become the property of the Department upon completion of the project. The field notebooks shall be subject to inspection by NDR project personnel at any time.
2. Paragraph 3., in Subsection 114.01, is amended to include paragraph d.:

- d. Additional Items of Work Considered Subsidiary to "Construction Staking and Surveying":
- (1) The Contractor's survey crew shall wear appropriate safety attire while working on the project. No shorts allowed and shall wear shirt under vest, instrument person will not be required to wear hat while running the instrument. When working around Railroad tracks the survey crew will be required to follow Railroad policies.
  - (2) When the plans show the matching of existing pavements, culverts, bridges, or structures, the survey crew will establish and report to the Project Manager the new alignment and its relationship the existing structure or pavement. The survey crew shall shoot elevations of the existing pavement and establish profile grades. The new grades will be adjusted as necessary to match the existing pavement smoothly. When matching an existing culvert or structure, the alignment and grades of the new structure will be adjusted. All changes will need Project Managers approval and will be plotted on cross-section paper to be included in the final records.
  - (3) All girder shim shots will be laid out as directed by the Project Manager. It is expected that top of girder elevations will be required at the lesser of 3 m intervals or at the tenth points of the girder along centerline of girder. The Contractor shall expect that a nominal amount of additional top of girder elevations will be required and these should be included in the contract price. Establishing elevations will be performed using a standard automatic level and a grade rod. The use of a total station will not be allowed. It will also be required that this automatic level is shown to be in adjustment to the satisfaction of the Project Manager. Surveyed top of girder elevations shall be provided by the Contractor in an ASCII type electronic file in a format provided by the Project Manager.
  - (4) The prime contractor shall coordinate all survey activities.
  - (5) Weekly surveying meetings between the prime contractor and the survey crew are required to establish survey priorities for the upcoming week. The prime contractor must supply the Project Manager with a list of surveying priorities.
  - (6) The survey crew shall provide NDOR, all utility companies and other public entities with all necessary survey information and stakes within 48 hours of request. This responsibility will begin within a week of Contract Award date and continue until final acceptance.
  - (7) Survey stakes that need to be re-staked will be subsidiary to the pay item.
  - (8) The centerline of all roadways will be established to allow for NDOR personnel to record the limits of various pay quantities. The establishment of centerline may be necessary both prior to beginning of any work and after construction has been completed. It is also possible that phased work may require additional re-establishment of roadway centerlines during construction activities.
  - (9) The survey crew shall stake the ROW.

- (10) Additional survey work that is a result of a change order shall be subsidiary to that change order and should be included in the change order price.
  - (11) The survey crew will notify the Project Manager of any errors in staking or result of incorrect construction.
3. Subsection 114.03 is amended to include the following:
3. Payment will be on progress estimates, the amount will be a percentage of lump sum bid price equal to the project completion percentage as shown on the project estimate, not to exceed 100%.
  4. In the event that survey work takes place while no other construction activities are being performed, the contractor may be paid \$125.00 per hour or 1% of the contract unit price for "Construction Staking and Surveying", which ever is smaller, for each week that survey work takes place.
- Progress payments for "Construction Staking and Surveying" will not exceed 95% until final acceptance is made. However, at no time will payment exceed 100% of the unit price.

In addition to the above changes to Section 114 in the Standard Specifications for Highway Construction (SSHC), Subsection 1300.06 in the Department's *Construction Manual* is amended as follows:

1. Paragraph B. is void and superseded by the following:
  - B. Additional Survey Work Payment. Additional field work required because of plan revisions or changes not associated with change orders, as directed by Project Manager, shall be paid for as extra work according to *SSHC Subsection 109.05*, which is amended to: Additional Survey Work Payment will be at a rate of \$125.00 per hour total cost for the survey crew and equipment for documented hours of actual field work.
2. The fifth bulleted item in paragraph C. is amended to read:

Establish relocated centerline and related points, including extensions of cross sections.
3. The sixth bulleted item in paragraph C. is amended to read:

Staking culverts, bridges, sewers, pavement and all other structures, including survey work for final cross-sections and survey work required for NDOR to obtain final quantities.
4. Paragraph D. is amended to read:

Perform work identified in the special provisions of the contract.

Install brass or aluminum caps in structures for the Contractor's Survey Crew to establish coordinates and elevation.

5. Paragraph F.1. is amended to read:
  1. Field notes are to be kept in the bound field books. After project completion, field books become the property of the Department. Examples are in Appendix 3-6 thru 3-15, in the Department's *Construction Manual*.

**NOTICE TO BIDDERS  
(Crushed Concrete)**

The State has made available to the Contractor at no cost an existing stockpile of crushed concrete located at 108<sup>th</sup> Street and I-80, as directed by the Engineer.

## **SPECIAL PROSECUTION AND PROGRESS INDEX**

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## SPECIAL PROSECUTION AND PROGRESS

### I. DEFINITION OF WORK PERIODS

The following definitions of work periods apply to this project,

• <b>Peak Hours (ph)</b>	Monday through Friday from 6:00 a.m. to 9:00 a.m. and 3:30 p.m. to 6:30 p.m.
• <b>Daytime Non-peak Hours (dnp)</b>	Monday through Saturday from 9:00 a.m. to 3:30 p.m. and from 6:30 p.m. to 10:00 p.m. Also Saturday from 3:30 p.m. to 6:30 p.m. and Sunday from 9:00 a.m. to 6:30 p.m.
• <b>Nighttime Non-peak Hours (nnp)</b>	Monday through Saturday from 10:00 p.m. to 6:00 a.m. of the following morning. Also Saturday and Sunday from 6:00 a.m. to 9:00 a.m. Also from Sunday 6:30 p.m. to 6:00 a.m. of the following Monday.

PEAK HOUR CHART							
Time	Sun.	Mon.	Tues.	Wed.	Th.	Fri.	Sat.
6 am – 9 am	nnp	ph	ph	ph	ph	ph	nnp
9 am – 3:30 pm	dnp	dnp	dnp	dnp	dnp	dnp	dnp
3:30 pm – 6:30 pm	dnp	ph	ph	ph	ph	ph	dnp
6:30 pm to 10 pm	nnp	dnp	dnp	dnp	dnp	dnp	dnp
10 pm – 6 am	nnp	nnp	nnp	nnp	nnp	nnp	nnp

All roadway lanes and ramps shall be open to normal traffic, as shown on the Traffic Control plans, during peak hours and holidays, as defined elsewhere in this proposal, unless a closure is specifically shown in the plans or described in the Special Provision.

### II. CRITICAL MILESTONES

The following items are designated as critical milestones for Projects NH-6-7(166), NH-6-7(167), NH-6-7(168) and BH-5164(1):

1. North Frontage Road (S2)

Completion of Westbound Express Bridge piers, erection of girders and completion of bridge deck pours from Pier 10W through 37W (bridge units 1B through 1F) in Phase 3 by December 1, 2005.

2. South Frontage Road (S5)

Completion of Eastbound Express Bridge piers, erection of girders and completion of bridge deck pours from Pier 10E through 34E (bridge units 2B through 2E) in Phase 6 by December 1, 2006.

3. There will be separate Incentive / Disincentive assessments for portions of the work described in No. 1 and No. 2.

4. From May 26, 2007, to August 21, 2007, the reconstruction and reopening of 120<sup>th</sup> Street, from Sta. 3005+50± to Sta. 3012, and all approaches of the 120th & Davenport intersection, as shown in Phase 7 and 8, by the first day of classes at Burke High School for the 2007-2008 school year, which is scheduled for August 22, 2007.
5. Opening of the Westbound and Eastbound Express Bridges as soon as possible after May 26, 2007, in order to facilitate the reconstruction and reopening of 120th Street by the first day of classes at Burke High School for the 2007- 2008 school year.
6. There will be separate Incentive / Disincentive assessments for the work described in No. 4 and No. 5.
7. The completion of Phase 9 reconstruction of West Dodge Road and the reopening of all lanes to traffic by November 29, 2008. It is the Department's desire that the Phase 9 work start in 2008; this is to avoid any disruption to Dodge Street over the 2007-2008 winter. There will be no Incentive / Disincentive assessments for this work, rather project liquidated damages shall apply.

### **III. PROJECT INCENTIVES AND DISINCENTIVES**

#### **A. Incentive / Disincentive (I/D) For 120<sup>TH</sup> Street & EB / WB Express Bridges**

It is imperative that the work on 120<sup>th</sup> Street (Webster St. to Davenport St.), as shown in Phases 7 & 8, be completed in 2007 during the summer months when Burke High School is not in session. This will also include completion of the remaining EB & WB Express bridge spans over 120<sup>th</sup> Street.

120<sup>th</sup> Street shall be closed for construction beginning 6:00 a.m. May 26, 2007, and work shall be completed by August 21, 2007. 120<sup>th</sup> Street and the EB & WB Express Bridges shall be open to traffic by 6:00 a.m. on August 22, 2007.

Completed work on these segments shall be as follows:

1. Completed work on 120<sup>th</sup> Street shall include:  
  
Bridge removal, grading, drainage, utilities, paving, driveways, intersections, medians, sidewalks, lighting, signals and temporary striping.
2. Completed work on the EB & WB Express Bridges (for each structure, full length) shall include:  
  
Approaches, bridge rail, attenuator systems, drainage systems (complete), anti-icing systems (material installed in the deck – work on this system below the deck may remain in progress), lighting, sign structures with signs and striping.
3. It should be noted that if 120<sup>th</sup> Street and the EB & WB Express Bridges are opened to traffic by 6:00 a.m. on August 22, 2007, without all of the items listed in No. 1 and No. 2 being completed, then this portion of the project shall be considered to be in Disincentive until all items listed are completed.

The Contractor's failure to complete 120<sup>th</sup> Street and the EB & WB Express Bridges and have them open to traffic by 6:00 a.m. on August 22, 2007, shall result in the assessment of a \$40,000 per calendar day disincentive assessment. This disincentive assessment shall begin on August 22, 2007, and shall continue per calendar day until, and including, the day the roadways are open to traffic and all designated items of work are completed.

In the event the Contractor completes all designated work and has 120<sup>th</sup> Street and the EB & WB Express Bridges open to traffic on or before August 21, 2007, the Contractor shall receive a \$40,000 per calendar day incentive payment. The last day of incentive payment will be August 21, 2007. The incentive payment shall not exceed \$560,000.

The following formula was used to determine this incentive / disincentive (I/D) assessment:

$$\begin{aligned}\text{Incentive / Disincentive Assessment} &= \text{ADT} \times \text{Delay} \times \text{Cost Factor} \\ &= 16,500^* \times 15 \text{ minutes} \times \$0.16 \\ &= \$39,600 \text{ (Use \$40,000)}\end{aligned}$$

\* Represents 50% of ADT on 120<sup>th</sup> Street, by Administrative Decision

B. Incentive for EB / WB Express Bridges

The closure period to reconstruct 120<sup>th</sup> Street and complete the remaining span on each of the EB / WB Express Bridges is from May 26, 2007, to August 21, 2007, as defined in Section I. This represents a period of 88 calendar days.

It is extremely important to remove the existing 120<sup>th</sup> Street bridge and associated embankment, complete the remaining bridge spans and open the EB and WB Express Bridges to traffic as quickly as possible after May 26, 2007. By doing so, this will greatly reduce the amount of traffic on existing Dodge Street and will accomplish the following:

1. Facilitate easier construction of 120<sup>th</sup> Street for the contractor because of the reduced traffic on existing Dodge Street.
2. Improve safety conditions for Dodge Street traffic on the EB / WB Express Bridges as well as for local Dodge Street traffic that must travel through the 120<sup>th</sup> Street construction area.

The Contractor will be paid an incentive payment of \$5,000 per calendar day, for each bridge, for the early completion and opening of the EB / WB Express Bridges. The maximum incentive for each structure is limited to \$200,000. It should be noted that each bridge may be opened on different days and the incentive will be determined accordingly. The determination of the \$5,000 incentive is an Administrative decision based on comparisons of user costs for traffic using (1) existing Dodge Street and (2) existing Dodge Street and the Express Bridges.

To determine an incentive payment for this work, the following example for the EB Express Bridge illustrates this calculation:

1. Closure of 120<sup>th</sup> Street = May 26, 2007.
2. Completion of EB Express Bridge = July 14, 2007.
3. Opening of EB Express Bridge = July 15, 2007.

4. May 26, 2007, to July 15, 2007, = 51 calendar days.
5. 88 calendar days minus 51 calendar days = 37 calendar days
6. 37 calendar days x \$5000 = \$185,000 incentive payment for EB Express Bridge.

It should be noted that if either the EB or WB Express Bridge is opened to traffic without all of the items listed below being completed, then that portion of the project shall be considered to be not complete and incentive will not be paid until all items listed are completed for each bridge. In order to be considered complete and eligible for incentive, the following work must be completed on each structure (full length):

Approaches, bridge rail, attenuator systems, drainage systems (complete), anti-icing systems (material installed in the deck – work on this system below the deck may remain in progress), lighting, sign structures with signs and striping.

C. Incentive / Disincentive (I/D) for North Frontage Road (S2)

Construction of the North Frontage Road and Westbound Express Bridge is accomplished in Phase 3 and shall have I/D assessments apply to their completion. The completion of the portion of frontage road, identified as Segments 1 – 4, Sta. 577+00 'S2' to 581+90± 'S2', and bridge piers 10W through 37W, bridge deck pours and bridge curb for bridge units 1B through 1F are included as part of the I/D assessment.

Segment 1, Sta. 580+90± to Sta. 581+90±, can be constructed in 2004 or 2005. Work on Segments 2, 3 and 4 cannot proceed until Segment 1 work is completed and that portion of the road open to traffic. If Segment 1 is started in 2004, Segment 1 shall be completed by December 1, 2004. Work to be completed on Segment 1 shall include:

Grading, drainage, paving, driveways, sidewalks, completion of WB Express Bridge piers (24W through 26W).

Work on Segment 2, Sta. 580+00 ± to Sta. 580+90±, shall begin after completion of Segment 1, but not prior to March 1, 2005. Work on Segment 2 cannot begin until Segment 1 work is completed and open to traffic. Work to be completed on Segment 2 shall include:

Grading, drainage, paving, driveways, sidewalks, completion of WB Express Bridge piers (22W through 23W).

Work on Segment 3, Sta. 578+33± to Sta. 580+00± shall begin following the completion and opening to traffic on Segment 2. Work to be completed on Segment 3 shall include:

Grading, drainage, paving, driveways, sidewalks, completion of WB Express Bridge piers (19W through 21W).

Work on Segment 4, Sta. 577+00± to Sta. 578+33± shall begin following the completion and opening to traffic on Segment 3. Work to be completed on Segment 4 shall include:

Grading, drainage, paving, driveways, sidewalks, completion of WB Express Bridge piers (15W through 18W).

Associated with the Incentive / Disincentive (I/D) for North Frontage Road (S2) is the completion of the Westbound Express Bridge including completion of the piers, erection of

girders and completion of the bridge deck pours and bridge rail from Pier 10W through 37W (bridge units 1B through 1F).

In the event the Contractor completes all work associated with frontage road Segments 1-4 and bridge units 1B through 1F as described in Section C and opens the road to normal traffic on or before October 29, 2005, the Contractor shall receive a lump sum incentive payment of \$100,000.

In the event the Contractor fails to complete all work associated with Segments 1-4 and bridge units 1B through 1F as described in Section C by December 1, 2005, the Contractor will be assessed a \$2,500 per calendar day disincentive assessment. This disincentive assessment will begin on December 1, 2005, and shall continue per calendar day until, and including, the day the designated work is completed.

It should be noted that the lump sum incentive payment of \$100,000 and the \$2,500 per calendar day disincentive payment are based on Administrative decisions regarding the usage of the North Frontage Road.

#### D. Incentive / Disincentive (I/D) for South Frontage Road (S5)

Construction of the South Frontage Road and the Eastbound Express Bridge is accomplished in Phase 3 and Phase 6 and shall have I/D assessments apply to their completion. The completion of the portion of frontage road, identified as segments 1 - 3, Sta. 678+15± 'S5' to Sta. 682+22± 'S5', and bridge piers 10E through 34E, bridge deck pours and bridge curb for bridge units 2B through 2E are included as part of the I/D assessment.

The frontage road work, Sta. 678+15± 'S5' to Sta. 681+97± 'S5', is divided into 3 segments, where the work on the first segment must be completed and that portion of the road open to traffic before work on the next segment begins.

##### 1. Phase 3 South Frontage Road

The South Frontage Road work in Phase 3 includes grading, drainage, paving, intersections, sidewalks and temporary surfacing on the south half of the roadway. The designated work on Segment 1 must be completed and open to traffic before starting Segment 2 and so on. The Phase 3 work shall include the following parameters:

- a. This Phase 3 work may be performed in 2004; if started in 2004, the work shall be completed and open to normal traffic by December 1, 2004.
- b. If the Phase 3 work begins in 2005, it shall start no sooner than March 1, 2005, and it shall be completed and open to normal traffic by December 4, 2005.
- c. Once the Contractor begins Phase 3 work on the South Frontage Road, whether in 2004 or 2005, the Contractor shall complete the work as quickly as possible so as to minimize disruption to adjacent properties.
- d. There will be no I / D associated with Phase 3 work on the South Frontage Road.

## 2. Phase 6 South Frontage Road

Segment 1, Sta. 678+15± to Sta. 678+93±, shall not begin prior to March 1, 2006. Work on Segments 2 and 3 cannot proceed until Segment 1 work is completed and that portion of the road open to traffic. Work to be completed on Segment 1 shall include:

Grading, drainage, paving, completion of EB Express Bridge piers (17E through 19E).

Work on Segment 2, Sta. 678+93 ± to Sta. 679+35±, shall begin after completion of Segment 1. Work on Segment 3 cannot begin until Segment 2 work is completed and open to traffic. Work to be completed on Segment 2 shall include:

Grading, drainage, paving, completion of EB Express Bridge piers (20E).

Work on Segment 3, Sta. 679+35± to Sta. 681+97± shall begin following the completion and opening to traffic on Segment 2. Work to be completed on Segment 3 shall include:

Grading, drainage, paving, completion of EB Express Bridge piers (21E through 26E).

Associated with the Incentive / Disincentive (I/D) for South Frontage Road (S2) is the completion of the Eastbound Express Bridge including completion of the piers, erection of girders and completion of the bridge deck pours and bridge rail from Pier 10E through 34E (bridge units 2B through 2E).

In the event the Contractor completes all work associated with frontage road Segments 1-3 and bridge units 2B through 2E as described in Section D. 2., and opens the road to normal traffic on or before October 28, 2006, the Contractor shall receive a lump sum incentive payment of \$100,000.

In the event the Contractor fails to complete all work associated with Segments 1-3 and bridge units 2B through 2E, as described in Section D. 2., by December 1, 2006, the Contractor will be assessed a \$2,500 per calendar day disincentive assessment. This disincentive assessment will begin on December 2, 2006, and shall continue per calendar day until, and including, the day the designated work is completed.

It should be noted that the lump sum incentive payment of \$100,000 and the \$2,500 per calendar day disincentive payment are based on Administrative decisions regarding the usage of the South Frontage Road.

### E. General Statement for Incentive / Disincentive (I/D)

1. When determining the Disincentive Assessments described in Sections A., C. and D., no time extensions will be allowed for unforeseen site, labor or utility conditions, or for weather delays (with the exception of catastrophic events such as tornado or earthquake which directly impacts the Contractor's performance).

2. It should be noted that incentive / disincentive assessments, as well as other assessments (lane rental, peak hour, etc.) described elsewhere in this proposal, are not provided for anywhere else in this contract, and shall be considered in addition to other liquidated damage assessment contained in this contract.

#### **IV. LANE CLOSURES – WEST DODGE ROAD**

<b>CLOSURE</b>	<b>ALLOWED CLOSURES</b>	<b>APPROVAL</b>	<b>ASSESSMENT</b>	<b>AMOUNT</b>
Peak-Hour Lane Closures	None	N/A	Peak Hour Lane Closure Assessment	\$7,800 /lane/hour
Daytime Non-peak Hour Lane Closures	Unlimited	Verbal	N/A	N/A
“2-Lane” Daytime Non-Peak Hour Lane Closures.	50	Written	Daytime Non-Peak Hour Lane Closure Assessment	\$2,900 /lane/hour
Nighttime Non-Peak Hour Lane Closures	Unlimited	Verbal	N/A	N/A
Nighttime Directional Closures	50	Written	Nighttime Directional Closure Assessment	\$150 /lane/hour

##### **A. Peak-Hour Lane Closures**

During peak hours, the contractor shall perform work in a manner as to maintain the number of lanes on West Dodge Road shown in the phasing plans. **Lane closures on West Dodge Road will not be allowed during peak hours until after the express lanes are open to traffic (end of Phase 8D).** Also left-hand turn lanes for both eastbound and westbound West Dodge Road traffic shall be maintained at all times at the intersection of 114<sup>th</sup> Street.

##### **B. Daytime Non-Peak Hour Lane Closures**

The existing number of lanes varies throughout the project from two lanes in each direction to four lanes in each direction.

For those segments of the project where there are 3 or more existing lanes in each direction, the Contractor, during Daytime Non-Peak Hours, will be permitted to close one lane in each direction without charge until the express bridges are open to traffic. These closures shall be referred to as **Daytime Non-Peak Hour Lane Closures** and may occur for the following operations (refer to ***Procedure for West Dodge Road Lane Closures*** for restrictions to reducing the number of lanes elsewhere in this special provision):

1. Pavement pours for pavement adjacent to traveled lanes (Refer to Construction Phasing and Traffic Control 2-P Sheets).
2. Paving the outside westbound and eastbound lane (adjacent to the express bridge piers) on West Dodge Road.
3. Installation of wall face panels for the two-stage retaining wall No. 13.

4. Setting of formwork for overhead pier capbeams. After setting the forms for the pier capbeam, the contractor shall restrict worker access around the end of the capbeam forms that is within 1.5 meters of an active lane of West Dodge traffic below.
5. Setting of pre-tied reinforcing cages for pier capbeams.
6. Placement of concrete for pier capbeams. **Concrete may only be placed during the daytime, non-peak hours from 6:30 p.m. Saturday to 9:00 a.m. on Sunday and/or during the nighttime, non-peak hours.** Lane closures for placement of capbeam concrete will not be allowed during the daytime, non-peak hours between 9:00 a.m. and 3:30 p.m. Monday through Saturday in order to achieve an initial set of the concrete prior to allowing traffic under the loaded forms.
7. Removal of pier capbeam forms.
8. Setting of the south deck cantilever forms for the westbound express bridge or the north deck cantilever forms for the eastbound express bridge. The deck cantilever forms that are set during daytime, non-peak hours shall be adequately secured or braced from potential wind damage prior to the start of the next peak traffic period. Prior to the beginning of the next peak period, the contractor shall ensure that all OSHA safety criteria has been satisfied regarding installation of handrails and toeboards on the cantilever formwork. In addition to OSHA requirements, vinyl safety fencing shall be secured to the outsides of the handrails and the toeboard to help prevent objects from inadvertently falling off the deck formwork onto traffic below. The cost of the safety fencing shall be subsidiary to other items for which direct payment is made.
9. Setting or removing concrete protection barriers.
10. Installing and removing temporary pavement markings.
11. Delivering materials to the work site.
12. Specific tasks requiring work immediately adjacent to the traveled lanes that in the opinion of the Engineer would constitute a hazard for the traveling public.

To further reduce these '3 or more lanes in each direction' segments with another lane closure or to reduce a 'two lanes in each direction' segment to one lane during **Daytime Non-Peak Hours**, the Contractor may use **"2-Lane" Daytime Non-Peak Hour Lane Closures**. The Contractor will be allowed 50 **"2-Lane" Daytime Non-Peak Hour Lane Closures**.

If the Contractor, after using all the 50 **"2-Lane" Daytime Non-Peak Hour Lane Closures**, still requires additional lane closures, NDOR may approve additional **"2-Lane" Daytime Non-Peak Hour Lane Closures** on a lane rental basis.

There is one exception to the use of **Daytime Non-Peak Hour Lane Closures** and **"2-Lane" Daytime Non-Peak Hour Lane Closures**. **Daytime Non-Peak Hour Lane Closures** are not allowed for temporary surfacing construction shown in construction phasing plans, Phase 1, Items 1, 2 and 4. Phase 1 temporary surfacing shall be completed during **Nighttime Non-Peak Hour Lane Closures**.

### C. Nighttime, Non-Peak Hour Lane Closures

The contractor will be allowed **unlimited** nighttime non-peak hour lane closures. During nighttime non-peak hour lane closures, the contractor will be required to keep one lane open to traffic in each direction. The following operations shall be performed during nighttime non-peak hours. The contractor may be allowed to reduce the number of lanes shown in the plans by one lane or two lanes in each direction to perform the operations described below:

1. Removal of existing median and placement of temporary surfacing in the median.
2. Bridge girder erection for express bridge spans involving lane closures on West Dodge Road or closure of 114<sup>th</sup> Street, North Bridge Road, South Bridge Road, and the 120<sup>th</sup> St. ramps.
3. Deck pouring operations for express bridge units involving lane closures on West Dodge Road or closure of 114<sup>th</sup> Street, North Bridge Road, South Bridge Road, and the 120<sup>th</sup> St. ramps. The bridge units that meet this criteria are Units 1B, 1C, 1D, 1E, and 1F for the Westbound Express Bridge and Units 2B, 2C, 2D, 2E, and 2F for the Eastbound Express Bridge.
4. Removal of the 120<sup>th</sup> Street Bridge.
5. Removal of bridge deck formwork and pier diaphragm formwork between Piers 1W and 3W and between Piers 1E and 3E.

### D. Nighttime Directional Closures

While constructing the project, the Contractor will be allowed 50 **Nighttime Directional Closures** during **Nighttime Non-Peak Hours** without charge. After these 50 closures, all other **Nighttime Directional Closures** will be charged a **Nighttime Directional Closure Assessment**. (Refer to ***Procedure For West Dodge Road Lane Closures*** elsewhere in this special provision).

Directional closures of West Dodge Road involve the closure of all lanes in either the westbound or eastbound direction. Directional closures shall only be permitted during **Nighttime Non-Peak Hours** and must be requested in writing by the Contractor. Concurrent closure of both westbound and eastbound West Dodge Road will not be permitted.

If a directional closure extends into a **Peak Hour**, the Contractor will be assessed a **Peak Hour Lane Closure Assessment** (\$7,800 / lane / hour/ direction) times the number of closed lanes.

Directional closures of West Dodge Road for the following activities will be permitted:

1. Erection of girders for bridge spans between Piers 13W and 35W for the Westbound Express Bridge and between Piers 13E and 31E for the Eastbound Express Bridge.
2. Removal of the 120<sup>th</sup> Street Bridge deck and girders.
3. Erection of girders for bridge spans between Piers 1W and 3W for the westbound express bridge and Piers 1E and 3E for the eastbound express bridge.

4. Pier diaphragm pours at Piers 2W and 2E after girders are erected.
5. Bridge deck pours for Units 1A and 2A.

Westbound directional closures shall divert traffic from West Dodge Road at I-680, North Bridge Road, 114<sup>th</sup> Street, or 120<sup>th</sup> Street, depending on the location of construction requiring the closure. Eastbound directional closures shall divert traffic from West Dodge Road at 132<sup>nd</sup> Street, 120<sup>th</sup> Street, or 114<sup>th</sup> Street, depending on the location of construction requiring the closure. Traffic control for directional closures shall be as shown on Special Plan 30C. The Contractor shall position, program, and maintain changeable message signs provided by the State as directed by the Engineer prior to and during the directional closure. Other alternate route signage will be provided, installed, maintained, and removed by others.

## **V. PROCEDURE FOR WEST DODGE ROAD LANE CLOSURES**

**Daytime Non-Peak Hour Lane Closures** on West Dodge Road shall not occur each day as part of normal operations but shall be limited to the specific operations described elsewhere in this special provision. **Daytime Non-Peak Hour Lane Closures** require a verbal request and approval from the Engineer.

The Contractor shall make a written request for each “**2-Lane**” **Daytime Non-Peak Hours Lane Closure** and each **Nighttime Directional Closure** on West Dodge Road and receive written approval of the Engineer prior to initiating the closure. Each written request shall describe the work requiring the closure and the approximate time required for the closure.

**Nighttime Non-Peak Hours Lane Closures** require a verbal request and approval from the Engineer.

The contractor will be required to have a work crew on the site at all times during a lane closure.

In cases where multiple liquidated charges can be assessed for violations in lane closure procedures, the highest single lane closure assessment will be charged for the appropriate period. The lane closure assessment charge will be in addition to other liquidated damages described elsewhere in this proposal. Lane closures for emergency service situations will not be assessed liquidated damages.

A lane closure will not be permitted during inclement weather conditions or during periods of time that atmospheric conditions may constitute a hazard to the traveling public, as determined by the Engineer.

### **A. Peak Hour Lane Closure Assessment**

The Contractor shall schedule and conduct work operations during periods of time that a lane closure is in effect, in a manner as to complete the work and open the affected traffic lane prior to the above stipulated earliest peak hour traffic movement time. In the event that a closed traffic lane is not opened prior to the stipulated peak hour, the Contractor will be charged a **Peak hour lane closure assessment** of \$7,800/lane/hour /direction. The following formula was used to determine this charge:

$$\begin{aligned}\text{Cost} &= (\text{Vehicle} / \text{Average peak hour} / \text{Direction}) \times \text{Delay} \times \text{Cost/Factor} \\ &= (4885)(10)(\$0.16) \\ &= \$7,816 \quad \text{use } \$7,800/\text{lane/hour}\end{aligned}$$

Any fraction of an hour will be considered as a whole hour when determining this assessment. This assessment is for Peak hours only and shall not be charged during daytime and nighttime non-peak hours.

## **B. Daytime Non-Peak Hour Lane Closure Assessment**

While constructing the project, the Contractor will be allowed 50 **“2-Lane” Daytime Non-Peak Hour Lane Closures** without charge. These lane closures must be approved as described above and for the operations described in the ***Lane Closures – West Dodge Road, Daytime Non-Peak Hours Lane Closures*** section of the Special Provisions. During the 50 lane closures, one **“2-Lane” Daytime Non-Peak Hour Lane Closure** is charged when a lane closure occurs in either direction or both directions for any length of time during a single weekday **Daytime Non-Peak Hour Period**.

After the 50 **“2-Lane” Daytime Non-Peak Hour Lane Closures**, the Contractor will be charged a **Daytime Non-Peak Hour Lane Closure Assessment** of \$2,900/lane/hour/direction for each additional approved lane closure. The following formula was used to determine this charge:

$$\begin{aligned}\text{Cost} &= (\text{Vehicle} / \text{Average non-peak hour} / \text{Direction}) \times \text{Delay} \times \text{Cost/Factor} \\ &= (3029)(6)(\$0.16) \\ &= \$2907.84 \quad \text{use } \$2900/\text{lane}/\text{hour}\end{aligned}$$

Any fraction of an hour will be considered as a whole hour when determining this assessment. The assessment is for daytime non-peak hours only and shall not be charged during peak hours.

When an approved **“2-Lane” Daytime Non-Peak Hour Lane Closures** is no longer required in accordance with the written request or not necessary in the opinion of the Engineer, the Contractor will have one hour to open the closed lane to traffic. After this one hour period, the Contractor will be charged a **Daytime Non-Peak Hour lane closure assessment** of \$2,900 /lane/hour/direction as calculated above.

## **C. Nighttime Directional Closure Assessment**

The Contractor will be allowed 50 **Nighttime Directional Closures** during **Nighttime Non-Peak Hours** during the project. These directional closures must be approved as described above and for the operations described in the ***Lane Closures – West Dodge Road, Nighttime Directional Closures*** section of the Special Provisions. One **Nighttime Directional Closure** is charged when all of the lanes are closed in one direction of travel for any length of time during a single **Nighttime Non-Peak Hour** period.

After 50 **Nighttime Directional Closures**, the Contractor will be charged a **Nighttime Directional Closure Assessment** of \$150 /lane/hour for each additional approved directional closure during **Nighttime Non-Peak Hours periods**. The following formula was used to determine this charge:

$$\begin{aligned}\text{Cost} &= (\text{Vehicle} / \text{Average non-peak hour} / \text{Direction}) \times \text{Delay} \times \text{Cost/Factor} \\ &= (464)(2)(\$0.16) \\ &= \$148.48 \quad \text{use } \$150/\text{lane}/\text{hour}\end{aligned}$$

Any fraction of an hour will be considered as a whole hour when determining this assessment. The assessment is for nighttime non-peak hours only and shall not be charged during peak hours.

When an approved directional closure for **Nighttime Non-Peak Hours** is no longer required in accordance with the written request or not necessary in the opinion of the Engineer, the Contractor will have one hour to open the closed lanes to traffic. After this one hour period, the Contractor will be charged a **Directional Closure Assessment** of \$150 /lane/hour/direction as calculated above.

Any fraction of an hour will be considered as a whole hour when determining this assessment. The assessment is for nighttime non-peak hours only and shall not be charged during peak hours.

## **VI. RAMP CLOSURES AND RAMP LANE CLOSURES**

The Contractor shall, at all times, maintain one lane of traffic on the ramps unless a closure is specifically shown in the plans or described in the Special Provisions.

The following ramp closures and ramp lane closures will be permitted:

<b>Ramp</b>	<b>(Project) Phase</b>	<b>Closure or Lane Closure</b>	<b>Reason</b>
120 <sup>th</sup> Eastbound Entrance Ramp	2A	Closure	Removal of existing ramp. Construction of temporary ramp.
120 <sup>th</sup> Westbound Exit Ramp	3	Closure	WB Express Bridge girder erection and deck pour.
120 <sup>th</sup> Eastbound Entrance Ramp	6	Closure	EB Express Bridge girder erection and deck pour.
120 <sup>th</sup> Eastbound Entrance Ramp	7A/8A	Closure	Permanent closure at beginning of work on 120 <sup>th</sup> Street.
120 <sup>th</sup> Westbound Exit Ramp	7A/8A	Closure	Shift traffic to temporary ramp.
120 <sup>th</sup> Westbound Entrance Ramp	7A/8A	Closure	Shift traffic to temporary ramp.
120 <sup>th</sup> Eastbound Exit Ramp	8B	Closure	Temporary ramp alignment on south frontage road is closed during construction of 120 <sup>th</sup> and Davenport intersection.
I-680 to Westbound West Dodge Ramp <b>(For NH-6-7(169))</b>	(169) Ph 1B	Lane	Required by paving of westbound lanes on West Dodge.
Eastbound West Dodge Ramp to I-680	9A & 9B	Closure	Reconstruction of at-grade lanes on West Dodge.
I-680 to Westbound West Dodge Ramp	9A & 9B	Lane	Required by downstream lane closures for West Dodge paving.
Northbound I-680 to Westbound West Dodge Ramp	1 through 8D	Lane	Lane closure is perpetuated from Project IM-680-9(796) through Phase 8D.

Once a ramp is temporarily closed to traffic, the Contractor shall make the work on or associated with that ramp the priority task of operations. The Contractor shall make every effort to complete the work on the ramp and reopen it to traffic as quickly as possible.

## **VII. PROCEDURE FOR RAMP CLOSURES AND RAMP LANE CLOSURES**

Before closing a ramp temporarily or permanently, as indicated in the Phasing plans, the Contractor shall advise the Engineer and the City of Omaha a minimum of two weeks prior to the planned closing date, and again 48 hours prior to the actual closing. If the 48-hour period falls on a weekend or holiday, the notification shall be given 72 hours prior to the actual closing.

The City of Omaha shall be notified of the closures by calling Lionel Oropeza, at (402) 444-4978.

The Contractor shall position, program, and maintain changeable message signs provided by the State as directed by the Engineer prior to and during the closure. Alternate route signage will be provided, installed, maintained, and removed by others.

Each specific ramp closure and ramp lane closure will require expressed, written approval of the Engineer.

## **VIII. FRONTAGE ROAD CLOSURES**

The Contractor will be permitted to sequentially close the segments of Frontage Roads S2, S3, S4, S5, and S6 as shown in the phasing plans during Phases 1, 3, and 6 (refer to ***Procedure For Closing Local Streets and Frontage Roads***). Once a segment of the frontage road has been closed to traffic, the Contractor shall make the work in that segment the priority task of operations. The Contractor shall make every effort to complete the work on the segment and reopen it to traffic as quickly as possible. The next sequential segment will not be closed until the currently closed segment has been sufficiently completed and can be reopened to two-way traffic.

Unless expressed, written approval is provided by the Engineer, during the winter months of December, January and February, the Contractor will be required to maintain two-way traffic on all frontage roads and provide continuous access to all properties off the frontage roads.

**The Contractor shall not schedule bridge girder erection and deck pours, which would require localized closure of a frontage road, at the same time another segment of the same frontage road is closed for bridge pier or roadway construction.**

Frontage Road S4 shall not be closed to traffic to install traffic control for temporary eastbound off ramp operation in Phase 4 prior to the last day of classes at Burke High School for the 2004-2005 school year. That date is anticipated to be June 1, 2005.

## **IX. 120<sup>TH</sup> STREET CLOSURE**

See Section III. A.

## **X. PROCEDURE FOR CLOSING LOCAL STREETS AND FRONTAGE ROADS**

- A. Before closing any section of roadway along 120<sup>th</sup> Street, 114<sup>th</sup> Street, North Bridge Road or South Bridge Road, the Contractor shall:

1. Advise the Engineer and the City of Omaha a minimum of two weeks prior to the planned closing date, and again 48 hours prior to the actual closing. If the 48-hour period falls on a weekend or holiday, the notification shall be given 72 hours prior to the actual closing.
  2. Position, program, and maintain changeable message signs provided by the State as directed by the Engineer prior to and during the closure. Alternate route signage will be provided, installed, maintained, and removed by others.
- B. Before closing any section of roadway along North Frontage Road S2 or South Frontage Roads S5 and S6, even if the closure is during overnight non-peak hours, the Contractor shall:
1. Insure access to all properties is available from the west or the east.
  2. Request the closure in writing and obtain the written approval of the Engineer.
  3. Advise the Engineer and the City of Omaha a minimum of two weeks prior to the planned closing date, and again 48 hours prior to the actual closing. If the 48-hour period falls on a weekend or holiday, the notification shall be given 72 hours prior to the actual closing.

The City of Omaha shall be notified of the closures by calling Lionel Oropeza, at (402) 444-4978.

#### **XI. BRIDGE FORMWORK AND DECK CURING OVER LOCAL STREETS AND FRONTAGE ROADS**

Deck formwork construction will be allowed over active traffic on 114<sup>th</sup> Street, North and South Bridge Road, 120<sup>th</sup> St. ramps and the frontage roads. The deck cantilever forms that are set shall be adequately secured or braced from potential wind damage. As forms are installed, the Contractor shall ensure that all OSHA safety criteria has been satisfied regarding installation of handrails and toeboards on the cantilever formwork. In addition to OSHA requirements, vinyl safety fencing shall be secured to the outsides of the handrails and the toeboard to help prevent objects from inadvertently falling off the deck formwork onto traffic below. The cost of the safety fencing shall be subsidiary to other items for which direct payment is made.

During all phases of bridge construction, a minimum overhead construction clearance of 14 feet shall be maintained during all phases of bridge construction over local streets and frontage roads that remain open to traffic.

The Contractor shall take care to direct and channel run-off water from bridge deck curing operations and storm events so that water falling from the bridge deck does not fall on traffic or does not cause damage or erosion to property below the bridge. Special attention shall be directed to the downhill end of the bridge deck where deck forms or the deck pour is terminated. The Contractor may need to provide a means to channel and capture run-off with temporary downspouts. This effort shall not be paid for directly but shall be considered subsidiary to other items for which direct payment is made.

## **XII. CONVERT EXISTING WEST DODGE MEDIAN TO TEMPORARY SURFACING**

For the work depicted in the plans the contractor shall perform the work sequence in the manner described. Any deviation from this sequence shall require written approval of the Engineer.

1. Removal of concrete median surfacing, excavation, milling curb and subgrade preparation shall be performed during a nighttime non-peak hour lane closure.
2. During the same nighttime non-peak work period, the contractor shall perform temporary surfacing in a manner as to place surfacing materials to the elevation of the adjacent pavement within all areas that the existing median has been removed. In the event the surfacing is not placed, any drop-off shall be filled with compacted earth materials, to a 3:1 or flatter slope, prior to opening the lane to public vehicular traffic.
3. When asphaltic concrete is used for temporary surfacing, the following construction methods shall be observed. After any lift of asphalt has been placed, the drop-off shall be filled with an asphalt wedge, to a 3:1 or flatter slope, prior to opening the lane to public vehicular traffic. If proper density is obtained on this asphalt wedge, it may be left in place, as additional lifts are placed. The top lift of asphalt will be placed at a uniform depth, which may require removal of a portion of the asphalt wedge.

**Daytime Non-Peak Hour Lane Closures** are not allowed for temporary surfacing construction shown in construction phasing plans, Phase 1, Items 1, 2 and 4. Phase 1 temporary surfacing shall be completed during **Nighttime Non-Peak Hour Lane Closures**.

## **XIII. ASPHALT CONCRETE WIDENING**

Paragraph 7. a., of Subsection 107.07 of the Standard Specifications is amended to include the following:

When asphalt concrete is used for temporary surfacing, it may be used as the drop-off wedge material. If proper density is obtained on this asphalt wedge, it may be left in place as additional intermediate lifts are placed. The top lift of asphalt will be placed at a uniform depth, which may require removal of a portion of the asphalt wedge.

Paragraph 7. d., of Subsection 107.07 of the Standard Specifications is amended to include the following:

1. The contractor shall perform temporary surfacing and pavement widening in a manner as to place surfacing materials to the elevation of the adjacent pavement within all areas that the existing shoulder has been removed. In the event the surfacing is not placed, any drop-off shall be filled with a wedge of compacted materials to a 3:1 or flatter slope, prior to opening the lane to public vehicular traffic.

## **XIV. SEWER CONSTRUCTION REQUIRING LANE CLOSURES ON 114<sup>TH</sup> STREET**

### **Sanitary Sewer Construction North of West Dodge Road**

During construction of the sanitary sewer manhole and sewer line to the east, northbound lanes of 114<sup>th</sup> Street shall not be affected by construction and the Contractor shall

maintain at least two southbound lanes of traffic, one lane for left-turning vehicles and at least one lane for through and right-turning traffic.

### **Storm Sewer Construction South of West Dodge Road**

During the removal of the existing storm sewer manhole and inlet just south of West Dodge Road and the construction of Inlet #270 and Pipe #271 and #272, the Contractor shall maintain at least one lane of southbound traffic and shall maintain all northbound lanes except the inside left turn lane.

### **Procedure for Work**

To minimize the impact of construction on traffic flow in this area, construction in 114<sup>th</sup> Street shall be scheduled over a weekend period to commence no earlier than the end of the p.m. peak hours on a Friday. All lanes shall be reopened to traffic by no later than the beginning of the a.m. peak hours on the following Monday.

## **XV. CONSTRUCTION PHASING**

The plans depict construction phasing, construction phasing details, traffic control phasing and pavement marking alignments required for the performance of work included in this proposal. Any modification to these sequences, geometries or alignments shall require **written approval** of the Engineer.

## **XVI. DRAINAGE PHASING**

The Plans and Special Provisions have been prepared with consideration given to drainage during the Phased construction. The Construction Phasing 2-P sheets identify those drainage components that will require Phased coordination for their installation. The Drainage 2-L sheets and Drainage Cross-sections have additional information in regard to which phase a component or section of the drainage system will be built. The contractor has been allowed some discretion in regard to which phase certain components or sections of the drainage system maybe constructed so long as continuity in the storm sewer system is maintained.

The work of phasing and maintaining drainage described in the plans and these special provisions shall be considered subsidiary to items of work for which direct payment is made. Any tools, equipment, materials, and labor required to phase and maintain drainage shall also be considered subsidiary.

These Special Provisions provide additional detail on the construction of specific components during intermediate phases.

### **Storm Sewer Pipe #120**

During Phase 2 construction, build 8.1 meters of Pipe #120 beginning at the existing Pipe located at Sta. 770+48.6, 0.4 rt. and terminating outside Phase 2 paving limits. Install a temporary bulkhead.

During Phase 5 construction, build remaining 7.4 meters of Pipe #120 by continuing at the temporary bulkhead and terminating in Inlet #120.

**Storm Sewer Pipe #131**

During Phase 2 construction, build 10.0 meters of Pipe #131 beginning at Inlet #131 and terminating outside Phase 2 paving limits. Install a temporary bulkhead.

During Phase 5 construction, build remaining 10.0 meters of Pipe #131 by continuing at the temporary bulkhead and terminating in Inlet #132.

**Storm Sewer Pipe #157**

During Phase 2 construction, jack entire length (26.4 meters) of Pipe #157. Temporarily connect Pipe #157 to Pipe #155 (also built in Phase 2). Install a temporary bulkhead at south end.

During Phase 4 construction, build Inlet #156.

During Phase 5 construction, build Inlet #155.

**Storm Sewer Pipe #216**

During Phase 3 construction, build entire length (16.4 meters) of Pipe #216 and manhole #213. This work will be restricted to nighttime non-peak hours.

**Storm Sewer Pipe #252**

During Phase 3 construction, build 5.0 meters of Pipe #252 beginning at Inlet #252 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 6.5 meters of Pipe #252 by continuing at the temporary bulkhead and terminating in Inlet #251.

**Storm Sewer Pipe #254**

During Phase 3 construction, build 5.0 meters of Pipe #254 beginning at Inlet #254 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 6.5 meters of Pipe #254 by continuing at the temporary bulkhead and terminating in Inlet #253.

**Storm Sewer Pipe #256**

During Phase 3 construction, build 5.4 meters of Pipe #256 beginning at Inlet #256 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 7.1 meters of Pipe #256 by continuing at the temporary bulkhead and terminating in Inlet #255.

**Storm Sewer Pipe #B7**

During Phase 3 construction, build 5.0 meters of Pipe #B7 beginning at Pipe #257 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 6.3 meters of Pipe #B7 by continuing at the temporary bulkhead and terminating at outlet structure for bridge drain 21E.

**Storm Sewer Pipe #258**

During Phase 3 construction, build 5.0 meters of Pipe #258 beginning at Inlet #258 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 6.5 meters of Pipe #258 by continuing at the temporary bulkhead and terminating in Inlet #257.

**Storm Sewer Pipe #261**

During Phase 3 construction, build 7.0 meters of Pipe #261 beginning at Inlet #260 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 9.6 meters of Pipe #261 by continuing at the temporary bulkhead and terminating in Inlet #259.

**Storm Sewer Pipe #264**

During Phase 3 construction, build 5.8 meters of Pipe #264 beginning at manhole #253 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 7.3 meters of Pipe #264 by continuing at the temporary bulkhead and terminating in Inlet #261.

**Storm Sewer Pipe #B11**

During Phase 3 construction, build 5.1 meters of Pipe #B11 beginning at Pipe #265 and terminating outside Phase 3 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 6.3 meters of Pipe #B11 by continuing at the temporary bulkhead and terminating at outlet structure for bridge drain 25E.

**Storm Sewer Pipe #234**

During Phase 3 construction, jack entire length (34.6 meters) of Pipe #234. Temporarily connect Pipe #234 to Pipe #235 (also built in Phase 3).

During Phase 6 construction, build Inlet #234.

**Storm Sewer Pipe #271 and #272**

During Phase 1 construction, jack entire length (11.6 meters) of Pipe #271 and entire length (18.9 meters) of Pipe #272. Build Inlet #270 which will be restricted to nighttime non-peak hours.

**Storm Sewer Pipe #S1**

During Phase 3 construction, jack entire length (20.0 meters) of Pipe #S1. Build manhole #S5 which will be restricted to nighttime non-peak hours.

**Storm Sewer Pipe #274**

During Phase 1 construction, build 3.5 meters of Pipe #274 beginning at Pipe #275 and terminating outside Phase 1 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 11.6 meters of Pipe #274 by continuing at the temporary bulkhead and terminating in Inlet #271.

**Storm Sewer Pipe #277**

During Phase 1 construction, build 5.2 meters of Pipe #277 beginning at Inlet #272 and terminating outside Phase 1 paving limits. Install a temporary bulkhead.

During Phase 6 construction, build remaining 6.6 meters of Pipe #277 by continuing at the temporary bulkhead and terminating in Inlet #273.

**Storm Sewer Pipe #279**

During Phase 1 construction, build 10.5 meters of Pipe #279 beginning at Inlet #274 and terminating outside Phase 1 paving limits. Temporarily connect Pipe #279 to Pipe #T3 (also built in Phase 1).

During Phase 6 construction, build remaining 1.5 meters of Pipe #279 by continuing at the temporary connection and terminating in Inlet #275.

**Storm Sewer Pipe #282**

During Phase 1 construction, build entire length (13.3 meters) of Pipe #282 beginning at Inlet #277 and terminating outside Phase 1 paving limits. Temporarily connect Pipe #282 to Pipe #T4 (also built in Phase 1).

During Phase 3 construction, build Inlet #278.

**Storm Sewer Pipe #284**

During Phase 1 construction, build 9.8 meters of Pipe #284 beginning at Pipe #283 and terminating outside Phase 1 paving limits. Install a temporary bulkhead.

During Phase 3 construction, build remaining 3.0 meters of Pipe #284 by continuing at the temporary bulkhead and terminating in Inlet #280.

**TEMPORARY PIPES**

Removal of temporary pipes shall be considered subsidiary to items of work for which direct payment is made and shall become the property of the contractor. Any incidental grading shall also be considered subsidiary.

**Temporary Pipe #1**

During Phase 2 construction, build Temporary Pipe #1 beginning at the existing inlet located at Sta. 273+57.6, 4.0 Rt. and terminating into ditch. Maintain positive drainage from this outlet to the existing area inlet located at Sta. 274+14.3, 12.9 Rt.

**Temporary Pipe #2**

During Phase 1 construction, build Temporary Pipe #2 beginning at the existing manhole located at Sta. 81+89.2, 14.7 Rt. and terminating into Manhole #270 (also built in Phase 1).

**Temporary Pipe #3**

During Phase 1 construction, build Temporary Pipe #3 beginning at the existing inlet located at Sta. 83+60.8, 20.1 Rt. and terminating into Pipe #279 (also built in Phase 1).

**Temporary Pipe #4**

During Phase 1 construction, build Temporary Pipe #4 beginning at the existing inlet located at Sta. 84+21.4, 20.6 Rt. and terminating into Pipe #282 (also built in Phase 1).

**XVII. PILE DRIVING OPERATIONS**

Pile driving operations shall be conducted in accordance with the City of Omaha Noise Ordinance.

### **XVIII. BRIDGE STAINING**

Staining operations are defined as the application of color coatings to girder, pier, and barrier elements of the bridges as shown in the Plans. In addition, sections of roadway approach barriers and retaining walls will receive color coatings in accordance with the plans and the manufacturer's recommendations.

Staining operations and overspray must be contained within the permanent right of way for the project. Temporary easements shall not be assumed to be available for staining operations. The only exception is Tract 27 (McDonalds) where the permanent easement is an aerial easement for bridge occupation and maintenance only. At Tract 27, bridge staining operations must be completed prior to expiration of the temporary construction easement in 2007.

Staining operations in 2008 after the expressway bridges are opened to traffic will be permitted, but must be completed by November 29, 2008.

### **XIX. SEQUENCING OF SIGNAL AND OVERHEAD SIGN FOUNDATIONS WITH BRIDGE GIRDER ERECTION**

The Contractor should take note that construction of foundations for permanent traffic signals and for overhead sign supports may conflict with overhead bridge girders if foundation construction is deferred until after the girders have been erected.

### **XX. REMOVAL OF OVERHEAD GUIDE SIGN TEMPORARY COVERS**

The Contractor shall be responsible for uncovering four overhead guide signs left covered by Project NH-6-7(169) contractor prior to opening of the express lanes in Phase 8D. This effort shall not be paid for directly but shall be considered subsidiary to other items for which direct payment is made.

### **XXI. SIDEWALK CLOSURES**

Sidewalk closures will be necessary during construction activities along the frontage roads, 120<sup>th</sup> Street, 114<sup>th</sup> Street, North Bridge Road and South Bridge Road for the protection of pedestrians. Specific sidewalk closures and pedestrian traffic control for specific closures are not shown on the plans. When a section of sidewalk is closed, the Contractor shall follow the general pedestrian traffic control layout shown on Special Plan 30C. When construction activities have been completed to the extent that closure of a specific segment of sidewalk is no longer needed, the Contractor shall reopen the sidewalk to pedestrian traffic.

### **XXII. PAPILLION CREEK TRAIL MAINTENANCE OF TRAFFIC**

See "Temporary Trail Covers For Bicycle/Pedestrian Trail Under Express and Ramp Bridges" provision elsewhere in this proposal.

### **XXIII. ACCESS TO PRIVATE PROPERTY**

#### **General**

Landowners retain the right to make all non-competing uses of the temporary easement area. Non-competing uses include use by the landowner and the public for access to the landowner's property and buildings.

During time periods when construction activity is not taking place in the temporary easement area, the Contractor shall remove all unnecessary equipment, material, and debris, and leave the temporary easement area in a clean, presentable condition useable by the landowner.

#### **Tracts 15 and 16 (Baxter Chrysler and VIP Car Wash)**

The State has acquired temporary easements for construction across the south side of Tracts 15 and 16. However the north 7.62 m (25 feet) of this temporary easement, between Station 75+09.095 to 76+58.846, is designated for access and shall be shared by the Contractor and the public. During business hours the public shall have access to the VIP Car Wash and the Baxter Auto dealership across the north 7.62 m (25 feet) of these easements. During business hours the Contractor may also use the north portion of these easements, but for access only. Construction work that affects the public access to these businesses shall be performed when the businesses are closed. The Contractor shall not store materials, supplies or equipment in the access portion of the easement at any time. At all times, the Contractor shall keep the access portion of these temporary easements free of debris, mud, dirt, dust, sand or any other soiling.

As the Contractor begins each Phase of construction (e.g.; bridge substructure work, girder placement, decking, staining, landscaping, etc.) in front of Tracts 15 and 16, emphasis shall then be placed on completing the item of work in a timely manner. As each Phase of construction is completed, the contractor shall remove any unnecessary equipment, materials or debris and leave the temporary easement area in a clean, presentable condition usable to the adjacent businesses.

**Tract 16 (VIP Car Wash)**

The landowner retains the right to make all non-competing uses of the temporary easement area. Non-competing uses include, but are not limited to: (1) use by the landowner and the public for access to the landowner's property and buildings, and (2) use by the adjoining landowner to the west for access to said landowner's property.

During time periods when construction activity is not taking place in the temporary easement area, the Contractor shall remove all unnecessary equipment, material, and debris, and leave the temporary easement area in a clean, presentable condition useable by the landowner and by the adjoining landowner to the west.

The Contractor's use of the north 7.62 meters (25 feet) of the temporary easement, between Stations 75+09.095 to 76+58.846 shall be restricted in the following respects:

1. Between the hours of 6:00 a.m. and 9:00 p.m. Contractor shall use said part of the temporary easement for access only and no construction work that affects access shall be performed during said hours.
2. Contractor shall not store materials, supplies, or equipment in the stated part of the temporary easement at any time.
3. Contractor shall keep the stated part of the temporary easement free of debris, mud, dirt, dust, sand, and any other soiling generated by construction activities.

**Tract 27 (McDonalds)**

The landowner retains the right to make all non-competing uses of the temporary easement area. Non-competing uses include, but are not limited to use by the landowner and the public for parking and access to the landowner's land and buildings.

During time periods when construction activity is not taking place in the temporary easement area, the Contractor shall remove all unnecessary equipment, material, and debris, and leave the temporary easement area in a clean, presentable condition useable by the landowner.

**Tracts 29, 30, and 31 (Huber Chevrolet/Cadillac)**

The temporary easement on these tracts is for construction and maintenance of customer access across the landowner's property only. Contractor shall not store materials, supplies, or equipment in the stated part of the temporary easement at any time.

#### **Tract 40 (Old Mill Toyota)**

The temporary easement is for the right to construct, reconstruct, occupy and maintain in the subsurface area only, subsurface anchors or tie-backs and rods, supports or other subsurface connections to be used in conjunction with a retaining wall system to be constructed on State property.

The landowner retains the right to pave, resurface, maintain and use the surface of the easement area for roads, parking, display of business inventory and for other uses that do not compete with State's subsurface use of the easement area.

#### **XXIV. BURKE HIGH SCHOOL EVENTS**

For planning and managing of construction operations and maintenance of traffic the contractor will be cognizant of the schedule of events occurring at Burke High School, 12200 Burke Boulevard, Omaha, NE 68154. Several key events that the contractor should be aware of are:

- Beginning date (First Day of Classes) for the 2004/05 through 2007/08 School years
- Athletic Events
- Academic Events
- 2005 through 2008 State Track Meets
- Final day of classes for the 2004/05 through 2007/08 School years

The Contractor will have several sources of information available to review the most current schedule:

- Project Engineer
- NDOR Project Public Relation Specialist
- Omaha Burke High School website, <http://www.ops.org/burke/default.htm>

#### **XXV. HOLIDAYS**

The contractor will be required to schedule his operations in a manner to have all traffic lanes open to traffic on the following holidays:

- Memorial Day and Labor Day weekends – these holiday weekends shall begin at 3:00 p.m., Friday, and shall include the remainder of Friday and all day Saturday, Sunday and the Monday holiday.
- July 4<sup>th</sup>:
  - If July 4<sup>th</sup> falls on a Monday or Friday, the Saturday and Sunday either preceding or following July 4<sup>th</sup> shall be included as part of the holiday.
  - If July 4<sup>th</sup> falls on either Tuesday, Wednesday or Thursday, only that day will be considered as the holiday.
  - If July 4<sup>th</sup> falls on a Saturday or Sunday, the day preceding and the day following July 4<sup>th</sup> shall be included as part of the holiday.
  - The July 4<sup>th</sup> holiday shall begin at 3:00 p.m. on the day preceding the first day of the July 4<sup>th</sup> holiday, as defined above.

Failure to have all traffic lanes open to traffic, as specified, on these holidays will result in a liquidated damage assessment of \$10,000 per occurrence. This assessment will be in addition to other liquidated damages described elsewhere in this proposal or in the Standard Specifications used for this project.

## **XXVI. CONSTRUCTION SCHEDULE UPDATES**

The Contractor shall submit an updated construction schedule to the Engineer every three months. The Engineer may request an updated schedule at any time if a schedule milestone is not met.

## **XXVII. COORDINATION WITH OTHER PROJECTS**

Construction will be coordinated with the following projects that may be under construction while work is being performed on this project:

1. NH-6-7(164), C.N. 21899, West Dodge Road - 132<sup>nd</sup> to 120<sup>th</sup>, Omaha.
2. IM-680-9(796), C.N. 21840, I-680/West Dodge Road Interchange, Omaha.
3. OPW 50049, North Bridge Road, Omaha.
4. NH-6-7(169), C.N. 21904, Papio Creek to 108<sup>th</sup> Street North, Omaha. Scheduled for August 2005 letting.
5. NH-6-7(170), C.N. 21905, Papio Creek to 108<sup>th</sup> Street South, Omaha. Scheduled for August 2005 letting.
6. NH-6-7(177), C.N. 22156, West Dodge Road – 120<sup>th</sup> to 108<sup>th</sup> Street Landscaping, Omaha. Scheduled for July 2008 letting.

**Project # 1** is the first part of the West Dodge Expressway, which was let in July 2003 and ties into the west end of Project NH-6-7(168). **Project # 2** is the last of a series of projects to reconstruct the I-680/West Dodge Road interchange and includes reconstruction of West Dodge Road from the Old Mill access roads to the east. **Project # 3** consists of the rehabilitation of the North Bridge Road structure over the Big Papillion Creek. **Projects # 4 & 5** consist of ramp and expressway bridges over 108<sup>th</sup> Street and paving between the 108<sup>th</sup> Street bridges and the Westbound and Eastbound Express Bridges abutments. These projects are located north and south of West Dodge Road respectively. **Project # 6** consists of plantings and irrigation system components along West Dodge Road from about 120<sup>th</sup> Street to 108<sup>th</sup> Street.

## **XXVIII. MAINTENANCE OF TRAFFIC AND COORDINATION WITH PROJECTS NH-6-7(169) AND NH-6-7(170)**

The Contractor shall provide traffic control in support of construction phasing for **Projects NH-6-7(169) and NH-6-7(170) as shown on the plans (2-P sheets)**. Refer to the construction phasing descriptions for Projects NH-6-7(169) and NH-6-7(170) in the 2-N sheets for information.

The Contractor shall coordinate with Projects NH-6-7(169) and NH-6-7(170) to maintain either the main Papillion Creek trail or the detour trail open at all times during construction of express bridges over the Papillion Creek and the express and ramp bridges over 108<sup>th</sup> Street.

#### **XXIX. COORDINATION OF TRAFFIC CONTROL WITH PROJECT IM-680-9(796)**

Construction activities of Project IM-680-9(796) may delay the start of some elements located north of West Dodge Road and east of 114<sup>th</sup> Street identified in Phase 3 of this project. East of 114<sup>th</sup> Street, the traffic control shift identified in Phase 3 Stages A, B, C for this project must be coordinated with Project IM-680-9(796). The traffic control shift cannot be fully implemented until Phase 3 Stage 2 of Project IM-680-9(796) is completed. Completion of Phase 3 Stage 2 is anticipated by November 15, 2004. An interim traffic control configuration may be coordinated by the project managers from each project, if requested by the NH-6-7(168) Contractor. If an interim configuration is requested, the NH-6-7(168) Contractor shall be responsible for installation of temporary traffic control markings for such configuration. Once the Project IM-680-9(796) contractor implements traffic control for Phase 3 Stage 3 of that project, the NH-6-7(168) Contractor will be responsible for installation of temporary traffic control markings as shown in the Project NH-6-7(168) plans.

At the end of Phase 3 Stage 2, the Project IM-680-9(796) contractor will store one run of concrete protection barriers on centerline from Sta. 85+70 to 93+00 for subsequent use by the NH-6-7(168) Contractor.

At the completion of Project IM-680-9(796), the NH-6-7(168) Contractor shall assume maintenance of temporary traffic control devices along the ramp from northbound I-680 to westbound West Dodge Road that limit the ramp to single lane traffic operation. These traffic control devices shall be maintained through Project NH-6-7(168) until all of the permanent ramp lanes are open to traffic.

#### **XXX. TRAFFIC CONTROL MANAGEMENT**

##### **Description and General Requirements**

Paragraph 1. of Subsection 422.01 of the Specifications is void and superseded by the following:

1. This work consists of furnishing, installing at the locations shown on the plans, operating, maintaining, and when work is complete, removing the temporary traffic control devices described in this Section. This work shall also consist of providing Traffic Control Management by furnishing one or more qualified individuals who shall be specifically responsible for performing or supervising the installation, inspection, maintenance, and removal of those devices.
2. When project conditions warrant, the Engineer may suspend the need for Traffic Control Management and will notify the Contractor accordingly. The Contractor shall be given at least three days' notice of the suspension, but the work may be suspended in a lesser time if mutually acceptable to the Department and the Contractor. During periods when no payment is being made for Traffic Control Management under this Special Provision, this provision will not apply.

3. For this project, Traffic Control Management will be required for this project as specified in these Special Provisions. The responsibilities and work associated with Traffic Control Management will be transferred from the NH-6-7(164) Contractors "Transferring" Traffic Control Manager to the NH-6-7(168) project Contractors "Receiving" Traffic Control Manager on **September 25, 2004**; unless otherwise directed by the Engineer, refer to ***Coordination With Other Projects***.

At the time of transfer, it is anticipated that the NH-6-7(164) project will have several phases of work in progress. Primary work tasks remaining on the project may consist of the work depicted in Phase 2, Stage A, Segments 5, 6, and 7 and the work west of Sta. 68+00 in Phase 2, Stages B and C and Phase 3, Stages B and C. The work west of Sta. 68+00 will not impact the work of the NH-6-7(168) Contractor. The NH-6-7(164) Contractor shall continue to meet the requirements of Section 422 of the Standards Specifications and Supplemental Specifications prior to the amendments set forth in this provision.

At the time of transfer, the "Receiving" Traffic Control Manager shall receive a complete status debrief relating to the current traffic control plan. The briefing shall cover the current traffic conditions, the status of traffic control devices, a summary history of traffic control and related incidents and subsequent corrective actions that have occurred on the project.

The "Transferring" Traffic Control Manager and "Receiving" Traffic Control Manager shall conduct a joint inspection reviewing all of the traffic control devices; any deficiencies observed at that time shall be corrected by the "Transferring" Traffic Control Manager. Following completion of any corrective action the traffic control devices inventoried on West Dodge Road shall become the responsibility of the "Receiving" Traffic Control Manager. The only exception will be for those devices required to complete the frontage road and miscellaneous work of the NH-6-7(164) project.

The "Receiving" Traffic Control Manager shall have overall responsibility of the entire project corridor, in particular the traffic operations on West Dodge Road. Additionally, the "Receiving" Traffic Control Manager shall coordinate with the NH-6-7(164) Contractor the remaining schedule, work operations and traffic control requirements of the NH-6-7(164) project to insure overall safety within the projects' corridor.

Paragraphs 2.i., 2.j.(2)(ii), and 2.k. of Subsection 422.01 of the Specifications are void; and Paragraph 2. of Subsection 422.01 of the Specifications and Supplemental Specifications is amended to include the following:

- p.(1) The Contractor shall designate an individual, other than the Project Superintendent, to be the Traffic Control Manager for the project. This person shall be certified as a Traffic Control Supervisor or Traffic Control Technician by the American Traffic Safety Services Association (ATSSA). Other certifications may be accepted if approved by the Engineer. The Traffic Control Manager shall also possess a current Flagger Certification Card. Copies of the Traffic Control Manager's certifications shall be provided to the Engineer prior to the installation of any traffic control devices on the project.
- (2) The Contractor may also designate one or more Assistant Traffic Control Managers for the project. These individuals shall be qualified by certification as a Traffic Control Technician by the American Traffic Safety Services Association (ATSSA) or other training or qualification satisfactory to the Engineer.

- q. The Traffic Control Manager or Assistant Traffic Control Manager shall be available and reasonably accessible (within 30 minutes) to the project during normal working hours on every day that work is being performed on the project and always on call at other times. During other than normal working hours, these individuals shall respond and be on the project within 60 minutes of notice being given that traffic control items on the project are in need of attention. The Contractor may elect to have an employee or employees perform this function simultaneously on more than one project, but shall not be relieved from the sanctions or disincentives that may be imposed for failure to meet the deadlines specified herein.
- r. The Traffic Control Manager's or Assistant Traffic Control Manager's activities on the project shall be dedicated to the purpose of monitoring and maintaining the traffic control devices. The performance of other crafts or trades will be permitted, but shall be secondary to the performance of duties associated with traffic control.
- s. The Contractor shall provide prior to the installation of any traffic control devices on the project two to four telephone numbers where the Traffic Control Manager or an Assistant Traffic Control Manager may be reached 24 hours a day, seven days a week.
- t. The Traffic Control Manager or Assistant Traffic Control Manager shall have available at all times an approved, current version of the Traffic Control Plan.
- u. If corrective action is not taken by the Contractor within the times specified in Paragraph 2.q., the Engineer may suspend all work on the project until the problem is corrected. The Engineer shall make reasonable allowance for existing weather conditions in the case of materials whose installation is governed by temperature or other atmospheric conditions.

### **Construction Methods**

Subsection 422.03 of the Standard Specifications is amended to include the following:

- 19. The Traffic Control Manager's or Assistant Traffic Control Manager's duties shall include:
  - a. Insuring that all traffic control devices are functioning properly, are clean, and are correctly located as shown on the Traffic Control Plan or as directed by the Engineer. This provision in no way restricts the cleaning, repair, and maintenance of traffic control devices to the Traffic Control Manager or his or her assistants.
  - b. Inspecting all traffic control devices on every calendar day that traffic control devices are in place, whether in use or covered. Inspections shall take place a minimum of twice daily, and at least two inspections shall be eight hours apart. However, during or following periods of inclement weather or when the situation warrants for other reasons, inspections shall be done more frequently. At least one inspection each week shall occur during hours of darkness. The Traffic Control Manager or Assistant Traffic Control Manager shall perform the inspections.

- c. Monitoring the cleaning and maintenance of all traffic control devices and the placement of temporary pavement markings.
- d. Completing a Traffic Control Inspection form provided by the Engineer at the completion of each inspection. These forms shall be submitted daily to the Engineer, either in person or via facsimile transmission.
- e. Monitoring flagging operations on the project. The Traffic Control Manager or Assistant Traffic Control Manager shall not act as a flagger, except in an emergency or when providing relief for short periods of time.
- f. Coordinating all traffic control operations, including those of subcontractors and suppliers.
- g. Coordinating traffic-related activities with the appropriate law enforcement, fire, and emergency medical agencies.
- h. Attending all project scheduling meetings.

### **Method of Measurement**

Subsection 422.04 of the Standard Specifications and Supplemental Specifications is amended to include the following:

- 21.(1) Traffic Control Management is measured by the day for the actual number of days management and inspection are required and provided. Payment will only be made for one day of Traffic Control Management during each midnight-to-midnight period regardless of the number of Traffic Control Managers or assistants required to adequately perform the work.
- (2) No measurement will be made when the Engineer has suspended the need for Traffic Control Management and notified the Contractor accordingly.

### **Basis of Payment**

Paragraph 1. of Subsection 422.05 of the Standard Specifications and Supplemental Specifications is amended to include the following:

Traffic Control Management	Day (d)
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Paragraph 15. of Subsection 422.05 of the Supplemental Specifications is renumbered to be Paragraph 16. Subsection 422.05 of the Standard Specifications and Supplemental Specifications is amended to include the following:

15. With regard to inspection, maintenance, and repair of temporary traffic control devices, an assessment in the amount of \$500 per occurrence per day shall be charged to the Contractor when any of the following occur (these assessments shall be in addition to any other liquidated damages which may be assessed):
- a. The Contractor fails to respond within the timeframe specified in Paragraph 2.q. of the amended Subsection 422.01 of the Standard Specifications. Response time shall begin when:
    - 1) The Engineer notifies the Contractor of deficiencies in person;
    - 2) The Engineer makes notification of deficiencies via the 24-hour phone number(s) provided by the Contractor; or
    - 3) The Engineer leaves a message or receives no answer at the number(s) provided;
  - b. The Contractor fails to begin corrective actions to repair, replace, remove, relocate, or clean any traffic control devices or pavement markings within two hours of the completion of an inspection that uncovers deficiencies or within two hours of notification of deficiencies by the Engineer.
  - c. The Contractor fails to begin corrective actions to repair, replace, remove, relocate, or clean any traffic control devices or pavement markings within two hours of documented notification by an official law enforcement agency.
  - d. The Contractor fails to make or report the inspections prescribed in this specification.
  - e. The Engineer observes and documents any occurrence of the Contractor or his or her subcontractors flagrantly disregarding the necessary maintenance of traffic control devices that are in obvious need of attention.

## **TRANSPORTATION OF EXCAVATION MATERIALS AND EQUIPMENT**

The Contractor's hauling and construction equipment will not be allowed to cross West Dodge Road during *peak hours or daytime non-peak hours*. During *nighttime non-peak hours*, public vehicular traffic movements within these travel routes will be controlled by flaggers during the transporting of excavation materials or construction equipment across these routes.

The Contractor's hauling and construction equipment will not be allowed to cross 114<sup>th</sup> Street or 120<sup>th</sup> Street during *peak hours*. During *daytime non-peak hours or nighttime non-peak hours*, public vehicular traffic movements within these travel routes will be controlled by flaggers during the transporting of excavation materials or construction equipment across these routes.

The Contractor is not allowed to build a haul road over these routes.

## CONSTRUCTION DETAILS

### FUEL COST ADJUSTMENT PAYMENT (S2-1-0801)

Section 205 in the Standard Specifications and Supplemental Specifications is amended to include the following:

Payment will be made to the contractor for monthly fluctuations in the cost of diesel fuel used in performing the items of work, "Excavation", "Excavation, Borrow", "Excavation, Established Quantity", and/or "Earthwork Measured in Embankment" when the fuel cost fluctuates by more than 10% from the base price defined below. Payments may be positive, negative, or nonexistent depending on the circumstances. Payments or deductions will only be calculated on that portion of the fuel cost fluctuation that exceeds the 10% specified above.

Payments or deductions for the fuel cost adjustment will be included in the contractor's progress estimates; and the payment or deduction authorized for each estimate will be based upon the algebraic difference between the quantities for "Excavation", "Excavation, Borrow", "Excavation, Established Quantity", and/or "Earthwork Measured in Embankment" on the current estimate and the quantities shown on the previous estimate.

The fuel cost adjustment for the current estimate will be computed according to the following formula:

FCA=QFD where

- FCA = Fuel cost adjustment, in dollars;
- Q = The algebraic difference between the quantities (in cubic yards or cubic meters) for "Excavation", "Excavation, Borrow", "Excavation, Established Quantity", and/or "Earthwork Measured in Embankment" on the current estimate and the quantities shown on the previous estimate;
- F = English  
The fuel use factor for diesel fuel, in gallons per cubic yard. For the items of work "Excavation", "Excavation, Borrow", and "Excavation, Established Quantity", "F" shall be equal to .15. For the item of work "Earthwork Measured in Embankment", "F" shall be equal to .20.
- Metric  
The fuel use factor for diesel fuel, in liters per cubic meter. For the items of work "Excavation", "Excavation, Borrow", and "Excavation, Established Quantity", "F" shall be equal to .74. For the item of work "Earthwork Measured in Embankment", "F" shall be equal to 1.00.
- D = Allowable price differential.

The allowable price differential, "D", for the current estimate will be computed according to the following formula:

When the current price, P, is greater than the base price, P(b).

$$D = P - 1.10P(b), \text{ but not less than zero.}$$

When the current price, P, is less than the base price, P(b).

$$D = P - .90P(b), \text{ but not greater than zero.}$$

In either case, P(b) shall be the base diesel price, in dollars per gallon (liter), defined as the average of the minimum and maximum prices for No. 2 Diesel Fuel (Oklahoma) published in the first issue of "*Platt's Oilgram Price Report*" for the month in which bids for the work were received.

In either case, P, shall be the current diesel price, in dollars per gallon (liter), defined as the average of the minimum and maximum prices for No. 2 Diesel Fuel (Oklahoma) published in the first issue of "*Platt's Oilgram Price Report*" for the month in which the progress estimate is generated.

### **WATER (S2-1-0603)**

Paragraph 4.a. of Subsection 205.04 in the Standard Specifications is amended to include the following:

Payment shall be made at the established contract unit price.

### **GENERAL CLEARING AND GRUBBING (S2-2-0801)**

Paragraph 1. of Subsection 202.03 in the Supplemental Specifications is amended to provide that General Clearing and Grubbing shall include all tree removal.

Paragraphs 2.a., b., and c. of Subsection 202.03 in the Supplemental Specifications are void.

Paragraph 3. of Subsection 202.04 in the Supplemental Specifications is void and superseded by the following:

3. All tree removal is subsidiary to the pay item "General Clearing and Grubbing".

### **EROSION CONTROL PLAN (S2-3-0304)**

Paragraph 8. of Subsection 204.01 in the Standard Specifications is void and superseded by the following:

The Contractor must submit an Erosion Control Plan prior to the start of any work. The Contractor shall not begin work until the Erosion Control Plan has been approved by the Engineer and appropriate erosion control measures are in place. Payment for work done shall be withheld until in the opinion of the Engineer adequate erosion control measures are in place.

Neither the approval of the Erosion Control Plan, nor the approval to increase the maximum surface area, nor any payment for, or acceptance of any or all of the work shall operate as a waiver of the Contractor's responsibility as prescribed in Section 204.

Subsections 204.04 and 204.05 are void and superseded by the following:

The temporary erosion control items will be measured for payment in accordance with the requirements stated elsewhere in these specifications.

### **GRADING FOR CONCRETE PROTECTION BARRIERS AND INERTIAL BARRIER SYSTEMS**

The contractor shall provide the grading work required to install the concrete protection barriers and the inertial barrier systems at the appropriate slope. The contractor shall also maintain positive drainage, which may be disrupted by this grading. Embankment material for this grading shall come from the project right of way as designated by the engineer.

The required grading work and the work of maintaining drainage at concrete protection barriers and at inertial barrier systems locations shall not be paid for directly, but shall be considered subsidiary to items for which direct payment is made.

### **REMOVE PAVEMENT**

The work noted on the plans as "Remove Pavement" shall be performed and paid for as "Crush Concrete Pavement".

The "Remove Pavement" notes shown in the plans do not indicate the appropriate phase for the pavement removal. The Contractor shall remove the pavement at the appropriate time base on the traffic movements.

### **CONSTRUCTION AND OBLITERATION OF THE SOUTH BRIDGE DETOUR**

The culvert pipe for the detour will be furnished and installed by the grading contractor. The pipe shall remain the property of the Contractor when no longer required and need not be new. Excavation and connection bands required to install the pipe will be subsidiary to the pipes.

The earthwork required to construct the detour is included in the pay quantity of

Earthwork Measured in Embankment shown in Group 1.

When the detour is no longer required the surfacing shall be removed as prescribed elsewhere in these special provisions. The temporary pipe shall be removed and remain the property of the Contractor. The removal of the temporary pipe will not be measured and paid for directly, but will be considered subsidiary to the item "Temporary Surfacing".

### **REMOVE AND SALVAGE IMPACT ATTENUATOR**

Removing impact attenuator shall include the removal of all beam guardrail materials, cartridges, fittings, and posts from locations shown in the plans or designated by the Engineer. Concrete anchors shall be removed in their entirety and disposed of by the Contractor.

Traffic shall at no time be within 5.4 meters of an unprotected concrete barrier section. If the Contractor cannot stage his work to accommodate this requirement, then the exposed concrete barrier must be protected in a manner as directed by the Engineer at no additional cost to the Department.

The system shall be delivered to the State at Papillion Maintenance Yard.

The item "Remove and Salvage Impact Attenuator" shall be measured by the each and shall include removing and delivering the impact attenuator system and any attachment materials.

### **REMOVE AND SALVAGE INERTIAL BARRIERS**

Removing inertial barriers shall include the removal of all modules and associated object markers from locations shown in the plans or designated by the Engineer. Filler material shall be removed and disposed of by the Contractor.

Traffic shall at no time be within 5.4 meters of an unprotected concrete barrier section. If the Contractor cannot stage his work to accommodate this requirement, then the exposed concrete barrier must be protected in a manner as directed by the Engineer at no additional cost to the Department.

The system shall be delivered to the State at Papillion Maintenance Yard.

The item "Remove and Salvage Inertial Barrier" shall be measured by the each and shall include removing all modules, including filler material and object markers located at each location and delivering the system.

### **REMOVE BOLLARD**

Section 203 of the Standard Specifications is amended to include the item "Remove Bollard".

"Remove Bollard" will be paid for at the unit price per each, regardless of size or material. Separate pavement for excavating, backfilling, compacting cavities resulting from the removal, and wasting the materials will not be made.

## **REMOVE DECORATIVE LIGHT**

Section 203 of the Standard Specifications is amended to include the item "Remove Decorative Light".

One pedestal sidewalk light exists at Station 581+22.0 on Frontage Road "S2" to illuminate the existing sidewalk leading into First National Bank's property.

Disconnect the electrical and grounding conductors. Remove the luminaries, foundations, and all associated wires, cables, pull boxes, and conduits.

The item "Remove Decorative Light" will be paid for at the unit price per each. Separate pavement for excavating, backfilling, compacting cavities resulting from the removal, and wasting the materials will not be made.

## **REMOVE SIGN, STRUCTURE AND FOUNDATION**

Section 203 of the Standard Specifications is amended to include:

An existing personal property sign structure shall be removed on this project. The sign is located at Station 82+80.7 on Mainline West Dodge. The McDonald's sign is an illuminated message board sign mounted on a rectangle wooden base.

The signs and materials shall become the property of the Contractor and disposed of off the right of way. Any tools, equipment, materials and labor required to perform this work shall be considered subsidiary.

## **EARTHWORK**

Section 205 of the Standard Specifications is amended to include:

The contractor will be paid for grading activities in Phases 1 through 6 by the pay item "Earthwork Measured in Embankment" and in Phases 8 and 9 by the pay item "Excavation (Established Quantity)". The earthwork required for Phase 7 is included in Phase 8 and 9 earthwork data sheets. The contractor will not be allowed to excavate areas designed in the plans as Phase 8 and 9 in order to gain material needed in Phases 1 through 6.

The plan quantity for Phase 3A on the earthwork data sheets includes an estimated placement of 43,000 cubic meters of embankment by the contractor on Project IM-680-9(796). After this task has been completed, the State will measure the actual amount of material placed and adjust the quantity shown in the plans. This may lead to an increase or decrease in the pay quantity of "Earthwork Measured in Embankment".

The earthwork required for surcharge shall be paid as "Earthwork Measured in Embankment". This price shall be full compensation for installing, maintaining, removing and disposing of embankment identified in the plans as surcharge. The contractor will be allowed to use this material in later phases for embankment fill.

## **MEDIAN CONSTRUCTION**

Section 308 of the Standard Specifications is amended to include:

Subsection 308.02 of the Standard Specifications is void and superceded by the following:

Soil requirements for embankments shall meet the requirements of:

Topsoil matter shall be capable of sustaining plant growth native to the surface soils of this project area. The topsoil matter shall be free of toxic materials, debris, garbage, weeds, rock, twigs, large clods which will not break down, other non-organic foreign material, and any objects larger than 50 millimeters in diameter.

Organic matter shall be dark brown or black in color and capable of enhancing plant growth, 98 percent of the organic matter shall pass a 50-millimeter screen. There shall be no admixture of refuse, such as noticeable inert contamination, or other materials toxic to plant growth. The organic matter shall be free from foreign objects larger than 50 millimeters in diameter. Acceptable organic matter may be derived from fully rotted manure or completely composted yard or vegetation waste, no food residuals.

Prior to placing topsoil, amend topsoil with organic matter at an 8:1 ratio (8 parts topsoil to 1 part organic matter). Mix thoroughly to evenly distribute organic matter throughout soil mix.

Subsection 308.03 of the Standard Specifications is amended to include the following:

Remove any debris from surface of areas to be excavated.

Loosen subgrade to a minimum 150 millimeters beyond excavation depth.

Place approximately 150-200 millimeters of soil mix and work into top of loosened subgrade to create a transition layer. Repeat process with additional lifts to bring soil level to finished grade as indicated in the plans. Work each successive lift into top layer of previous lift.

Finish grades to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas. Establish grades so finish grade in place will be 12 millimeters below adjacent edging or paving.

## **SUBGRADE PREPARATION (S3-1-0801)**

Paragraph 2.a. of Subsection 302.03 in the Standard Specifications is amended to include that trimming on narrow, irregular or roadway grading of 1/2 mile (0.8 km) or less may be accomplished using conventional methods.

## **FOUNDATION COURSE PLACEMENT**

The foundation course shall be placed as follows:

The pavement removed and crushed as part of this project shall be used as Crushed Concrete Foundation Course when available. When Crushed Concrete Foundation Course from this project is not available, Crushed Concrete Foundation Course produced from the existing stockpile of crushed concrete at the 108<sup>th</sup> Street and I-80 site shall be used. When Crushed Concrete Foundation Course is not available, Aggregate Foundation Course -D shall be used.

The foundation course type used at any individual location shall be the same type across the entire roadway cross section.

## **FOUNDATION COURSE**

The Contractor shall have the option of using either Aggregate Foundation Course- D or Crushed Concrete Foundation Course and the Contractor shall bid the pay item "Foundation Course \_\_\_\_\_ mm" accordingly.

These different foundation courses may be used interchangeably throughout the project, with the exception being that the same type of foundation course shall be used across the entire width of a pavement section to provide uniform drainage across that template. The Contractor shall make every attempt to use the same type of foundation in long paving runs and any changes in foundation course type shall be approved by the Engineer.

## **AGGREGATE FOUNDATION COURSE-D**

Amend Section 307 of the 1997 Metric Edition of the Standard Specifications to include Aggregate Foundation Course-D. This specification applies to all depths of Aggregate Foundation Course-D shown on the plans.

1. Material Requirements
  - a. Foundation Course-D shall consist of mineral aggregate.
  - b. Aggregate shall conform to the quality requirements of Subsection 1033.02, Paragraphs 1., 2., and 9.
  - c. At least 14 days before beginning foundation course production, the Contractor shall submit a proposed mix design along with a 27-kg sample of each aggregate to the NDR Materials and Research laboratory for approval. The mix design will:
    1. Result in an aggregate mix that meets the gradation requirements of Table 1.
    2. Propose single defined values for the percentage passing each sieve on the gradations of Table 1.
    3. Include the average aggregate(s) gradations used to calculate the mix design.

4. Create a fine aggregate angularity value of 43.0 or greater according AASHTO T 304 Method A.
- d. The NDR Materials and Research laboratory will determine the specific moisture-density values for the proposed foundation course design.

Table 1

Aggregate Foundation Course-D Gradation Requirements		
Sieve Size	Target Value (Percent Passing)	Tolerance
12.5 mm	100	0
9.5 mm	100	-4
4.75 mm	93	±4
2.00 mm	55	±10
600 µm	25	±5
425 µm	20	±4
75 µm	3	±3

2. Construction Methods

- a. The Contractor shall place, compact and profile the foundation course as shown in the plans.
- b. The foundation course shall be spread in a uniform layer and compacted to at least 100 percent of the maximum density as determined by NDR T 99.
- c. After compaction the foundation course shall be trimmed such that the thickness will not vary from the plan thickness by more than 12.5 mm.

3. Method of Measurement

Aggregate Foundation Course-D -- shall be measured as prescribed in Paragraph 3. of Subsection 307.04.

4. Basis of Payment

Aggregate Foundation Course-D measured as provided herein shall be paid for at the contract unit price per square meter for the item, "Foundation Course 100 mm". This price shall be full compensation for all material, equipment, labor, tools and incidentals necessary to complete the work.

## **CRUSH CONCRETE PAVEMENT**

Paragraph 1. of Subsection 312.02 and Paragraph 5. of Subsection 312.03 of the 1997 Metric Edition of the Standard Specifications are void and superseded by the following:

The Contractor shall crush the concrete to the gradations shown below.

Crush Concrete Foundation Course Gradation Requirements		
Sieve Size	Target Value (Percent Passing)	Tolerance
31.5 mm	100	0
25.0 mm	95	±5
19.0 mm	75	±12
4.75 mm	30	±12
2.00 mm	16	±11
425.0 µm	9	±5
75.0 µm	3	±3

Crushed Concrete material shall be stockpiled at a site provided by the State. The State provided stockpile site is located at 108'h Street and 1 80, as directed by the Engineer.

A stockpile/crushing site is available and located south of 1-80 east of 108th Street as shown in the plans. The Contractor is allowed to use this location for their crushing operation. This site shall be used to stockpile removed concrete for crushing and milled asphalt. This site shall not be used as a construction waste dumping area.

The existing crushed material is the property of the State and shall not be used on this project.

The Contractor is expected to vacate this site in a timely manner at the completion of the crushing operation. The site is to be left in a clean, neat and orderly manner.

Crushed Concrete material not used on the project shall be stockpiled at a site provided by the State. The State provided stockpile site is located at 108" Street and 1 80, as directed by the Engineer.

### **CRUSHED CONCRETE FOUNDATION COURSE 100 mm**

Paragraph 3.d. of Subsection 307.02 of the 1997 Metric Edition of the Standard Specifications is void and superseded by the following:

The crushed concrete gradation shall be determined as prescribed in NDR T 27 (washed test). The gradation requirement for the crushed concrete foundation course, whether obtained from an existing stockpile or from the crushed concrete pavement operation on the project, is shown below:

Crushed Concrete Foundation Course Gradation Requirements		
Sieve Size	Target Value (Percent Passing)	Tolerance
31.5 mm	100	0
25.0 mm	95	±5
19.0 mm	75	±12
4.75 mm	30	±12
2.00 mm	16	±11
425.0 µm	9	±5
75.0 µm	3	±3

3. Method of Measurement

Crushed Concrete Foundation Course shall be measured as prescribed in Paragraph 3 of subsection 307.04.

4. Basis of Payment

Crushed Concrete Foundation Course measured as provided herein shall be paid for at the contract unit price per square meter for the item, 'Foundation Course 100 mm'. This price shall be full compensation for all material, equipment, labor, tools and incidentals necessary to complete the work.

## **STABILIZED SUBGRADE**

### **Description**

The work of constructing the stabilized subgrade shall consist of reshaping the subgrade and constructing and compacting a 200 mm layer to the widths shown in the plans, of pulverized soil from the subgrade, Fly Ash and water to provide a firm, stable foundation for the subsequent construction. The stabilized subgrade shall be constructed in conformity with the lines, grades, quantity and material requirements, and typical cross section shown in the plans.

### **Material Requirement**

1. The Fly Ash shall be Type C and shall meet the requirements of Section 1008 in the 1997 Metric Edition of the Standard Specifications.
2. Water shall conform to the requirements of Section 1005.

### **Equipment**

1.
  - a. All equipment used in the work shall be adequate for the purpose for which it is to be used and shall be kept in satisfactory working order.
  - b. The contractor shall furnish the necessary accessories and personnel and shall perform the tests and calibrations on the equipment under the supervision of the engineer. In the event problems are encountered during the tests and calibrations, the contractor shall arrange for a trained technician or company representative of the company from which the equipment was obtained to make the necessary repairs and/or adjustments to the equipment. Calibration shall be made as often as is deemed necessary by the engineer, to insure accuracy of the equipment.
2. Distributors used for applying water shall conform to the requirements of Subsection 301.02.
3. Equipment for use in trimming stabilized subgrade shall conform to the requirements of Section 302.

### **Construction Methods**

1. The work of constructing the stabilized subgrade shall be according to Section 302 except that the thickness of the stabilized subgrade is 200 mm.
2. Prior to the placement of the fly ash, the subgrade shall be adjusted to the typical cross section shown in the plans. The quantity of fly ash to be applied shall be approximately 10% to 15%, by weight as determined by the Materials and Research Division Laboratory. The fly ash shall be placed on the surface of the subgrade and distributed in a layer of uniform thickness over the entire width of the area being treated. The fly ash shall not be placed on the subgrade when the wind is blowing so that the loss cannot be satisfactorily controlled.

3. The portion of the roadbed being treated shall be graded to within 15-mm of the finished elevation by use of conventional equipment, then scarified to loosen the subgrade soil to the full width and depth of the fly ash treated subgrade. This work may be performed prior to, during or after the application of the fly ash, however, if prior to the application of the fly ash, the material being treated shall be broken down to the extent necessary to prevent the fly ash, insofar as practicable, from sifting or draining through the material to be treated, into the underlying subgrade. If necessary the larger chunks or pieces of soil shall be broken down by the use of disc harrows, sheepsfoot rollers or other suitable equipment.
4. Mixing operations shall begin within 30 minutes after distribution of the fly ash. Mixing of fly ash shall be accomplished throughout the scarified material with a machine capable of pulverizing the existing subgrade to the depth required by these specifications and to a minimum width of not less than 2.4 meters in a single pass operation. The pulverizing machine shall be capable of blending and mixing, to a homogeneous material, the pulverized subgrade with the fly ash and water. The machine shall be equipped with standard automatic depth controls and be capable of maintaining a constant depth and width. Care shall also be taken to avoid mixing the fly ash with a greater quantity of the subgrade soil than is required to build the compacted thickness specified. During the mixing, water shall be added to provide a moisture content in a range from optimum moisture content of the mixture to plus 2 percentage points. The optimum moisture content shall be determined by NDR T 99. Mixing shall be continued until all chunks of soil have been reduced to a maximum of 50-mm in size.
5. After mixing, the material shall be shaped to the proper cross section and compacted with sheepsfoot rollers. Final shaping with a motor grader and final rolling with pneumatic-tired rollers will then be accomplished. Compaction shall begin immediately after mixing and shall be completed within 1.25 hours following the addition of fly ash. The size and weight of the sheepsfoot and pneumatic-tired roller shall be such that the attained density throughout the entire width and depth of the layer shall be not less than 100 percent, as determined by NDR T 99. Water may be added during the compaction and finishing operations to compensate for evaporation loss.
6. After the required compaction has been attained, the subgrade shall be trimmed in accordance with the requirements of Subsection 302.03,
8. Any damage to the stabilized subgrade shall be repaired at the Contractors' expense.

#### Sampling and Testing

1. A 27 kg. sample(s) of subgrade soil and a 4.5 kg. sample of the fly ash shall be submitted for mix design prior to beginning the Stabilized Subgrade.

#### Method of Measurement

1. Fly Ash shall be measured by the Mg of acceptable material used in the work

2. Water which is applied as directed by the Engineer will be measured as provided in paragraph 2. of Subsection 302.04,
3. Stabilized subgrade will not be measured directly. The quantity for payment will be the overlying square meters of pavement.

#### Basis of Payment

1. Fly Ash that is used in the work, measured as provided herein, shall be paid for at the contract unit price per Mg for the item, 'Fly Ash'. This price shall be full compensation for furnishing, delivering, and distributing the fly ash, and for all equipment, labor, tools and incidentals necessary to complete the work.
2. Water measured as provided herein, shall be paid for at contract unit price per kiloliter for the item "Water for Fly Ash Stabilization".
3. Stabilized Subgrade measured as provided herein, shall be paid for at the contract unit price per square meter for the item, "Stabilized Subgrade". This price shall be full compensation for shaping and trimming the subgrade, scarifying and pulverizing the subgrade soil, drying, mixing, shaping, and compacting the Fly Ash treated subgrade, and for all equipment, labor, tools and incidentals necessary to complete the work.

### **REMOVE LIGHTING UNIT**

Existing lighting units for removal as described in this section consists of conventional lighting units (Type CL) and also existing temporary lighting units (Type TL) located on north and south frontage roads along West Dodge Road from Sta. 65+72 to Sta. 73+30. The existing temporary lighting units are comprised of one or three floodlights, mounting bracket, and wood pole.

When the existing conventional lighting units are no longer required as determined by the project manager, the Contractor will remove the lighting units by disassembling the luminaire from the mastarm, the mastarm from the pole, and the pole from its concrete foundation.

The Contractor will remove the concrete pole foundation, including reinforcing steel and anchor bolts, to a minimum of two feet (600 mm) below finished grade: backfill the excavation with clean soil and compact the soil to the density requirements on the project. The Contractor may, at his option, remove the foundation as an entire unit. Abandon unused existing conduit and cable in place.

When the existing temporary lighting units are no longer required as determined by the project manager, each floodlight pole shall be carefully lowered, the luminaries and mounting bracket carefully removed. Direct buried cable shall be disconnected and abandoned in place.

Prior to their removal, the engineer or his representative shall inspect all lighting units to determine which units will be salvaged for state stock and which will be given to the Contractor.

All components of the existing conventional lighting units, with exception of the luminaries, will be salvaged for state stock if not damaged and in good condition. The luminaire and all damaged components will become the property of the Contractor and must be removed from the project.

For existing temporary lighting units, the luminaries and mounting bracket shall be cleaned and salvaged for state stock. Luminaires shall have their photo control in place with all openings covered by duct tape. All wood poles will become the property of the Contractor and must be removed from the project site.

The project manager or his representative will determine which components will be taken to the NDOR supply yard at 5001 South 14<sup>th</sup> Street, Lincoln, Nebraska. Contact the stock control manager at (402) 479-4322 two days prior to delivery.

All components to be salvaged shall be carefully disassembled and cleaned. Conventional lighting poles shall be free of internal wiring, have their hand hole cover and pole cap in place and the mastarm bolts attached. The transformer bases shall have their covers in place and all associated bolts, nuts, and washers attached.

All items being delivered to the State yard for insertion into state stock must be accompanied by a properly completed Department of Roads Form 147 "Stock Return for Credit". The form will be signed by the project manager and must be presented to the yard foreman at the time the materials are delivered. The Contractor will not be allowed to "offload" any material if all of the above requirements are not complied with.

It shall be the Contractor's responsibility to protect the salvaged material from damage during removal and delivery to the state yard in Lincoln. The Contractor will place the items in the yard at the locations designated by the yard foreman.

#### **METHOD OF MEASUREMENT AND BASIS FOR PAYMENT**

The item "Remove Lighting Unit" will be measured and paid for as a complete unit for each lighting unit removed, accepted by the Engineer and delivered to stock in Lincoln or given to the Contractor for disposal. This work shall include but not be limited to the following: Removing, salvaging, preparing, storing and delivering the existing lighting units: removing existing concrete foundations; all necessary excavation, backfilling and disposal of surplus material; for the termination and abandonment of existing underground feeders and for all materials, labor, equipment, tools and incidentals necessary to complete the work.

## **REMOVE LIGHTING CONTROL CENTER**

There are five (5) existing lighting controls centers that will require removal under this contract: The control centers are at the locations listed below:

LIGHTING CONTROL CENTER	LOCATION
E-1	Sta. 65+77, 36 m Left
E-2	Sta. 65+77, 33 m Right
E-3	Sta. 69+84, 36 m Left
E-4	Sta. 70+45, 45m Right
E-5	Sta. 73+23, 63m Left

Each is a 240/120v fiberglass or galv. steel utility pedestal type lighting control cabinet with control relay and circuit breaker. The pedestal type control cabinet with contents and associated photo control will be salvaged in its entirety and all items delivered to the NDOR Supply Yard in Lincoln. All items must be accompanied by a properly completed DOR Form 147 "Stock Return for Credit".

The control center will remain in operation as long as required to serve its associated lighting units.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Removal of the control center will be measured for payment as a single unit and paid for at the contract unit price per each for item "Remove Lighting Control Center". This price and payment shall be full compensation for the removal of the complete control center; for the proper delivery of all removed materials to Lincoln stock; for all labor, equipment, tools, materials, and incidentals necessary to complete the work.

## **REMOVE HIGH MAST TOWER**

Disconnect the electrical and grounding conductors to the existing high mast towers scheduled for removal the lighting plan drawings (see the "Remove Existing High Mast Light Tower" table on the applicable lighting plan drawings). Carefully remove tower from its foundation. It will be the Contractor's responsibility to protect the tower from damage during removal and transfer to storage.

Remove the entire lowering system (luminaries, masthead assembly, hoist and winch cables, power cable, and winch assembly) from the tower before being stored. The removed lowering system will not be salvaged for re-use but will become the property of the Contractor and must be removed from the project.

The tower shall be secured on timber cribbing with its shaft in straight alignment and with no part of the tower in contact with the ground. The tower will be stored at a location designated by the Project Manager.

Completely remove the existing tower foundation, including steel and anchor bolts to a minimum depth of 0.6 m below finish grade; backfill the excavation with clean soil; compact the soil to the density requirements of the project and abandon all unused conduit and cable in

place. All rubble and waste resulting from the foundation removal shall be taken from the project.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The high mast tower, removed, prepared, and stored as indicated in the plans and these special provisions shall be measured for payment as an individual unit and paid for at the contract unit price, per each, for the item "Remove High Mast Lighting Unit". The price and payment will be considered full compensation for removing, salvaging, transferring, and securing the tower on its cribbing, for removal and disposal of the lowering system, for removing the concrete foundation to a minimum of 0.6 m below grade; for all necessary excavation, backfilling, and disposal of surplus materials; for the termination and abandonment of existing underground feeders and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

## **REMOVE TEMPORARY LIGHTING SYSTEM**

There are six Temporary Lighting Systems to be installed on this project (Temporary Lighting Systems 'A' through 'F'). Each of the six lighting systems will be removed when no longer needed. The removal of the temporary lighting systems is included in the cost of the temporary lighting system as prescribed in Section 416 of the Standard Specifications.

When construction is complete and the temporary lighting system is no longer required as determined by the Project Manager, the lighting system shall be removed by the Contractor. All temporary street lighting units (pole, luminaires, mounting bracket) and the associated Type "P" lighting control centers E-1 thru E-6 comprising the Temporary Lighting Systems shall be removed.

The floodlights and mounting brackets from the Type 'A' and 'B' Temporary Street Lighting Units will be salvaged, cleaned, properly prepared, and delivered to the Department of Roads' Supply Yard at 5001 South 14<sup>th</sup> Street in Lincoln, Nebraska. The wood floodlight poles and all other items will not be salvaged but will become the property of the Contractor and must be taken from the project.

Abandon unused direct buried feeder cables in place. The Type "P" lighting control centers with contents and associated photo control will be completely removed and all items delivered to NDOR stock in Lincoln. Each lighting control center will remain in operation as long as required to serve its associated lighting units.

All items to be salvaged must be accounted for and delivered in good working condition. Missing or damaged components must be replaced by the Contractor before final payment will be made. The floodlight luminaires must have their shorting cap in place and the mounting access hole covered with duct tape.

All items being delivered to the State yard for insertion into state stock must be accompanied by a properly completed Department of Roads Form 147 "Stock Return for Credit". The form will be signed by the project manager and must be presented to the yard foreman at the time the materials are delivered. The Contractor will not be allowed to "offload" any material if all of the above requirements are not complied with.

## **TEMPORARY LIGHTING SYSTEM**

There are six Temporary Lighting Systems to be installed on this project (Temporary Lighting Systems 'A' through 'F'). The Contractor shall install these systems as detailed on the plans and in these special provisions. The systems shall be tested and operating properly before being put into use.

The Contractor shall provide all other materials required for a complete and working system and shall install all materials in accordance with the plans and specifications.

A power location for each of the six systems has been arranged for with the local utility (O.P.P.D.). The Contractor will not be responsible for the energy used to power the lighting systems.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

A temporary lighting system as described in the Plans and Special Provisions, complete, in place and accepted by the Engineer, shall be measured for payment as a single unit and paid for at the contract unit price, per each, for the item "Temporary Lighting System, Type \*\*\*". This price and payment shall be full compensation for furnishing and installing and repairing the lighting system including poles, luminaires, lamps, foundations, breakaway bases, all necessary wiring, all control centers, all materials, labor, equipment, tools; for all transportation, storage, and for all incidentals necessary to complete the work. Payment shall be made in accordance with the following schedule: Two-thirds (2/3) of the contract price to be paid when the system is installed, in place and approved by the Engineer: one third (1/3) of the contract unit price to be paid when the system is removed and delivered to the Department of Roads as specified.

## **ROADWAY LIGHTING**

Subsection 412.02 "Material Requirements", line 1 of the Standard Specifications is void and shall be replaced with the following:

### **PERMANENT LUMINAIRES**

#### **1. Type 'L1' thru 'L7, L9, L10:**

Luminaire shall be the manufacturer and model number listed on the Luminaire Schedule as shown on the lighting plans or an approved equal. An equal fixture shall be of a type without a mast arm. The housing, door, and fitter shall be die cast aluminum. External hardware shall be stainless steel.

Finish shall be a gray Polyester Powder Coat or an electrodeposited epoxidized acrylic paint coat capable of successfully withstanding a 1000-hour salt spray test per ASTM B 117.

Fixture shall have a high power factor, copper-wound ballast providing full rated wattage to lamp. Ballast shall be 277 volt or a multi-tap ballast to be factory wired at 277 volt.

The luminaire shall have "full cutoff" control characteristics as follows: Zero intensity at or

above horizontal (90 degrees above nadir) and limited to a value not exceeding 10% of lamp lumens at 80 degrees above nadir.

The luminaries, with lamp size and lumens as specified in the plans and in accordance with the following parameters, shall provide an average maintained horizontal illumination level of 0.8 FC with an average to minimum uniformity ratio not exceeding 3.5:1. The maximum to minimum uniformity ratio shall not exceed 7.0:1. Any adjustment to the luminaries optical system needed to provide a light distribution meeting the preceding requirements shall be made at the factory prior to shipment.

Parameters used: roadway width 8.4 M, pole spacing of 58 m, mounting height of 12 m, pole setback of 3 m, light loss factor of .75, pole layout single sided.

## **2. Type 'L8', 'L11' and 'L12':**

Luminaire shall be the manufacturer and model number listed on the Luminaire Schedule as shown on the plans or an approved equal. The housing shall be die cast aluminum. Finish shall be a gray Polyester Powder Coat or an electrodeposited epoxidized acrylic paint coat capable of successfully withstanding a 1000-hour salt spray test per ASTM B 117. Fixture shall be completely gasketed. External screws shall be stainless steel or treated for corrosion resistance. Luminaire shall be suitable for installation in wet locations.

Type 'L8' and 'L12' fixtures shall have a high power factor, copper-wound ballast providing full rated wattage to lamp. Ballast shall be 277 volt or a multi-tap ballast to be factory wired at 277 volt. Type 'L11' fixture shall have an electronic ballast for 277V operation.

The reflector shall be hydro-formed aluminum. Lens shall be thermal and shock resistant glass.

Subsection 412.05 is amended to include the item "Medallion Light". The medallion lights will be paid for on a per each basis.

## **TEMPORARY LUMINAIRES**

### **1. Type 'TL1', 'TL2':**

Luminaire shall be the manufacturer and model number listed on the Luminaire Schedule as shown on the plans or an approved equal.

#### **A. Housing**

Floodlight luminaire with die-cast aluminum housing. Housing shall be gasketed and activated-charcoal filtered.

Finish shall be a gray Polyester Powder Coat or an electrodeposited epoxidized acrylic paint coat capable of successfully withstanding 1,000 hours of salt spray test per ASTM B 117.

Housing must be legibly and durably marked with a lamp size, using ANSI NEMA lamp identification label.

Front accessible via a hinged/removable door.

External hardware shall be corrosion resistant.

**B. Reflector**

The reflector shall be hydroformed aluminum with an approved aluminum oxide or silica coating bonded to the inside and outside surfaces.

**C. Socket**

The socket shall be a mogul base porcelain.

**D. Lens**

The lens shall be made of clear tempered flat glass, heat resistant and free from imperfections.

**E. Terminal Block**

A terminal block will be required.

**F. Ballast**

The ballast shall be of the magnetic regulator type, the high pressure sodium lamp size as indicated in the plans.

Ballast shall be dual volt 120/240 or a multi-tap ballast factory wired to 240 volt.

The ballast and starting aid shall not incur significant life reduction should the lamp continue in open or shorted circuit condition for a six-month period.

**Regulation and Operation**

At nominal line voltage and nominal lamp voltage, the ballast design center will not vary more than 5% from the rated lamp wattage. Lamp wattage variation shall not exceed 10% for a  $\pm 10\%$  line voltage variation.

The ballast/lamp combination must provide reliable starting to  $-40$  degrees F ( $-40$  degrees C).

Ballast starting current must not exceed normal operating current.

Power factor must be rated above 90% through all operational modes.

**G. Photometric and Performance Requirement**

Type TL2 luminaire shall have a NEMA 6x5 beam spread.

## **APPROVAL REQUIREMENTS**

In addition to the requirements for approval of the roadway lighting luminaries outlined in Subsection 1073.02, the Contractor may be asked to supply IES formatted photometrics on a 1.44 MB computer disk for each type of luminaire he/she proposes to furnish for the project. The disk must be IBM compatible.

The Contractor shall be prepared, upon request, to furnish a working sample of the luminaire for this project (sample will be returned to the Contractor or counted as part of the contract quantity).

The right is reserved to reject any and all proposals. The State of Nebraska will decide all questions which may arise as to the quality or acceptability of the luminaire submitted for approval under this specification.

## **JUNCTION BOXES**

Junction boxes (Type 'B' or 'C') for use in roadway and bridge barriers shall be of NEMA type 4 watertight and dust-tight construction and sized as per the Junction Box Schedule in the lighting plans. Boxes shall be of machineable quality gray iron castings, outside flanged with recessed checkered cover, and designed especially for mounting in masonry. Cover and box shall have hot-dip galvanized finish. Cover shall be gasketed and secured to the box with hex head stainless steel screws. Conduit entrance into the box shall be through slip holes. Fasten conduit to box using sealing type locknuts.

Junction box (type 'A') is a NEMA 4x surface mounted box with body and cover of 14 GA Type 304 or 316 stainless steel and no knockouts; seams are continuously welded and ground smooth; externally mounted flanges; hinged door with stainless steel screws and mounting clamps; door with oil-resistant gasket. Mounting locations and box size as per the junction box schedule in the lighting plans.

The junction boxes will be measured and paid for per each for the item "Junction Box Type \_\_\_\_". This price shall be considered full compensation for all work required to furnish and install the junction boxes.

## **MAINTENANCE OF LIGHTING UNITS**

The Contractor will be responsible for the proper operation of all working lighting units (existing, relocated, temporary, and new) within the limits of the project from the time the projects is started until construction is completed and the project has been accepted. A malfunction of any part of the lighting system(s) (pole, luminaries, pole wiring, control center, or circuit conductors) shall be promptly corrected. Any existing lighting units within the project limits, not working at the time construction is started, will not be the Contractor's responsibility. The Engineer may negotiate the repair and maintenance of the non-working lighting units with the Contractor if he determines the units are needed.

If, for any reason, a lighting unit fails or is "knocked down", it shall be repaired or replaced within two days from the time the Contractor is advised of the failure. The Contractor will furnish all needed replacement parts.

For each occurrence, liquidated damages of \$100.00 per calendar day shall be assessed the Contractor if he/she fails to correct the reported failure of the lighting system as stipulated above. If necessary, the Engineer may cause the needed repairs to be made by others. The cost of such repairs will also be assessed the Contractor.

The Contractor will be responsible for locating and flagging all underground circuits to State owned facilities within the areas of his work where any type of grading, excavation, or underground construction is scheduled.

The Contractor will be responsible for the proper repair or replacement of any part of the lighting system(s) damaged as the result of negligence or carelessness on the part of his forces.

The Contractor will not be responsible for the cost of electrical energy required to operate the lights on the project.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The maintenance of all working lighting units on the project shall be measured for payment per day for the number of calendar days the lights are in operation under this contract.

Payment will be made at the contact unit price per day for the item "Maintenance of Lighting Units." This price and payment shall be full compensation for the locating and flagging of underground circuits; for all repairs, replacements, installations, rentals, fees, transportation costs and for all labor, equipment, tools, and incidentals necessary to maintain all lights in working order as set forth in the plans and in these Special Provisions.

## **POWER LOCATIONS**

In most instances, the location at which the Contractor is to obtain electric power for a lighting system will be prearranged with the local utility and this location will be shown on the plans. These locations, however, are approximate and subject to change.

The Contractor will be required to contact the utility prior to installing the conduit, cables, and lighting control center to determine if the location for electrical power remains as shown on the plans. If the location for the service has changed, the Contractor shall advise the Engineer of this change and shall refrain from installing the lighting control center, conduit, and cable until he received the Engineer's approval.

The utility contact person for this project is Robert Adams, Utility Coordinator for OPPD, (402) 636-3333.

## **LIGHTING FOR NIGHT CONSTRUCTION**

For construction operations conducted during the hours of darkness, the Contractor shall provide illumination upon the work area in accordance with the following:

OPERATION	AVE. ILLUMINATION (HORIZ. FT.-CANDLES)	UNIFORMITY (AVE.: MIN.)
Rough Grading, Embankment	2.0	4:1
All Other Construction Operations	10.0	4:1

The Contractor will be responsible for the furnishing, installation, energy, operation and maintenance of the construction area lighting system. The lighting levels, as specified, shall be maintained throughout the period nighttime construction operations are in progress. A standard size roadway plan sheet showing how the Contractor proposes to provide the required lighting shall be submitted to the engineer for review and approval fourteen days prior to beginning any nighttime operations.

In selecting a configuration for the lighting systems, consideration should be given to the mounting of the luminaires to ensure structural integrity and to minimize glare. The vertical supports should be capable of supporting the weight of the mounted equipment (luminaires, brackets and cross arms) and of withstanding the effect of wind and other climatic factors. In addition, consideration should be given to mounting height, location of the luminaires and aiming of the luminaires. Floodlights or other area lighting units used to provide the illumination for nighttime operations should be aimed, adjusted and/or shielded to prevent stray light (glare) from interfering with the workers and the passing motorists.

When providing illumination for nighttime construction in a work area 20,000 ft. (6,096 m) or less from an airport runway, the Contractor shall notify the airport's governing authority of the proposed construction and abide by all requirements and restrictions, the airport authority may impose. Notification to the authority must be made at least 30 days prior to the date the construction is to begin. A copy of the airport's response must be submitted to the engineer for his files.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Lighting for nighttime construction operations will not be measured for payment, but will be considered subsidiary to other items of work for which direct payment is made.

## **SURVEILLANCE CAMERA SYSTEM**

### **A. General:**

The Traffic Surveillance Pan-Tilt-Zoom Camera (PTZ Camera) with dome enclosure, wireless antenna, video server, electrical box, a "power brick" and/or power transformer, if necessary, any conduit and wiring above ground and all necessary mounting hardware shall be supplied and installed by the contractor. All workmanship and materials for the surveillance system, excluding underground conduit and wire, shall be paid as "Surveillance Camera System". The PTZ Cameras shall be mounted on overhead sign structures at the locations shown in the plans labeled Surveillance System.

### **B. Camera Specs:**

The camera shall be an Ultrak/Honeywell KD66: - High resolution day/night camera with an 18x optical zoom (48' wide angle and 2.80 telephoto). The KD6B camera shall have the following characteristics:

### **C. Wireless Antenna:**

The wireless antenna shall be a Proxim Tsunami Wireless Ethernet QuickBridge 20 with: 18 Mbps Aggregate throughput and 5.8 GHz license free band PTP kit.

The Contractor, if necessary, for the wireless antenna installation described, shall supply a "power brick".

The antenna shall be installed according to the manufactures instructions and direct its signal to the electronic bridge on the camera tower at 108th and North Bridge Road.

### **D. Video Server:**

The video server shall be an AXIS 2401 + video server. The AXIS 2401 + video server is a high performance video server designed for professional surveillance applications. Connecting directly to an Ethernet network or modem, the AXIS 2401 + accommodates a single video input stream and a video output for connection to an analog monitor. The video server transforms analog video into digital images for video transmission over intranet networks, or the Internet.

### **E. Electrical box:**

Electrical boxes manufactured by either Axtelitech, Winncom are approved for this project. The box sizes are approximately 500mm x 500mm x 330mm. These boxes are designed specifically for this application. Each box has a heater for the winter months, and proper fan ventilation for the summer months. The electrical box is where all electrical connections and data connections reside, and the video server also sits in the electrical box. It comes with outlets for 120v ac use.

### **F. Wire between the camera and the video server:**

The Contractor shall supply all required hardwire connections between the PTZ Camera, the wireless antenna and the video server. The wiring shall be installed as recommended by the manufacturer or as directed by the Engineer.

The wiring from the PTZ camera shall be installed un-spliced down the sign bridge through underground conduit as shown in the West Dodge Road Interconnect sheets to the video server in the electrical box.

### **G. Installation procedures:**

The contractor shall use camera mounting brackets manufactured by Ultrak, or an approved equal. The Engineer must approve the camera mounting brackets.

At each PTZ camera location, the Contractor shall build an Electrical box on public right of way, on a 800mm x 800mm x 155mm reinforced concrete pad. The concrete pad shall be built similar to the concrete pad for a Lighting Control Center pad detailed in the project Lighting Plans. The pad for the electrical box shall be reinforced with mess and include a ground rod, anchor bolts and conduit as shown in the Lighting Control Center detail. The box shall be built within 30 meters of the camera as directed by the Engineer.

The power for the PTZ Cameras will come from the power supply junction boxes located on or near the sign structures. At camera location 2, a power supply conduit shall be provided through the pier 15E to the sign structure as shown on 2-L213 of the Lighting Sheets.

If a power source requires a transformer for the PTZ camera to operate properly, it shall be supplied and installed as part of this pay item.

For questions about the systems materials or installation procedures, please contact Rod Cummings of the Nebraska Department of Roads at (402) 471-1743

### **H. Method of Measurement and Basis of Payment**

The item "Surveillance Camera System" shall be measured and paid by the each. The price shall be full compensation for supplying the materials:

The PTZ Camera.

The wireless antenna.

The "Power block", if necessary.

The power transformer, if necessary.

The video server.

The electrical box .

The wiring between the Camera, the wireless antenna and the video server.

And shall be full compensation for installing the system. The item "Surveillance Camera System" shall also be full compensation for all the hardware tools equipment and the labor to provide the specified video output to the Nebraska Department of Roads' field office at 11204 Davenport, Suite 200.

## **31 mm/32 mm CONDUIT**

Section 405 in the Standard Specifications is amended to include the following:

The 32 mm conduit, shown in the plans, will be paid for as "31 mm Conduit \_\_\_\_". The Contractor may, at his option, substitute 38 mm conduit for all of the 31 mm conduit on this project at no additional cost to the Department.

**PREFORMED PAVEMENT MARKING TAPE, TYPE 4  
IN GROOVED PAVEMENT  
(S4-6-0801)**

Paragraph 6. a. of Subsection 424.03 in the Supplemental Specifications is void and superseded by the following:

a. The permanent preformed pavement marking, Type 4 dashed lines on this project, shall be applied to the pavement in Contractor installed grooves.

**TEMPORARY TRAFFIC CONTROL DEVICES  
(S4-9-0104)**

Subsection 422.01 in the Standard Specifications and Supplemental Specifications is amended to include the following:

Temporary signs shall not be in place longer than 3 days. Any sign that is to be in place longer than 3 days shall be post mounted.

All stub steel posts used for temporary traffic control devices shall be removed immediately by the Contractor when a sign is no longer required at that location.

Paragraphs 2.a. of Subsection 422.05 in the Standard Specifications is void and superseded by the following:

2.a. If signs are not returned or are returned damaged, and the damage is beyond reasonable "wear and tear" and the damage was caused by the Contractor, then the Contractor shall be charged the value of the missing or damaged items. These charges shall be deducted from monies due the Contractor upon final payment.

**TYPE B HIGH INTENSITY WARNING LIGHTS  
(S4-9-1002)**

All references in the plans to Type B High Intensity Warning Lights shall be considered void. The plans will not be revised to reflect this change.

**CONTRACTOR FURNISHED SIGNS  
(S4-11-0303)**

"Contractor Furnished Sign Day" shall consist of approved retroreflective fluorescent orange or white signs mounted on NCHRP-350 approved traffic control devices, i.e. Type III Barricades or Plastic Drums. The Contractor furnished sign, mounted on a traffic control device, shall together be NCHRP-350 Test Level 3 approved. The signs shall be of the size and shape required by the plans. The color and design of the signs shall be as required by the MUTCD and the NDR Traffic Engineering Division. Sign legends and symbols shall be of professional quality workmanship and in uniformity with the Standard Highway Signs design guide. Contractor furnished Signs shall meet the requirements of the American Traffic Safety Services Association (ATSSA), "Quality Standard for Work Zone Traffic Control Devices", hand printing or poor workmanship shall not be allowed.

Rigid sign substrates that have been approved to NCHRP 350 (TL-3) mounted on a traffic control device may be used.

Retroreflective orange fluorescent sheeting used for Contractor Furnished Signs shall be 3M diamond grade, Avery Dennison 6500 sheeting or other approved equal material.

Subsection 422.03 is amended by adding Paragraph 1.h.

Contractor Furnished Signs shall be installed as shown in the plans, or as directed by the Engineer. Contractor Furnished Signs shall be installed as prescribed in the MUTCD.

Paragraph 1.a. of Subsection 422.04 is void and superseded by the following:

- 1.a. Sign days of permanent, temporary and Contractor furnished signs installed in accordance with the plans, or as directed by the Engineer, will be measured and paid for by the each.

Paragraph 1. of Subsection 422.05 is amended to include the following:

<b>Pay Item</b>	<b>Pay Unit</b>
Contractor Furnished Sign Day	Each (ea)

### **TEMPORARY PAVEMENT MARKING**

Paragraph 6. of Subsection 422.03 in the Standard Specifications and Supplemental Specifications is amended to include the following:

This work shall consist of installing and removing reflectorized temporary pavement lines of the color, width, and line configuration shown in the plans or as designated by the Engineer.

Temporary paint markings will be used on this project. The use of Type I tape will not be permitted and Type II tape may be used for short durations only, as directed by the Engineer. Temporary paint stripes shall be a minimum 100 mm wide, 3 m long with a 9 m gap or a minimum 100 mm wide solid line as shown on the plans.

Raised pavement markers and plowable pavement markers shall be used to supplement the temporary paint markings on projects requiring lane shifts. They shall consist of single markers spaced 24 m apart, and the spacing shall be reduced to 12 m through transition curves and on solid white lane lines. Yellow edge lines shall be supplemented at a spacing no greater than 6 m. They shall not be placed on top of any dashed painted temporary pavement marking. Raised pavement markers may be used on new or existing concrete pavement and temporary asphaltic concrete pavement. Plowable pavement markers shall be used in lieu of raised pavement markers only on those projects where lane shifts are required to carry over through the winter months and into the following construction season. Plowable pavement markers are to be used only on existing concrete pavement that is to be removed or temporary asphaltic concrete pavement.

Temporary pavement marking which is no longer applicable shall be removed as directed by the Engineer.

Section 1069 in the Standard Specifications is amended to include the following:

1. Prior to the initial placement of the markings, temporary paint, Type II tape or raised pavement markers, the pavement upon which the markings are to be placed shall be dry, cleaned and properly prepared by shot blasting, as a minimum, and to the extent recommended by the manufacturer so that all contaminants, loose debris, and other foreign material are completely removed. Surface preparation for any subsequent application shall consist of air blasting and brushing the roadway surface to remove all loose dirt, mud or other debris and to dry the surface. Each additional application of paint shall be applied over the previously painted stripes.

Prior to placing the temporary pavement markings on the prepared surface, the Contractor shall layout, spot or string line the proposed temporary marking location. The temporary markings shall be aligned in such a way as to provide a smooth and gradual transition to and from the existing markings, and throughout both straight and horizontally curved sections of the project.

2. The material used for temporary paint marking shall be a commercially available alkyd resin Type II traffic paint that dries to no pickup in 4 minutes and shall be applied with a minimum of 0.7 kg of glass beads per liter. The beads shall have a minimum width of 100  $\mu$ m and a wet thickness of approximately 380  $\mu$ m {approximately 39 liters of paint per kilometer of solid line}. The equipment used to paint the line shall be a machine designed for the purpose of applying long line traffic lane markings of the type, width and thickness required, and shall be self-propelled or truck mounted and be equipped with an adjustable guide-on to assure proper placement of the line. Hand application, walk behind equipment or towing of the equipment will not be allowed.

Temporary paint lines shall be used on new or existing concrete pavement and asphaltic concrete pavement.

Any temporary painted line or segment of line, placed before December 1, which fails to adhere to the roadway surface for a minimum of 30 days under normal vehicular traffic or which appears wavy, nonuniform, thin, poorly applied, misaligned, beadless or nonreflective, shall be replaced as directed by the Engineer. For temporary painted pavement markings placed between December 1 and March 15, the minimum time requirement shall be 15 days with the same conditions applicable. No direct payment will be made for replacement within the 15 day or 30 day warranty periods.

After the minimum 15 day or 30 day warranty periods, the Contractor may be required to repaint the temporary traffic markings, as directed by the Engineer. Direct payment will be made for each additional application. However, should the additional application fail within the 15 day or 30 day warranty periods, the provisions as stated in the previous paragraph shall apply.

The Contractor must begin each additional repainting application within 72 hours after notification by the Engineer. Should the Contractor fail to begin repainting within this 72 hour period, the Engineer may use State forces or hire a private contractor to repaint the temporary traffic markings. The Contractor will be assessed any costs above the contract unit price "Temporary Pavement Marking, Type Paint" incurred by the State as a result of performing the corrective action by others, and the project will be shut down until the painting is completed.

When painting is required with air temperatures between 3° C and 10° C, the paint shall be heated according to the manufacturer's recommendation prior to application on the dry, clean and properly prepared pavement. Any paint application made when the air temperature is below 3° C will be paid for by the State, even if the application falls within either the 15 day or 30 day warranty periods previously described.

3. Temporary pavement marking tape Type II shall be a mixture of high quality polymeric materials and pigments, with glass beads throughout the pigmented portion of the film, and a reflective layer of high index of refraction glass beads bonded to the top surface. The film shall be precoated with a pressure-sensitive adhesive. Unless otherwise specified, the temporary pavement marking shall be 100 mm wide and the reflectorizing glass beads shall be incorporated to facilitate removal of the tape easily from asphalt and Portland cement concrete surfaces intact or in large pieces, at temperatures above 4° C, either manually or with a recommended roll up device. Removal shall be accomplished without the use of heat, solvents, grinding, or sandblasting.
4. Raised pavement markers shall consist of a plastic shell with one or more prismatic reflective faces with a minimum of 2.45 square centimeters of reflective surface for each direction required to reflect incident light. The raised pavement marker shall be fastened to the surface with an approved adhesive system. Raised pavement markers, which have not been previously approved by the Department of Roads, will not be permitted on the project until approved by the Engineer.
5. The use of paint, as provided above, shall be paid at the contract unit price per meter for the item "Temporary Pavement Marking, Type Paint".
6. Temporary pavement marking tape Type II shall be paid at the contract unit price per meter for the item "Temporary Pavement Marking, Type II".
7. Raised pavement markers shall be paid at the contract unit price per each for the item "Temporary Raised Pavement Markers".
8. Plowable pavement markers shall conform to Section 419.
9. The removal of temporary paint pavement marking, as directed by the Engineer, shall be paid at the contract unit price per linear meter for the item "Pavement Marking Removal".
10. Initial surface preparation requiring shot blasting shall be paid at the contract unit price per linear meter for the item "Temporary Pavement Marking, Surface Preparation". Surface preparation for repainting, consisting of air blasting and brushing, shall be subsidiary to other items for which payment is made.

### **TEMPORARY TRAFFIC CONTROL DEVICES**

The last sentence of paragraph 2.b.(i) of Subsection 422.04 in the Supplemental Specifications is void.

Paragraphs 3.b. and 3.c. of Subsection 422.05 are void and superseded by the following:

- b. Vertical Panels shall be paid for at ½ the contract unit price bid for the item "Barricade, Type II".
- c. "42 inch (1070 mm) Reflectorized Cones", "Reflectorized Drums", and "Barricades, Type II" shall be paid for at the contract unit price bid for the item, "Barricade, Type II".

## **CHANGEABLE MESSAGE SIGNS**

Section 402 of the Standard Specifications is amended to include:

Subsection 402.03, Paragraph 17 of the Standard Specifications is void and superceded by the following:

Changeable message signs will be provided and delivered to the project by the State. The Contractor shall install, operate, and maintain changeable message signs as prescribed in the plans and as directed by the Engineer. The plans do not indicate all of the sign locations and messages that may be required. When their removal is approved by the Engineer, the Contractor shall salvage the changeable message signs to the State as directed by the Engineer.

## **CONCRETE PROTECTION BARRIER**

The Standard Specifications and the Supplemental specifications are amended to include the following:

1. Concrete protection barriers shall be constructed new as shown in the Special Plan "Concrete Protection Barriers" and furnished, installed and maintained by the Contractor at the locations shown in the plans.
2. The furnished barriers shall become the property of the State upon delivery to the project.
3. The barriers shown in the plans at Sta. 67+15 to Sta. 67+87 Rt. ±, Sta. 86+07 to Sta. 86+45 Rt. ±, and Sta. 85+72 to Sta. 93+00 Lt. & Rt. ± were built and left in place by others and shall be relocated and/or removed by the Contractor at the appropriate time during construction. The work of removing these barriers shall be considered subsidiary to the items for which direct payment is made.
4. Approximately 400 (3.81 m) barriers are available at the NDOR maintenance yard in Papillion.
5. As they become available, approximately 600 barriers (3.81 m) are to be relocated along the project from the I-680 / West Dodge Road interchange work. Approximately 50 percent of the 600 barriers will be stored in Old Mill, Sta. 89+00 to 89+50 Rt. The

remaining barriers will be stored in the southeast quadrant of the 132<sup>nd</sup> Street interchange.

All Concrete Protection Barriers shall be returned to the State Maintenance Yard in Papillion at the conclusion of the project.

## **TRAFFIC SIGNALIZATION WORKS**

### **6 PR COMMUNICATION CABLE**

The Contractor shall request and receive the permission of the City Construction Inspector before any part of the 6PR Communication Cable is to be disconnected (made non-operational) during any work activities at a traffic signal. If permission is granted, the maximum duration of disconnection and any provision for a temporary connection (if necessary) must be provided by the City Construction Inspector.

The only exception will be spelled out in the plans and the contractor will be directed to remove the 6PR to eliminate damage to the wire. Any costs associated with either of the above including the replacement of the original 6PR because of damages (splices/torn casing) caused to it, shall be considered incidental to the cost of the project.

### **TRAFFIC SIGNAL CONTROLLER, TYPE 170**

The following specification identifies the 170E Controller, controller cabinet, system memory module and other related equipment. Equipment documentation shall be provided as specified in the latest version of the Traffic Signal Equipment Specifications published by the State of California Business, Transportation and Housing Agency (Caltrans).

The Controller provided shall be a Type 170E Controller dual ACIA. The controller shall be provided with internal modem slots. The 170 Controller shall meet the Type 170 Traffic Signal Controller Systems - Hardware Specifications, FHWA-1P-78-16 and the latest revision of the California State Specification. The controller shall be provided with a system memory module, model 412B with blank EPROM'S.

The controller at each signal location shall be supplied with all the equipment required for the operation as shown in the plans, to include, but not be limited to:

#### ***120<sup>th</sup> Street & West Dodge Road***

- 1 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 12 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 332 with Dual 170 controller rack
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 6 - 2 Channel Loop Detector Amplifier, Model 222
  - 1 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Networkable Video Vehicle Detection Equipment with modem (See Networkable Video Vehicle Detection)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

***North Bridge Road & West Dodge Road (Permanent Signal)***

- 1 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 12 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 332 with Dual 170 controller rack
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 6 - 2 Channel Loop Detector Amplifier, Model 222
  - 1 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Networkable Video Vehicle Detection Equipment with modem (See Networkable Video Vehicle Detection)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

***South Bridge Road & West Dodge Road (Permanent Signal)***

- 1 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 12 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 332 with Dual 170 controller rack
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 1 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Networkable Video Vehicle Detection Equipment with modem (See Networkable Video Vehicle Detection)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

***114<sup>th</sup> Street & West Dodge Road (Temporary and Permanent Signals)***

- 2 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 12 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 332 with Dual 170 controller rack
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 1 - System Memory Module (set-up for master controller, with appropriate memory chips)
  - 2 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - 1 - Modem, GDI Model SM2400
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Networkable Video Vehicle Detection Equipment with modem (See Networkable Video Vehicle Detection)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

While this controller operates the temporary signal, some of the equipment may not be in use.

***120<sup>th</sup> Street & Webster Street (Temporary and Permanent Signals)***

- 2 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 12 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 332 with Dual 170 controller rack
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 1 - System Memory Module (set-up for master controller, with appropriate memory chips)
  - 2 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - 2 - Modem, GDI Model SM2400
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Networkable Video Vehicle Detection Equipment with modem (See Networkable Video Vehicle Detection)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

While this controller operates the temporary signal, some of the equipment may not be in use.

***120<sup>th</sup> Street & Davenport Street***

- 1 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 4 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 336
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 1 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Modular Video Detection System (See Modular (single camera), Detector Rack Mounted Video Detection System)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

***South Bridge Road & West Dodge Road (Temporary Signal)***

- 1 - Controller Unit, Model 170E
  - 1 - Monitor Unit, Model 210
  - 4 - Switch Pack, Model 200
  - 2 - Flasher Unit, Model 204
  - 1 - Cabinet, Model 336
  - 1 - System Memory Module (as City requires with appropriate memory chips)
  - 1 - Modem, GDI Model 404 (2400 Baud)
  - 3 - DC Isolators, Model 242
  - \* - Emergency Vehicle Preemption Equipment (See Emergency Vehicle Preemption)
  - \*\* - Modular Video Detection System (See Modular (single camera), Detector Rack Mounted Video Detection System)
- Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

***Relocated South Bridge Road & West Dodge Road***

- 1 - Controller Unit, Model 170E
- 1 - Monitor Unit, Model 210
- 4 - Switch Pack, Model 200
- 2 - Flasher Unit, Model 204
- 1 - Cabinet, Model 336
- 1 - System Memory Module (as City requires with appropriate memory chips)
- 1 - Modem, GDI Model 404 (2400 Baud)
- 3 - DC Isolators, Model 242
- \*\* - Modular Video Detection System (See Modular (single camera), Detector Rack Mounted Video Detection System  
Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided.

***Relocated South Bridge Road & Existing South Bridge Road***

- 1 - Controller Unit, Model 170E
- 1 - Monitor Unit, Model 210
- 4 - Switch Pack, Model 200
- 2 - Flasher Unit, Model 204
- 1 - Cabinet, Model 336
- 1 - System Memory Module (as City requires with appropriate memory chips)
- 1 - Modem, GDI Model 404 (2400 Baud)
- 3 - DC Isolators, Model 242
- \*\* - Modular Video Detection System (See Modular (single camera), Detector Rack Mounted Video Detection System  
Flash transfer relays necessary for full operation. Flash transfer plugs installed to produce all red flash, 4 yellow plugs shall also be provided

**VEHICLE SIGNALS**

Vehicle signals shall be equipped with backplates if shown in the plans. The backplates shall be one piece plastic-vacuumed formed, fabricated from black ABS plastic with a material thickness of at least 0.125" (3 mm) and a flange wall on all sides with a minimum thickness of 5/8" (16 mm) for stiffness.

Signal head housings shall be of the **black polycarbonate** type. The yellow housing signal head will not be approved/accepted.

All vehicle signal red, yellow, and green indications on permanent signals shall be of the **LED** type. Currently, Dialight Corporation supplies the only acceptable LED. LED supplied by others may be accepted only after the item has been tested and approved.

All vehicle signal red, yellow and green indications on temporary signals shall be of the incandescent lamp type.

**SALVAGEABLE TRAFFIC SIGNAL EQUIPMENT**

The contractor shall haul salvaged traffic signal equipment to the City Traffic Maintenance Facility at 50th and "G" Street. The contractor shall make an appointment with Joe Sobczyk at 444-5163 before delivering these items. The contractor shall deliver these items during normal business hours and supply the men and equipment to unload the items.

The following existing signal items shall be returned to the City of Omaha (Note that the dimensions are in English units):

- 2 ea. Traffic signal controller/cabinet, Type 170/332 Master
- 1 ea. Traffic signal controller/cabinet, Type 170/332
- 3 ea. Traffic Signal Mast-Arm Pole, Type MP-50
- 1 ea. Traffic Signal Mast-Arm Pole, Type MP-45
- 2 ea. Traffic Signal Mast-Arm Pole, Type MP-30-30
- 3 ea. Traffic Signal Mast-Arm Pole, Type MP-30
- 1 ea. Traffic Signal Mast-Arm Pole, Type MP-25
- 1 ea. Traffic Signal Mast-Arm Pole, Type MP-20
- 2 ea. Combination Mast Arm Signal and Street Lighting Pole, Type CMP 45-12-40
- 1 ea. Combination Mast Arm Signal and Street Lighting Pole, Type CMP 55-12-40
- 2 ea. Pedestal Pole, Type PP-10
- All 12" (300 mm) Signal Heads (Plastic Only)
- All 12" Pedestrian Signal Heads [PSI (man/hand) only]
- All Signal Head Mounting Hardware (Overhead & Sidemount)  
B-4 (alternate), MA-5, MA-5-1, and SW-1 (span wire) mountings only.
- All Overhead Mounted Signs

The following temporary signal items shall be returned to the City of Omaha:

- 4 ea. Traffic signal controller/cabinet, Type 170/336
- 14 ea. 12.2 m Class IV Wood Pole with 3.7 m Luminaire Arm
- 6 ea. 12.2 m Class IV Wood Pole
- All 12" (300 mm) Signal Heads (Plastic Only)
- All 12" Pedestrian Signal Heads [PSI (man/hand) only]
- All Signal Head Mounting Hardware (Overhead & Sidemount)  
B-4 (alternate), MA-5, MA-5-1, and SW-1 (span wire) mountings only.
- All Overhead Mounted Signs

### **TRAFFIC SIGNAL SYSTEM CABLE**

Where new wire is used on a signal project splices will not be allowed in the wire. If a splice is to be made the contractor shall notify the City Inspector before the splice is made to determine if the wire can be installed without splicing.

### **GENERAL CABLE: TYPE 16/C, 12/C, 7/C, 5/C**

The traffic signal cable shall be No. 14 AWG solid wire traffic signal cable with the number of conductors as shown in the plans.

The cables shall comply in all respects with the International Municipal Signal Association (IMSA) specification as follows:

- 20-1 General Use
- 20-3 Aerial Cable
- 20-5 Direct Burial Cable

### **GROUNDING CONDUCTOR: TYPE GC**

The grounding conductor shall be No. 8 AWG, type THHN-THWN stranded copper. Splices to the grounding conductor shall be irreversible connections.

### **PUSH BUTTON CABLE: TYPE PC**

The push button lead-in cable shall be No. 16 AWG traffic signal cable with 2 conductors, which meets IMSA Specification 20-1. The cable shall be measured and paid for per meter for the item "2/C #16 AWG Pedestrian Pushbutton Lead-In Cable".

### **HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT**

HDPE shall only be installed into type PB-6 pull boxes and pad mounted controller cabinets. PVC shall be installed into all other pull box types, signal poles, street light poles, pedestal poles and service disconnect pedestals. HDPE conduit shall only be used for boring installations. When installing HDPE conduit into a type PB-6 pull box or controller pad, the minimum depth of the conduit shall vary from 30" (760 mm) at a 3 foot (0.9 m) distance from the edge of the pull box or controller pad to 18" (457 mm) at the edge of the pull box or controller pad.

### **COMMUNICATION LINE**

Splices shall not be made between controllers. Where this is not possible, the location of the splice shall be given to the city inspector along with the reason for the splice.

All 3-way splices shall be inspected by a City of Omaha inspector before splices are sealed.

The communication line (6 pair) is to be installed from inside of controller to inside of controller. If the controller is not installed prior to 6 pair installation enough 6 pair shall be left on the controller pole to allow for the connection into the controller without splicing. The connection into the controller shall be made through the C2 connector on the controller. The cable coming from the controller to the EDCO PCB1B connector must be 2 pair, 22-gauge wire. The wire must be communication cable that meets the 1987 requirements of N.E.C. The four wires must be color coded, the red wire to pin A, the black or blue wire to pin B, the green wire to pin C and the white wire to pin E. The cable shall be soldered to the male pin amp. connectors. All necessary amp. hardware shall be provided by the contractor to make a solid connection to the C2 connector on the back of the controller. The city will provide an example of this cable upon request of the contractor. The cable connection and its assembly is considered incidental to other pay items.

### **EXISTING WIRING**

The existing wire, which becomes unnecessary as a result of this project shall be removed from all conduit affected by this project. This will be considered incidental to other pay items.

### **SERVICE DISCONNECT PEDESTAL – FOR PERMANENT SIGNALS**

If the location of the service disconnect pedestal is not indicated on the plans, it shall be field located within 50' to 100' (15 m to 30 m) of the traffic signal controller cabinet in line between the controller cabinet and power source. In order to arrange to have a representative from the City of Omaha come out to field locate the service disconnect pedestal, the contractor shall contact the Construction Inspector (City of Omaha) at 444-5148 with two weeks notice prior to installing the service disconnect pedestal. The service disconnect pedestal shall be installed and connected to the power source as soon as possible after construction of the signal begins.

Note: This is a 100 AMP Service Rated Pedestal. Service conductors must be sized appropriately per section 230 of the National Electrical Code.

The item "Service Disconnect Pedestal" will be measured and paid for on a per each basis.

### **TRAFFIC SIGNAL OPERATION**

The existing traffic signals shall remain in operation during this project unless temporary signals are turned on. Any signal downtime shall not occur during peak hours. The peak hours are Monday - Friday, 5:00 A.M to 9:00 A.M and 3:00 P.M to 7:00 P.M. Signal down time shall not occur on the weekends (Saturday & Sunday) between 9:00 A.M to 4:00 P.M..

### **TRAFFIC SIGNS**

All permanent signing (except the Fiber Optic Signs and 18" street name signs) shown on the plans shall be provided by the City of Omaha for the contractor to install. These signs shall be picked up by the contractor at the Traffic Maintenance Facility, 4303 South 50th Street. Two weeks notice shall be given the City Construction Inspector in order to coordinate the pick-up of these signs at the Traffic Maintenance Facility. The Contractor shall supply all the hardware necessary to mount and install the Traffic Signs.

Any sign mounted to the mast-arm shall be done so by using an Astro-Bracket and 3/4 inch (19 mm) banding, this is part of the hardware that is necessary to mount and install Traffic Signs.

The installation of ground-mounted signs will be measured and paid for per each for the item "Install Traffic Sign and Post". The installation of overhead signs will be measured and paid for per each for the item "Install Overhead Sign".

### **GROUND MOUNTED SIGN**

The following are the signs provided by the City of Omaha:

9	ea.*	No U Turn	R3-4-1	607 mm X 607 mm
8	ea.	Right Must	R3-7-2	762 mm X 762 mm
2	ea *	Keep Right	R4-7-1	607 mm X 762 mm

The following is not provided by the City of Omaha:

19	ea.	9' U Post, 2.5 lbs/ft (2.7 m U Post, 3.1 lbs/ft)	Galvanized
19	ea.	5' U Post, 2.5 lbs/ft (1.5 m U Post, 3.1 lbs/ft)	Galvanized
11 *	ea.	V LOC Socket System 19-VR3U with 12" (300 mm) Channel Post Adaptor 19-UCA-2 or Pre-Approved Equal.	

The \* sign shall be installed with a break-away type anchor (\*).

### **OVERHEAD MOUNTED SIGNS – PERMANENT SIGNALS**

The following are the signs provided by the City of Omaha:

9	ea.	Right Only	R3-5-2	762 mm X 914 mm
5	ea.	No Turn On Red	R10-11-1	610 mm X 762 mm
7	ea.	DBL Left	R3-8-5	914 mm X 914 mm
1	ea.	LT, RT Opt	R3-8-7	914 mm X 914 mm
1	ea.	LT, ST Only	R3-8-9	914 mm X 914 mm

The following is not provided by the City of Omaha:

4	ea.	457 mm Street Name Sign, 120 <sup>th</sup> St
2	ea.	457 mm Street Name Sign, 114 <sup>th</sup> St
4	ea.	457 mm Street Name Sign, W Dodge Rd 500 N
2	ea.	457 mm Street Name Sign, Webster St 700 N
35	ea.	Astro- Bracket and 3/4 inch (19 mm) banding

### **OVERHEAD MOUNTED SIGNS – TEMPORARY SIGNALS**

The following are the signs provided by the City of Omaha:

2*	ea.	Right Only	R3-5-2	762 mm X 914 mm
2*	ea.	NO LEFT TURN	R3-2-1	914 mm X 914 mm
10*	ea.	Left Only	R3-5-1	762 mm X 914 mm
11*	ea.	No Turn On Red	R10-11-1	610 mm X 762 mm
1*	ea.	DO NOT ENTER	R5-1-1	914 mm X 914 mm
1*	ea.	LT, LT/RT OPT	R3-8-Spec	914 mm X 1067 mm

The following is not provided by the City of Omaha:

2**	ea.	457 mm Street Name Sign, 114 <sup>th</sup> Street
2**	ea.	457 mm Street Name Sign, W Dodge Rd
4**	ea.	457 mm Street Name Sign, 120 <sup>th</sup> Street
2**	ea.	457 mm Street Name Sign, Davenport St
2**	ea.	457 mm Street Name Sign, Webster St
54	ea.	19" Vertical Extender #SE-0507
54	ea.	3/8" (9 mm) Crosby Clips
27	ea.	Span Wire Sign Hanger #SE-5115
24	ea.	3" (75 mm) Horizontal Zee Bracket Stringer
24	ea.	Sign Bracket #006A with 3/4 inch (19 mm) banding

The \* indicates which sign shall be installed with 2 - 19" (480 mm) or longer Vertical Extender, 2 - 3/8" (9 mm) Crosby Clips, and 1 – Span Wire Sign Hanger.

The \*\* indicates which sign shall be installed with 2 – 3" (75 mm) Horizontal Zee Bracket Stringer and 2 – Sign Bracket with 3/4 inch (19 mm) banding. The Zee Bracket shall extend a maximum of 12 inches (300 mm) from both the right and left edges of the sign.

### **460 mm STREET NAME SIGNS**

All 460 mm street name signs shall be made in accordance with Standard Plate no. 825. Currently, only the following two companies are approved by the City to provide 460 mm street name signs:

Midwest Sales and Service  
P.O. Box 533  
Schuyler, Nebraska 68661  
Contact: Cindy Yosten  
1-800-642-8302

Newman Signs  
P.O. Box 1728  
Jamestown, North Dakota 58402  
Contact: Nan Elston  
1-800-437-9770 ext. 142

The contractor shall be responsible for selecting one of the two approved companies to supply the street name signs specified on the plans. The selected company must obtain pre-approval of the project street name signs. Shop drawings and material specifications must be submitted

to the City of Omaha for approval. The shop drawings shall include a 'to-scale' paper mock-up of all required street name signs, the specification of the sign sheeting, the type/brand of ink, and the sign blank specifications. Each shop drawing shall be on an 8 ½" X 11" (215 mm x 280 mm) sheet of paper.

The street name signs will be measured and paid for per each for the item "Street Name Sign". This price shall be considered full compensation for all work required to furnish and install the signs.

### **ORDERING TRAFFIC SIGNAL EQUIPMENT**

The equipment required to complete the project shall be ordered within 10 (ten) business days after the bid award date. If some materials are already in stock, the contractor needs to identify those materials that he already has in stock.

### **TRAFFIC SIGNAL BASES**

The contractor shall provide designs for all concrete bases where mast arms are longer than 61 feet (18.5m). The cost for the design shall be considered as part of the cost of the mast arm pole. This design would then be used as a substitute for Standard Plate 6-22. The use of the ground rod and the number of conduits as indicated on Standard Plate 6-22 shall remain the same.

Any cost associated with installing wire/conduit into an existing signal base/foundation/pad is considered incidental to the other pay items. When installing a conduit bend in an existing base the conduit size shall be equivalent to the conduit in the ground. The steel in the base shall not be cut or damaged and the concrete shall be broken away in the shape of a "U" with an approximate depth of at least 12" (300 mm) or 6"(150 mm) below the depth of the surrounding ground surface, whichever is greater. Enough concrete shall be removed so the conduit will be inside the anchor bolts of the foundation. The conduit shall be placed in the "U" with concrete added in the "U" and finished to match the base.

The contractor shall supply three (3) spare conduit bends in all concrete bases for Mast Arm Poles and Combination Mast Arm Poles, with or without a controller. The contractor shall supply two (2) spare conduit bends in all concrete bases for Street Light Poles. The contractor shall also provide and install conductors in the CMP/Street Light Pole shaft and in the Luminaire Arm and hook up the Luminaire Head (Luminaire Head provided by O.P.P.D.). The contractor shall also connect the conductors in the pole shaft to the 3/C street lighting cable as shown on the plans. O.P.P.D will connect the conductors from the power source to the conductors in the pole that carries the traffic controller. The cost of that described above shall be considered incidental to the cost of the Combination Mast Arm Pole, Street Light Pole or the cost of the Mast Arm Pole.

### **FIBER OPTIC SIGNS**

These signs and all the necessary mounting hardware (Astro Brackets) shall be supplied by the contractor. The fiber optic signs shall be measured and paid for per each for the item "Fiber Optic Sign". This price shall be considered full compensation to furnish and install the fiber optic signs.

### **MODEMS - MODEL 400, 404 AND AUTO DIAL**

The Model 400 and Model 404 modems shall be compatible with the Type 170 Traffic Control System and shall meet all requirements of the latest version of the Traffic Signal Equipment Specifications published by the State of California Business, Transportation and Housing Agency (Caltrans). Where a black box 400 type modem is requested GDI Model 400SA or 404SA is acceptable, specification sheets on other black box type modems shall be submitted to the engineer for prior approval. The modem shall have an operating temperature range between 130 degrees F (54°C) and -20 degrees F (-29°C).

The auto dial modem shall be functionally equivalent to the Hayes 2400 Modem. GDI Model SM2400 is acceptable, specification sheets on other auto dial modems shall be submitted to the engineer for prior approval. The auto dial modem shall be able to reset itself if hung up or disconnected by anything other than a command from a PC. The modem must have an operating temperature range between 130 degrees F (54°C) and -20 degrees F (-29°C).

The auto dial modem must be programmed to operate at 2400 baud and will auto select to 1200 baud when operating at the slower speed.

### **EMERGENCY VEHICLE PRE-EMPTION - OPTICOM**

This is a system that employs optical communication to identify the presence of designated priority vehicles and cause the traffic signal controller to advance to and/or hold a desired traffic signal display.

The bid item will be per each based on the location and the equipment listed below for that location.

The Opticom system shall be supplied with all of the equipment required for the operation as shown on the plans, to include, but not be limited to:

#### ***120<sup>th</sup> Street & West Dodge Road***

- 2 - Phase Selector (Auxiliary Detector/Green Sense Harness Model 762)
- 2 - Optical Detector, Two Channel, Two Direction, Model 722
- 2 - Unspliced Length of Detector Cable, Model 138

#### ***120<sup>th</sup> Street & Webster Street (Temporary and Permanent Signals)***

- 2 - Phase Selector (Auxiliary Detector/Green Sense Harness Model 762)
- 2 - Optical Detector, Two Channel, Two Direction, Model 722
- 2 - Unspliced Length of Detector Cable, Model 138

#### ***114<sup>th</sup> Street & West Dodge Road (Temporary and Permanent Signals)***

- 2 - Phase Selector (Auxiliary Detector/Green Sense Harness Model 762)
- 2 - Optical Detector, Two Channel, Two Direction, Model 722
- 2 - Unspliced Length of Detector Cable, Model 138

#### ***South Bridge Road & West Dodge Road (Temporary and Permanent Signal)***

- 1 - Phase Selector (Auxiliary Detector/Green Sense Harness Model 762)
- 2 - Optical Detector, One Channel, One Direction, Model 711
- 2 - Unspliced Length of Detector Cable, Model 138

***North Bridge Road & West Dodge Road (Permanent Signal)***

- 1 - Phase Selector (Auxiliary Detector/Green Sense Harness Model 762)
- 2 - Optical Detector, One Channel, One Direction, Model 711
- 2 - Unspliced Length of Detector Cable, Model 138

***120<sup>th</sup> Street & Davenport Street (Temp.)***

- 2 - Phase Selector (Auxiliary Detector/Green Sense Harness Model 762)
- 2 - Optical Detector, Two Channel, Two Direction, Model 722
- 2 - Unspliced Length of Detector Cable, Model 138

**PEDESTAL POLES**

Pedestal poles supplied with a project shall have a height equal to that indicated on the plans, the pedestal pole base supplied shall add to that height. An example of this would be a PP-3.0, the pole shaft above the base shall be 3 m, the actual pedestal pole base (450 mm) shall increase that height to over 3.3 m.

**CONSTRUCTION SPECIFICATIONS**

The State of Nebraska, Standard Specifications for Highway Construction, 1997 Metric Edition, shall apply to all signal construction work completed as part of this project, except for information that is contained in this Special Provision and the Special Provision entitled "Reference Plates and Specifications for Traffic Signals".

**ADDITIONAL CONSTRUCTION REQUIREMENT**

A licensed electrician or lineman must perform all splicing and cabinet wiring or must be on site directly supervising wire splicing, signal head wiring and cabinet wiring.

**REQUIREMENTS AT SIGNAL TURN-ON**

The following must be completed before contacting the City of Omaha about turning on a traffic signal. This is true for new and rebuilt signals or for modifications made to signals which require the signal to be turned off for any length of time.

- 1.0 Two hours will be allowed for the "turn on".
- 2.0 Before the scheduled "turn on" time:
  - A. Do not grout the t-bases.
  - B. Do not install the nut covers.
  - C. Before the arrival of the inspector the following must be complete:
    - 1. All signs shall be installed.
    - 2. All signal heads shall be installed, wired and bulbs inserted.
    - 3. All transformer bases shall be wired.
    - 4. All pushbuttons shall be installed and wired.
    - 5. All detectors shall be installed and wired. This includes loops, video detection and microwave detection, etc.
    - 6. All fiber optic signs shall be installed and wired.
    - 7. All Opticom heads shall be installed and wired in the heads.
    - 8. All Opticom cables shall be in the cabinet, but not hooked up. The cables must be labeled to identify which head is attached to which cable.
    - 9. All 6-pair communications cables shall be in the cabinet, not hooked up and the direction labeled.
    - 10. The phone drop, if required, shall be in the cabinet.
    - 11. All other cables shall be hooked up in the cabinet.
    - 12. All cable destinations shall be marked with a permanent label.
    - 13. The cabinet C1 cable shall be connected to the controller C1 socket.

14. The controller power cord shall be plugged into the Isobar.
15. All pluggable modules and relays, except the modem, shall be installed in their proper slots.

- D. The following shall be present, on site, at the scheduled turn on time\*\*:
1. The cabinet keys
  2. The original termination plan
  3. The instruction package including the cabinet drawings
  4. The as-built drawings
  5. A licensed electrician and an assistant, one of whom shall be capable of troubleshooting, repairing, and correcting equipment and wiring problems
  6. All equipment, tools and materials required to troubleshoot, repair and correct any problems discovered.

\*\*There are exceptions to this! Please contact the inspector for information about the exceptions.

- E. If the contractor is missing parts and/or equipment called for in the intersection plans, the inspector will terminate the turn on and it will have to be rescheduled.
- F. The inspector will provide parts and/or equipment when they are needed to operate the intersection, and are in excess of what is called for in the plans.
- G. If there is a failure of any part or any equipment the inspector at his discretion may supply replacements, provided he has them.
- H. If the turn on is not successful, the inspector will troubleshoot to determine if there is a problem with the termination plan, the diode card and/or the program. If an error is found in one of these areas, the inspector will correct the problem. If an error is not found in one of these areas, a minimal amount of troubleshooting will be performed to aid the contractor. However, the two hour time limit will not be exceeded and the contractor will have to finish the troubleshooting and correct the problem on his own.
- I. When new signals are replacing old signals, the contractor shall not begin dismantling the old signals until the new signal has been successfully turned on.

Any exceptions to the above rules must be cleared with the Engineer 24 hours in advance.

### **TELEPHONE DROP**

An underground connection shall be made between the intersection controller cabinet and the telephone pedestal unless it is specified otherwise. Type REA specification PE-39, 22-AWG, 6 pair wire inside a 2" (50 mm) diameter PVC conduit shall be used from the telephone pedestal to the modem inside the traffic signal controller cabinet. A minimum of 5 feet (1.5 m) of wire must be left at each end to allow for final connection without splicing.

The contractor shall request Tom Glow or Troy Staroscik (City of Omaha Construction Division) to submit authorization to Barbara Anderson (City of Omaha MIS) for a phone drop. This request shall be made as soon as possible after the project begins.

The work of the telephone drop installation shall be measured and will be paid for per each for the item "Telephone Drop".

### **NOTIFICATION CONCERNING START OF PROJECT**

The contractor shall notify Joe Sobczyk (City of Omaha) at 444-5163 and Robert Adams (O.P.P.D.) at 636-3333 before construction is to begin. The contractor shall also notify the City of Omaha, Sewer Maintenance Division at 444-5332 before drilling the bases for the mast arm poles, to insure all sewer lines are located before work begins.

### **TEMPORARY NETWORKABLE VIDEO VEHICLE DETECTION SYSTEM**

The pay item "Wide Area Video Vehicle Detection System at \_\_\_\_\_ (Temporary)" provides for the complete installation and removal of a networkable video vehicle detection system for a temporary span wire traffic signal at 114<sup>th</sup> Street & West Dodge Road and 120<sup>th</sup> Street & Webster Street. Any required work to move and re-program the detection cameras to accommodate construction phasing is included in this pay item. The material for this pay item is part of the separate pay item "Wide Area Video Vehicle Detection System at \_\_\_\_\_" for the permanent signals at these locations. The work required to relocate the Video Detection Systems from their temporary locations to their permanent locations shall be considered subsidiary to the bid item "Wide Area Video Vehicle Detection System at \_\_\_\_\_". The installation and operation of this equipment shall follow the section "Networkable Video Vehicle Detection System" in the Special Provisions.

### **TEMPORARY VEHICLE PRIORITY CONTROL SYSTEM (OPTICOM)**

The pay item "Emergency Vehicle Preemption System at \_\_\_\_\_ (Temporary)" provides for the complete installation and removal of a vehicle priority control system for a temporary span wire traffic signal at 114<sup>th</sup> Street & West Dodge Road, 120<sup>th</sup> Street & Webster Street, 120<sup>th</sup> Street and Davenport Street, and South Bridge Road & West Dodge Road. Any required work to move the opticom equipment to accommodate construction phasing is included in this pay item. The material for this pay item is part of the separate pay item "Emergency Vehicle Preemption System at \_\_\_\_\_" for the permanent signals at these locations. The work required to relocate the vehicle priority control systems from their temporary locations to their permanent locations shall be considered subsidiary to the bid item "Emergency Vehicle Preemption System at \_\_\_\_\_".

### **TEMPORARY TRAFFIC SIGNAL CONTROLLER/CABINET**

The pay item "Install Traffic Signal Controller, Type TC-170 (Temporary)" provides for the complete installation of the controller and all its necessary equipment for a temporary span wire traffic signal at 114<sup>th</sup> Street & West Dodge Road, and 120<sup>th</sup> Street & Webster Street. Any required work to remove and reinstall the controller equipment for its permanent use is included in this pay item. The material for this pay item is part of the separate pay item "Traffic Signal Controller, Type TC-170" for the permanent signals at these locations.

### **SIGNAL MODIFICATIONS FOR BRIDGE GIRDER PLACEMENT**

Modifications to the temporary signals at North Bridge Road & W Dodge Road, South Bridge Road & W Dodge Road, and 114<sup>th</sup> Street & W Dodge Road may be necessary to allow for the placement of the Expressway bridge girders. The contractor shall determine if a modification to the temporary signal is necessary to allow the girders to be placed without interference. If modifications are needed, the temporary signal shall be back in full operation by the next morning after the nighttime placement of the bridge girders. If the contractor is able to place the bridge girders without modifications to the temporary signal they may do so with the assumption that any damage to the temporary signal as a result of the placement of the girder will be at the

expense of the contractor. Temporary signal modification shall be considered subsidiary to the temporary signals.

## **NETWORKABLE VIDEO VEHICLE DETECTION SYSTEM**

### 1.0 GENERAL

This specification sets forth the minimum requirements for a system that monitors vehicles on a roadway via processing of video images and provides detector inputs to the traffic controller (Type TC-170) and provides the ability to monitor traffic conditions and unit operation from any remote location via standard telephone lines and with a speed not less than 5 frames per second. **The bid is for the supply and installation of a complete functional system, as specified hereinafter, with the number of image sensors and related equipment as shown on the plans and supervisor software.**

### 1.1 SYSTEM HARDWARE

The system at each intersection shall consist of a certain number of MVP sensors (as shown on the plans), a detector port master, a communication interface panel, a video isolation amplifier (if necessary), all necessary video and power cables, supervisor cables, junction boxes, arm mast brackets, modem and cables, etc.

Each intersection video detection system will be connected to a master hub, which will include a phone drop (pay item is separate from the cost of the video detection system) and 56K modem.

The video detection systems at the following intersections will be connected to the master hub at 114<sup>th</sup> Street & West Dodge Road:

North Bridge Road & West Dodge Road  
South Bridge Road & West Dodge Road  
120<sup>th</sup> Street & West Dodge Road  
120<sup>th</sup> Street & Webster Street

### 2.0 MVP SENSOR (VIDEO VEHICLE DETECTION CAMERA)

All system components are ISO 9002 and CE certified.

#### A. The MVP sensor shall be:

- 1 An integrated imaging CCD array with optics, high-speed, color, image-processing hardware and a general-purpose CPU bundled into a sealed enclosure.
- 2 Equipped with a sunshield to reflect solar heat and to shield the CCD array from direct exposure to the sun.
- 3 Equipped with a faceplate heater to melt accumulated ice, snow or fog from the view of the camera.

B. The CCD array shall be directly controlled by the general-purpose CPU, thus providing high video quality for detection that has virtually no noise to degrade detection performance.

C. The optics and camera electronics shall be directly controlled for optimal illumination for traffic detection.

D. The lens shall be pre-focused at the factory, as required for operation.

E. It shall be possible for the user to focus the lens, as required for operation.

- F. The MVP sensor shall operate at a maximum rate of 30 frames per second when configured for the NTSC (US) color video standard and 25 frames per second for the PAL (Euro) color video standard.
- G. The MVP sensor shall process a minimum of twenty detector zones placed anywhere in the field of view of the sensor.
- H. The video output shall have the ability to selectively show overlaid graphics indicating the current real-time detection state of each individual detector defined in the video.
- I. The sensor output NTSC or PAL color video shall be viewed with any compatible video-display device.

## 2.1 MVP SENSOR DETECTOR TYPES

The MVP sensor shall be able to be programmed with a variety of detector types that perform specific functions. The general functions performed by the detectors shall include:

- A. Presence/passage detection of moving and stopped vehicles.
- B. Enable detection based on the direction of travel and/or exclusively for stopped vehicles.
- C. Measure speed.
- D. Generate a variety of alarms based on measured traffic conditions.
- E. Combine the output of several detectors with logical operators and optionally modify the cumulative state based on delay or extension timers and the state of any associated signal phase state.
- F. Each of the detector types shall optionally be made visible in the live video output of the sensor.

The allocation of these functional detection capabilities to programmable detector types is described below. Different detector types shall be selectable via software. Detector types shall include:

- A. Count detectors output traffic volume statistics. Generates traffic counts and occupancy.
- B. Presence detectors indicate presence of a vehicle, stopped vehicle, or vehicles traveling in the wrong direction.
- C. Speed detectors provide vehicle counts, speed, length and classification
- D. Detector Function combines outputs of multiple detectors via Boolean logic functions.
- E. Label displays information on the MVP video output and passes input information to other detectors.
- F. Detector Station collects and reports traffic data gathered over specified time intervals.
- G. Incident detectors monitor traffic parameters for conditions that suggest an incident has occurred, such as an accident or a stalled car that produce a sudden reduction in roadway capacity or throughput.
- H. Schedulers define plans that can be used by other detectors to specify different parameters for each time-of-day plan.

- I. Contrast Loss detectors monitor the quality of the video image that the MVP is processing.
- J. Speed Alarm generates alarm outputs based on user-defined algorithms using speed.

## 2.2 MVP SENSOR EXTERNAL INTERFACES

The external interfaces to the MVP sensor shall include:

- A. A detector port specifically to exchange detector state data with the Solo Mini Hub, Detector Rack Card, Mini-Hub II, or Mini-Hub TS2.
- B. Differential color video out.
- C. 24 VAC/DC power to operate the sensor.

### 2.2.1 SUPERVISOR COMMUNICATIONS PORT

- A. There shall be a supervisor communications port to configure and provide general communications.
- B. The MVP sensor shall use an RS-485 multi-drop network protocol to facilitate communications via a network of Rack Cards, Mini Hubs, Mini-Hub IIs or Mini-Hub TS2s to a remote or local PC client/server application.
- C. The communications port shall allow the user to update the embedded software with a new software release and interact with a PC client/server application for all of the various detection requests supported by the MVP sensor.
- D. The communications protocol over the supervisor communications port shall be the UDP/IP message packet and routing standard.
- E. This protocol shall be used throughout the field network of MVP sensors, Hubs and the host PC server application.

### 2.2.2 DETECTOR I/O PORT

- A. The MVP sensor detector port shall provide a dedicated, RS-485, half-duplex interface between the MVP sensor and a detector port master such as a Rack Card, Mini Hub, Mini-Hub II, or Mini-Hub TS2.
- B. The real-time state of phase inputs shall be transmitted to the MVP sensor.
- C. The MVP sensor shall exchange input and output state data with the detector port master every 100 ms.
- D. The communications protocol shall be UDP/IP over the single twisted-pair wiring.
- E. A detector port master such as a Mini-Hub, Mini-Hub II, or Mini-Hub TS2 shall subsequently translate the detection states, in an electrically compatible manner, to a traffic signal controller:
  - 1. Single pin state outputs shall be applied by the interface card immediately upon receipt of the state change:
    - a. Each on or off pulse shall be guaranteed a minimum pulse width of 100 ms.
  - 2. Speed outputs from 2 pins shall reflect the true output of the delay proportional to measured speed within  $\pm 1$  ms.

### 2.2.3 DIFFERENTIAL VIDEO

- A. The MVP sensor shall output full motion video using a differential video port in either NTSC or PAL format.
- B. The differential video shall be transmitted over a single twisted pair.

### 2.2.4 POWER

- A. The MVP sensor shall operate on 24 VAC/DC, 50/60 Hz at a maximum of 25 watts.
- B. The camera and processor electronics shall consume a maximum of 10 watts.
- C. The remaining 15 watts shall support an enclosure heater.

## 2.3 MVP SENSOR OPERATIONS LOGS

The MVP sensor shall maintain a non-volatile operations log, which minimally contains:

- A. Revision numbers for the current MVP sensor hardware and software components in operation.
- B. Title and comments for the detector configuration.
- C. Date and time the last detector configuration was downloaded to the MVP sensor.
- D. Date and time the operation log was last cleared.
- E. Date and time communications were opened or closed with the MVP sensor.
- F. Date and time of last power-up.
- G. Time-stamped, self-diagnosed hardware, and software errors that shall aid in system maintenance and troubleshooting.

## 2.4 MVP SENSOR VEHICLE DETECTION PERFORMANCE

The real time detection performance of the MVP sensor shall be optimized by following the set of guidelines for:

- A. The traffic application to perform.
- B. MVP sensor mounting location.
- C. The number of traffic lanes to monitor.
- D. The sizing, placement, and orientation of vehicle detectors.
- E. Traffic approaching and/or receding from the sensor's field of view.
- F. Minimizing the effects of lane changing maneuvers.

### 2.4.1 DETECTION ZONE PLACEMENT

- A. The video detection system shall provide flexible detection zone placement anywhere and at any orientation within the field of view of the MVP sensor. Preferred detector configurations shall be:
  - 1. Detection zones placed across lanes of traffic for optimal count accuracy.
  - 2. Detection zones placed parallel to lanes of traffic for optimal presence detection accuracy of moving or stopped vehicles.
- B. A single detection zone shall be able to replace one or more conventional detector loops connected in series.

- C. Detection zones shall be able to be overlapped for optimal road coverage.
- D. In addition, selective groups of detectors shall be able to be logically combined into a single output by using optional delay and extend timing and signal state information.
- E. Optimal detection shall be achieved when the MVP sensor placement provides an unobstructed view of each traffic lane where vehicle detection is required.

Examples of obstructions are not limited to fixed objects. Obstruction of the view can also occur when vehicles from a lane nearer to the sensor obscure the view of the roadway of a lane further away from the sensor.

#### 2.4.2 DETECTIONS ZONE PROGRAMMING AND SUPERVISOR SYSTEM

Placement of detection zones shall be by means of a portable or desktop computer with the necessary supervisor software using the Windows 95, 98, Millenium, or Windows NT 4.0, or 2000 operating systems, a keyboard, and a mouse.

- A. The minimum supervisor computer system, as need for detector setup and viewing of vehicle detection, shall consist of a notebook/laptop computer with an LCD display supporting 256 color operation, a docking station for field use (if necessary), and a Windows- based interface software. A video digitizer board shall not be required for detector programming. However, a video digitizer shall be included as part of the supervisor computer system to allow the display of real time video if necessary.
- B. The supervisor computers include four (4) City-owned desktop computers. Two of these desktop computers are located in the Civic Center and two (2) are located in the Traffic Maintenance Shop. The supervisor computer software shall be installed on all the supervisor computers.
- C. If a video digitizer board is required for detector programming or to allow the display of real time video, then the contractor shall provide and install these video digitizer boards on all four (4) supervisor computers and provide a docking station. The cost for this work shall be included in the lump sum price for the whole system.
- D. The supervisor computer software shall include a Windows-based program to interface with the MVP. This software shall provide an easy to use graphical user interface and support all models/versions of the supplied MVP. The software shall support both still image and real-time viewing of video images within a window.
- E. The supervisor computer software shall have passwords and multiple security levels of operation.
- F. The VGA monitor shall be able to show the detection zones superimposed on images of traffic scenes.
- G. The mouse and keyboard shall be used to:
  - 1. Place, size, and orient detection zones to provide optimal road coverage for vehicle detection.
  - 2. Modify detector parameters for site geometry to optimize performance.
  - 3. Edit previously defined detector configurations.
  - 4. Adjust the detection zone size and placement.
  - 5. Add detectors for additional traffic applications.
  - 6. Reprogram the sensor for different traffic applications, changes in installation site geometry, or traffic rerouting.

H. It shall be possible to:

1. Download detector configurations from the computer to the MVP sensor.
2. Upload the current detector configuration that is running in the MVP sensor.
3. Back up detector configurations by saving them to the computer's removable or fixed disks.
4. Perform the above upload, store, and retrieve functions for video snapshots of the MVP sensors' view.

#### 2.4.3 DETECTION ZONE OPERATION

The MVP sensor real-time detection operation shall be verifiable through the following means:

- A. View the video output of the sensor with any standard video display device (monitor).
- B. The video output of the MVP sensor (differential twisted pair) shall be capable of selectively transmitting:
  1. Camera video only.
  2. Analog video overlaid with the current real-time detection state of each detector.
  3. Camera video with overlaid, scaled cross-hairs that are useful for aiming the sensor (during installation).
  4. Individual detectors shall have the option of being hidden.
- C. Electrically monitor assigned contact closure pinouts from a detector port master such as a Mini Hub TS1 interface card, Mini-Hub TS2 interface card, Detector Rack interface card, or Mini-Hub II interface card. Each pin of an interface card shall have one associated LED output to reflect its output state.
- D. View the associated output LED state on the detector port master:
  1. An LED shall be ON when its assigned detector output or signal controller phase input is on.
  2. An LED shall be OFF when its assigned detector or signal controller input is off.

#### 2.4.4 OPTIMAL DETECTION

- A. The video detection system shall provide optimal detection of vehicle passage and presence when the:
  1. MVP sensor is mounted 10 m (30 ft) or higher above the roadway.
  2. Image sensor is adjacent to the desired coverage area.
  3. Distance to the farthest detection zone locations is not greater than 10 times the mounting height of the MVP sensor.
- B. The recommended deployment geometry for optimal detection also requires that there be an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the MVP sensor is mounted directly above the traveled lanes, the MVP sensor shall not be required to be directly over the roadway.
- C. The MVP sensor shall be able to view either approaching or receding traffic or both in the same field of view. The preferred image sensor orientation for optimal

detection shall be to view approaching traffic since there are more high contrast features on vehicles as viewed from the front rather than the rear.

- D. The MVP sensor, when placed at a mounting height that minimizes vehicle image occlusion and equipped with a lens to match the width of the road, shall be able to monitor a maximum of 6 to 8 traffic lanes simultaneously.

#### 2.4.5 COUNT DETECTION PERFORMANCE

- A. Using a MVP sensor installed within the optimal viewing specifications described above for count station traffic applications; the system shall be able to accurately count vehicles with:
  - 1. At least 96% accuracy under normal operating conditions (day and night).
  - 2. At least 93% accuracy under artifact conditions.
- B. Artifact conditions are combinations of weather and lighting conditions that result from shadows, fog, rain, snow, etc. The volume count shall be:
  - 3. Accumulated for the entire roadway (all traveled lanes).
  - 4. Accumulated over time intervals that contain a minimum of one hundred (100) vehicles to ensure statistical significance.

#### 2.4.6 DEMAND PRESENCE DETECTION PERFORMANCE

- A. Using a MVP sensor installed within the optimal viewing specifications described above for intersection control traffic applications; the system shall be able to accurately provide demand presence detection.
- B. The demand presence accuracy shall be based on the ability to enable a protected turning movement on an intersection stop line, when a demand exists.
- C. The probability of not detecting a vehicle for demand presence shall be less than 1-percent error under all operating conditions.
  - 1. In the presence of artifact conditions, the MVP sensor shall minimize extraneous (false) protected movement calls to less than 7 %.
  - 2. To ensure statistical significance, the demand presence accuracy and error shall be calculated over time intervals that contain a minimum of 100 protected turning movements.
  - 3. These performance specifications shall be achieved with a minimum of 2 presence detectors coupled with a single detector function (Type-9) to provide adequate road coverage to sample the random arrival patterns of vehicles at the stop line.
- D. The calculation of the demand presence error shall not include turning movements where vehicles do not pass through the presence detectors, or where they stop short or stop beyond the combined detection zones.

#### 2.4.7 SPEED DETECTION PERFORMANCE

- A. The MVP sensor shall accurately measure average (arithmetic mean) speed of multiple vehicles with more than 98% accuracy under all operating conditions for approaching and receding traffic.
- B. The average speed measurement shall include more than 10 vehicles in the sample to ensure statistical significance.

- C. Optimal speed detection performance requires the sensor location to follow the specifications described above for count station traffic applications with the exception that the sensor must be higher than 13 m (40 feet). The MVP sensor shall accurately measure individual vehicle speeds with more than:
  - 1. 95% accuracy under all operating conditions for vehicles approaching the sensor (viewing the front end of vehicles).
  - 2. 90% accuracy for vehicles receding from the sensor (viewing the rear end of vehicles).
- D. These specifications shall apply to vehicles that travel through both the count and speed detector pair and shall not include partial detection situations created by lane changing maneuvers.

### 3.0 MVP SENSOR HARDWARE

#### 3.1 MVP SENSOR

The MVP sensor shall:

- A. Use medium resolution, color image sensors as the video source for real-time vehicle detection using either NTSC or PAL formats.

As a minimum, each image sensor shall provide the following capabilities:

- 1. Images shall be produced with a CCD sensing element with horizontal resolution of at least 500 lines and vertical resolution of at least 350 lines. Images shall be output as video conforming to NTSC or PAL specifications.
- B. Provide software JPEG video compression.
- C. Provide useable video and resolvable features in the video image shall be produced when those features have luminance levels as low as 0.1 lux at night.
- D. Provide useable video and resolvable features in the video image shall be produced when those features have luminance levels as high 10,000 lux during the day.
- E. Provide useable video and resolvable features in the video image shall be produced when the ratio of the luminance of the resolved features in any single video frame is 300:1.
- F. Provide direct real-time iris and shutter speed control.
- G. Be usable for video surveillance.
- H. Provide an optical filter and appropriate electronic circuitry shall be included in the image sensor to suppress "blooming" effects at night.
- I. Have gamma for the image sensor present at the factory to a value of 1.0.

#### 3.2 MVP SENSOR OPTICS

- A. The MVP sensor shall be equipped with an integrated zooms lens with zoom and focus capabilities that can be changed using either configuration computer software or hand-held controller.

#### 3.3 MVP SENSOR ENCLOSURE

- A. The MVP sensor and lens assembly shall be housed in an environmental enclosure that provides the following capabilities:

- B. The enclosure shall be waterproof and dust-tight to NEMA-4 specifications, and shall have the option to be pressurized with dry nitrogen to  $35 \pm 8$  kPa.
- C. The enclosure shall allow the MVP sensor to operate satisfactorily over an ambient temperature range from  $-34^{\circ}\text{C}$  to  $+74^{\circ}\text{C}$  while exposed to precipitation as well as direct sunlight.
- D. The enclosure shall allow the image sensor horizon to be rotated during field installation.
- E. The enclosure shall include a provision at the rear of the enclosure for connection of the factory-fabricated power, communications and video signal cable. Input power to the environmental enclosure shall be 24 VAC/DC and either 50 or 60 Hz.
- F. A heater shall be at the front of the enclosure to prevent the formation of ice and condensation in cold weather, as well as to assure proper operation of the lens' iris mechanism. The heater shall not interfere with the operation of the image sensor electronics, and it shall not cause interference with the video signal.
- G. The enclosure shall be light-colored and shall include a sun shield to minimize solar heating and glare. The front edge of the sunshield shall protrude beyond the front edge of the environmental enclosure and shall include provision to divert water flow to the sides of the sunshield. The amount of overhang of the sunshield shall be adjustable to prevent direct sunlight from entering the lens or hitting the faceplate.
- H. The total weight of the image sensor in the environmental enclosure with sunshield shall be less than 2.7 kg (6 pounds).
- I. When operating in the environmental enclosure with the power, communication and video signal cable connected, the image sensor shall meet FCC class B and CE requirements for electromagnetic interference emissions.

### 3.4 MVP SENSOR ELECTRICAL

- A. The video output of the MVP sensor shall be isolated from earth ground.
- B. All video connections from the sensor to the interface panel shall also be isolated from earth ground.
- C. The video output, communication, and power stages of the sensor shall include transient protection to prevent damage to the sensor due to voltage transients occurring on the cable leading from the MVP sensor to other field terminations.
- D. Connections for video, communications and power shall be made to the image sensor using a single 18-pin circular metal shell connector (Bendix PT07C-14-18P or equivalent).
- E. The mating cable shall use a right-angle shell.
- F. The MVP sensor shall have passed requirements for and received the CE mark.

### 3.5 MVP SENSOR FIELD INTERFACE EQUIPMENT

#### 3.5.1 COMMUNICATIONS PANEL REQUIREMENTS

A communications panel shall be provided with each MVP sensor for installation. The communications panel shall provide:

- A. A terminal block for terminating power.
- B. Terminated, four twisted-pair wiring to the image sensor

### 3.5.2 MVP SENSOR POWER REQUIREMENTS

- A. The MVP sensor communications interface panel shall provide 24 VAC input power, at less than 25 Watts, 50/60 Hz.

### 4.0 INSTALLATION AND TRAINING

- A. The supplier of the video detection system shall supervise the installation and testing of the video detection system and computer equipment. A factory certified representative from the supplier shall be on-site during installation.
- B. One day of training shall be provided to personnel of the City of Omaha in the operation, setup and maintenance of the video detection system. Instruction and materials shall be provided for a maximum of 6 persons and shall be conducted at a location selected by the City. This training shall be provided at no extra cost to the project.
- C. The MVP Sensor and its support hardware/software are a sophisticated leading-edge of technology system. Proper instruction from certified instructors is required to ensure that the end-user has complete competency in system operation. The User's Guide is not an adequate substitute for practical classroom training and formal certification by an approved agency.
- D. Formal levels of authorized training are required for installers, contractors, and system operators. Contractors unable to attend client/end-user training sessions, will be required to arrange for appropriate level training and certification at additional expense to their respective firms/agencies. A formal training curriculum is a required component for all initial system bids for a specific firm/agency. Any required training shall be part of the bid price and will not be paid for separately.

### 5.0 WARRANTY, MAINTENANCE AND SUPPORT

- A. The video detection system shall be warranted by its supplier for a minimum of two (2) years from date of acceptance by the City of Omaha. Acceptance will be the date that each shipment is approved for payment.
- B. Ongoing software support by the supplier shall include updates of the MVP Sensor and supervisor software. These updates shall be provided free of charge during the warranty period.
- C. The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be made available to the City of Omaha in the form of a separate agreement for continuing support.

### 6.0 MEASUREMENT AND PAYMENT

The video detection system shall be measured and paid for per each system furnished and installed for the item "Wide Area Video Vehicle Detection System at \_\_\_\_\_".

## **MODULAR (SINGLE CAMERA), DETECTOR RACK MOUNTED VIDEO DETECTION SYSTEM**

This type of vehicle detection system is used on temporary signals only.

### 1.0 GENERAL

This specification sets forth the minimum requirements for a system that detects vehicles on a roadway using only video images of vehicle traffic. **The bid is for the supply and installation of a singular camera, detector rack mounted video detection system, as specified hereinafter, with the supervisor software.**

Currently, Iteris supplies the only acceptable Modular (Single Camera), Detector Rack Mounted Video Detection System. A single camera video detection system supplied by others may be accepted only after the item has been tested and approved.

### 1.1 SYSTEM HARDWARE

The video detection system shall consist of one video camera, a video detection processor (VDP) which mounts in a standard detector rack, and a detector rack mounted extension module (EM).

The video detection systems shall be supplied with all of the equipment required for the operation as shown on the plans, to include, but not be limited to:

#### ***120<sup>th</sup> Street & Davenport Street***

- 3 – Modular Video Detection Cameras with Weather Enclosure
- 3 – Video Detection Processor
- 3 – Extension Module
- 2 – Unspliced length of 16 AWG three conductor cable
- 3 – Unspliced length of coaxial cable

#### ***South Bridge Road & West Dodge Road***

- 1 – Modular Video Detection Cameras with Weather Enclosure
- 1 – Video Detection Processor
- 1 – Extension Module
- 1 – Unspliced length of 16 AWG three conductor cable
- 1 – Unspliced length of coaxial cable

#### ***Relocated South Bridge Road & West Dodge Road***

- 1 – Modular Video Detection Cameras with Weather Enclosure
- 1 – Video Detection Processor
- 1 – Extension Module
- 1 – Unspliced length of 16 AWG three conductor cable
- 1 – Unspliced length of coaxial cable

***Relocated South Bridge Road & Existing South Bridge Road***

- 2 – Modular Video Detection Cameras with Weather Enclosure
- 2 – Video Detection Processor
- 2 – Extension Module
- 1 – Unspliced length of 16 AWG three conductor cable
- 2 – Unspliced length of coaxial cable

**1.2 SYSTEM SOFTWARE**

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only a video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available.

**LOCAL MATERIAL SOURCES  
(S5-1-0801)**

Information regarding possible sources of local materials is available at the Materials and Research Division of the Department of Roads, Lincoln, Nebraska.

**ASPHALTIC CONCRETE  
(S5-5-0801)**

Paragraph 5. of Subsection 503.02 in the Standard Specifications is void.

**TEMPORARY SURFACING**

The work shall consist of the construction and removal of the temporary surfacing on this project in accordance with plans and these Special Provisions.

The Temporary Surfacing depth shall be as shown in the plans. This provision is applicable to all Temporary Surfacing depths shown in the plans.

The finished surface shall not vary more than 3 mm as determined by using a three meter straightedge, or other devices approved by the Engineer. The Contractor shall correct any depressions or high areas in excess of 3-mm.

At the Contractors option the surfacing may be constructed using Class "47B-25" Concrete or Asphaltic Concrete Type SP5. These materials may be used interchangeably during the course of the work except that surfacing at any individual location must be completed with the same material with which the work was begun. If asphaltic concrete is chosen as the temporary surfacing the Contractor will be required to fly ash stabilize the subgrade under the temporary surfacing. The Contractor will fly ash stabilize the subgrade as shown in the Special Provisions except the depth of the stabilization under the temporary surfacing will be 300 mm. Fly Ash applied for the stabilized subgrade under temporary surfacing shall be 15 percent by weight and the water applied shall be determined by the Engineer. If concrete is chosen as the temporary surfacing the Contractor will prepare the underlying subgrade, prior to placing the

temporary surfacing, in accordance with the requirements of Section 302 of the Standard Specifications.

Asphaltic Concrete used for surfacing shall meet all specifications and sampled and tested as shown in the Supplemental Specifications. The incentive, disincentive pay tables do not apply, however, any asphaltic concrete not meeting the specifications will be subject to removal.

The work of Subgrade Stabilization including fly ash and water under the temporary surfacing, if asphalt concrete is chosen, will not be measured and paid for but shall be considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_".

Subsection 302.04 is amended to provide that the work of subgrade preparation, as well as all water applied as directed by the Engineer, will not be measured for payment, but shall be considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_".

Subsection 304.04 is amended to provide that the work of shoulder construction, as well as all water applied as directed by the Engineer, will not be measured for payment, but shall be considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_".

Subsection 503.05 is amended to provide that Asphaltic Concrete and P.G. Binder used in the asphalt concrete will not be measured for payment, but shall be considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_". Performance Graded Binder 76-22 shall be used if asphaltic concrete is chosen as the temporary surfacing

Subsection 504.04 is amended to provide that the application of a tack coat, including furnishing emulsified asphalt, will not be measured for payment, but shall be considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_".

Paragraph 10 of Subsection 603.03 is amended to provide that concrete used in the surfacing, reach a minimum strength of 25 MPa before opening to traffic.

Subsection 603.04 is amended to provide that concrete pavement will not be measured for payment, but shall be considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_".

When the need for the temporary surfacing is no longer required, the Contractor shall cold mill the temporary surfacing if asphaltic concrete was used as the temporary surfacing. Uncontaminated millings shall be stockpiled on 108th Street and I-80 as directed by the Engineer. Millings from the temporary surfacing shall be kept separate from other millings. If concrete was chosen as the temporary surfacing the Contractor shall crush the concrete and stockpile at the same location. Any foundation course used under the temporary surfacing shall be stockpiled at the location listed above. All the work necessary to accomplish this requirement is considered subsidiary to the item "Temporary Surfacing \_\_\_\_\_".

Measure temporary surfacing by the square meter of completed and accepted work.

The work and materials required for temporary surfacing will be paid for at the contract unit price per square meter for the item "Temporary Surfacing \_\_\_\_\_". Payment will be full Compensation for the work prescribed in these Special Provisions and the Standard Specifications.

#### Temporary Surfacing Thickness Cores

The Contractor will be required to core the Temporary Surfacing for final thickness determination. The cores will be cut prior to opening the temporary surfacing to traffic. One core shall be taken for each 3000 square meters, or fraction thereof, of temporary surfacing placed with a minimum of 1 core taken per project. The Engineer shall select the site where the core shall be taken. All work, materials and incidentals necessary to complete the work shall considered subsidiary to the item "Temporary Surfacing".

### **TINING (S6-19-0203)**

Paragraph 5.d. of Subsection 603.03 of the Standard Specifications is void and superseded by the following:

#### Description

When required by the plans or Special Provisions, the Contractor shall tine texture the concrete pavement surface using the following methods:

#### Construction Methods

1. The surface of the concrete pavement shall be dragged with wet burlap, carpet, or canvas belt before tining.
2. Mainline Tining-Longitudinal
  - a. Mainline paving shall be tined with a metal device 23 feet (7 meters) in length with a single row of tines.
  - b. The tines shall be of such dimensions as to produce grooves parallel to the centerline of the road approximately 1/8 inch (3 mm) wide and 1/8 inch (3 mm) deep spaced at 3/4 inch (19 mm) on center. A 2 inch (50 mm) to 3 inch (75 mm) wide strip of pavement surface shall be protected from surface grooving for the length of and centered along the longitudinal joint.
  - c. The tining device shall be mechanically operated and shall cover the full pavement width in a single pass at a uniform speed and depth centered on the longitudinal joint. Longitudinal tining shall be accomplished by equipment with horizontal and vertical string line controls to ensure straight grooves.
  - d. Hand tining will be allowed on irregular areas or areas inaccessible to the tining machine as shown in the 6 inch (155 mm) to 16 inch (405 mm) Concrete Pavement Plan. A tine rake shall be used for hand tining. The use of a corrugated bull float or other device that creates a smooth finish between the grooves will not be permitted.

3. When authorized, pavement texture damaged by rain and pavements not textured to the specified requirements shall be textured only after the concrete has attained its designed strength. The texturing shall be done with diamond grinding equipment specifically designed to grind and texture concrete pavements. The cutting head shall be at least 36 inches (915 mm) wide and capable of producing the depth and spacing indicated in 2.b.

### **TIE BARS FOR CONCRETE PAVEMENT (S6-19-1103)**

Paragraph 4.k. of Subsection 603.03 in the Standard Specifications is amended to include the following:

<b>TIE BARS FOR LONGITUDINAL JOINTS</b>		
<b>Slab Thickness</b>	<b>Bar Size*</b>	<b>Bar Spacing</b>
10" (255 mm) or Less	# 5 (#16)	33" (840 mm)
More Than 10" (255 mm)	# 6 (#19)	33" (840 mm)

\*Bent bars that must be straightened shall be #5.

All deformed tie bars shall be epoxy coated. Epoxy that is damaged by straightening bars to a 45° angle does not need to be repaired.

Tie bar spacing may vary  $\pm 1"$  ( $\pm 25$  mm) from the nominal spacing shown. The number of tie bars per 16'-6" (5 m) panel shall remain constant.

No tie bar shall be installed closer than  $\frac{1}{2}$  the tie bar spacing to a transverse joint; except, tie bar spacing may vary  $\pm 1"$  ( $\pm 25$  mm) from the nominal spacing shown. The number of tie bars per 16'-6" (5 m) panel shall remain constant.

Paragraph 4.k.(3)(ii) of Subsection 603.03 in the Standard Specifications and Supplemental Specifications is void and superseded by the following:

(ii) To minimize tie bar breakage, before placing the adjacent lane the tie bars shall be bent to a position that is at least 45 degrees to the longitudinal joint. The free end of the bar shall not be within six inches (150 mm) horizontally of the location of the transverse joint to avoid corner cracking when the joint is sawed. The free end of the bar shall also be positioned so that it does not interfere with the movement of any dowel bar in the transverse joint. Bars that are broken by bending or that are loose in their socket must be replaced or secured.

### **DOWELED CONCRETE PAVEMENT (S6-20-0203)**

Section 603 in the Supplemental Specifications and the Standard Specifications is amended to include Doweled Concrete Pavement.

Transverse Joints for doweled concrete pavement shall be constructed perpendicular to the roadway on 16'-6" (5 meter) centers.

The dowel bars shall meet the requirements of Section 1022.

The dowel bars shall be placed within a tolerance of 1/4 inch (6 mm) in both the horizontal and vertical planes. The Contractor shall check with a suitable template approved by the Engineer, the placement of each assembly and the position of the bars within the assembly. If the assembly is found to be placed outside any one of the tolerances, the placement shall be corrected.

Dowels for transverse joints furnished in approved assemblies shall be suitable for the joint layout shown in the plans. The assemblies shall be dipped in MC-70, RC-70, RC-250, CRS-1, CRS-2, CSS-1H, HFMS-2h, or HFMS-2s prior to delivery to the work site.

For areas with pavement widening, the Department requires that dowel baskets be placed in all contraction joints which are 6 feet (1.8 m) or wider.

When basket assemblies are used, the baskets shall be placed at all transverse joints where doweled concrete is required, and shall be securely pinned to the grade to prevent any movement during the paving operation. Pins shall be placed at a maximum distance of three feet (1 meter) apart and shall be a minimum of 12 inches (300 mm) in length. All lateral support braces, which would restrict movement of the dowel bars, shall be cut after the baskets are secured and prior to placing the concrete.

Assemblies that are damaged prior to placement shall not be used. Assemblies damaged after placement shall be replaced prior to paving.

If normal vibration is found inadequate to thoroughly consolidate the plastic concrete within and around the dowel basket assemblies, additional hand vibration or other procedures may be required by the Engineer.

Precautions shall be taken to assure that the sawed contraction joint is located directly over the center of the dowel bars.

### **CRACKS IN CONCRETE PAVEMENT (S6-20-0901)**

Transverse cracks which form in the concrete pavement panels between load transfer joints shall be secured with a minimum of 1 1/2 inch x 18 inch (38 mm x 450 mm) epoxy coated deformed reinforcing bars as shown in the plans. The reinforcing bars shall conform to the requirements of Sections 1020 and 1021. The dowel bars shall be secured using a resin adhesive listed on NDOR approved products list. No payment will be made for this work.

### **GRANULAR BACKFILL**

This work shall consist of furnishing and backfilling areas designed in the plans with granular backfill.

Paragraph 2. of Subsection 702.02 in the Standard Specifications is void and superseded by the following:

Granular backfill aggregate shall meet the requirements specified in Subsection 1033.02, Paragraphs 1 and 2 and the requirements in Table 1033.07.

Granular backfill limits are identified in the plans and shall be uniformly compacted to facilitate placing the concrete median surfacing.

The item "Granular Backfill" will be paid for at the unit price per cubic meter. This price shall be considered full compensation for furnishing all materials, compaction and for furnishing all labor, equipment, tools and incidentals necessary to complete the work.

### **CONCRETE IMPRINTED MEDIAN SURFACING**

This work shall involve the placing of concrete median surfacing, at the locations shown in the plans, then treating the surface with texturing and color.

Texture on the median surface shall be a cobblestone pattern except where indicated as a tined pattern. The cobblestone pattern shall be achieved by imprinting with forms and shall match the pattern used on the State project, project number IM-680-9(796), I-680 West Dodge Interchange. The tined pattern, detailed on Special Plan 28C, shall be applied on concrete median surfacing between barriers and where the median surfacing is adjacent to interlocking concrete paver blocks. The tined depth shall be a minimum of 13 mm. Maximum spacing between tines shall not exceed 38 mm. The tined pattern shall be applied after the coloring effect is achieved.

Color for all areas with the cobblestone pattern shall be mixed to match the color "Harvest Amber", as shown by Bomanite Color Hardener colors, by Bomanite Corporation, (559) 673-2411. Color to match referee samples as approved by the Project Engineer. The color shall be achieved by applying a colored sealer: a penetrating high performance water repellent acrylic silane polymer product for exterior concrete surfaces. Acryl Pen produced by Nox-Crete, Inc., (402) 341-2080 and Certi-Vex Guard CACS produced by Vexcon Chemicals, Inc., (888) 839-2661 are approved products. The Contractor may use other products if approved by the Project Engineer and the Materials and Research Division. The Contractor shall submit to the Project Engineer a copy of the product data sheet and instructions for surface preparations and product application. The stain shall be applied as recommended by the manufacturer of the product.

Color for areas with the tined pattern shall match the color and coloring system used for the bid item, Terrace. Color of hardener and release agent to match referee samples as approved by the Project Engineer. Curing compound and sealers to be compatible with hardener and release agents. Apply a color hardener evenly to the surface of fresh concrete by the dry-shake method using a minimum of 27.21 Kg. per 9.29 square meters. Hardener shall be applied in two or more shakes, floated after each shake and troweled only after final floating. Apply release agent evenly to troweled surface, at a rate recommended by the manufacturer, prior to applying tined texture. Apply Curing method, as recommended by the manufacturer, immediately after completing texturing process. After initial curing period, seal colored surface as recommended by the manufacturer.

The imprinted concrete surfacing shall not be built until other items of work that might damage the median texture and color are completed. The concrete mix shall be placed and screeded to the proper grade and wood floated to a uniform surface.

Expansion joints shall be 13mm wide and placed at intervals not to exceed 18 meters. Expansion joints shall be sealed with a sealing compound colored to match the colored concrete.

Contraction joints shall be made with a pointed trowel cutting completely through the concrete prior to imprinting. Contraction joint lines shall be neatly cut and follow along "bound lines" of the cobblestone or along the alignment of the tines. While the concrete is still in the plastic stage of set, the forming tools shall be applied to make the cobblestone pattern.

Test samples of both the cobblestone pattern with its associated color and stain product, and the tined pattern with its associated color and coloring system shall be prepared for the approval by the Project Engineer prior to building the imprinted median on the project. As many as three (3) test samples may be requested by the Project Engineer.

**Pay items**

Concrete Class 47B-20 Imprinted Median Surfacing  
150mm Concrete Class 47B-20 Imprinted Median Surfacing  
255mm Concrete Class 47B-20 Imprinted Median Surfacing  
150mm Reinforced Concrete Class 47B-20 Imprinted Median Surfacing

All pay items shall be measured and paid for by the square meter. Any test samples, product information, tools, equipment, materials and labor required to perform this work shall be considered subsidiary.

## **TIMBER CULVERT OUTLET STRUCTURE**

This work consists of complete installation of a timber culvert outlet structure conforming to the details shown in the plans.

Treated timber piling and bridge plank shall conform to the requirements of Section 1075.

Galvanized hardware shall conform to the requirements of Section 1059.

Timber culvert outlet structures shall be measured as single units complete and in place for each location.

This work, measured as provided herein, shall be paid for at the contract unit price per each for the item, "Outlet Structure." This price shall be considered full compensation for furnishing all materials, driving treated timber piling as required and for furnishing all labor, equipment, tools and incidentals necessary to complete the work.

## **WATER METER PIT**

### **GENERAL**

1. This section specifies the requirements for preparation and construction of a water meter pit as indicated on the plans.

The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, tools, excavation, backfilling, services, and incidentals necessary to perform the work of this section.

2. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

## **REFERENCES**

1. Metropolitan Utilities District rules and regulations.

## **SUBMITTALS**

1. Shop drawings of water meter pit.

## **CONSTRUCTION**

1. Construct water meter pit where shown and as detailed on the plans.
2. Construction of the water meter pit shall conform to the requirements of the Metropolitan Utilities District rules and regulations.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

1. The work of excavation, subgrade preparation, construction, backfilling and any incidental items shown on the detail will be measured and paid for per each for the item "Meter Pit".
2. The work of water service connections will not be measured for payment but shall be considered subsidiary to the item "Meter Pit".

## **INTERLOCKING CONCRETE PAVER BLOCKS**

### **GENERAL**

1. This section specifies the requirements for preparation and installation of interlocking concrete paver blocks as indicated on the plans.
2. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, tools, excavation, backfilling, services, and incidentals necessary to perform the work of this section.
3. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

1. American Society for Testing Materials (ASTM)
  - a. ASTM C 33, Standard Specification for Concrete Aggregates.
  - b. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
  - c. ASTM D 698-00a Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
  - d. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - e. ASTM C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
  - f. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
  - g. ASTM C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
  - h. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
2. Standard Specifications for Highway Construction, Nebraska Department of Roads, 1997, Metric Units Edition.
3. Interlocking Concrete Pavement Institute: ICPI Tech Spec Technical Bulletins.

## SUBMITTALS

1. Manufacturer's drawings and details: Indicate perimeter conditions, relationship to adjoining materials and assemblies, expansion and control joints, concrete paver layout, patterns, color arrangement, installation and setting details.
2. Prior to installation of interlocking concrete pavers, provide written certification that site conditions meet specifications for subgrade preparation and aggregate base materials.
3. Sieve analysis per ASTM C 136 for grading of bedding and joint sand.
4. Concrete pavers:
  - a. Four representative full-size samples of each paver type, thickness, color, finish that indicate the range of color variation and texture expected in the finished installation.
  - b. Color(s) selected by Landscape Architect from manufacturer's available colors.
  - c. Accepted samples become the standard of acceptance for the work.
  - d. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
  - e. Manufacturer's certification of concrete pavers by ICPI as having met applicable ASTM standards.
  - f. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

5. Paver Installation Subcontractor:

- a. A copy of Subcontractor's current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
- b. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

**QUALITY ASSURANCE**

1. Paving Subcontractor Qualifications:
  - a. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
  - b. Utilize an installer holding a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
2. Mock-Ups:
  - a. Install a 2 x 2 m paver area.
  - b. Use this area to determine surcharge of the bedding sand layer, joint sizes, lines, laying patterns, colors and texture of the job.
  - c. This area will be used as the standard by which the work will be judged.
  - d. Subject to acceptance by owner, mock-up may be retained as part of finished work.
  - e. If mock-up is not retained, remove and properly dispose of mock-up.

**DELIVERY, STORAGE & HANDLING**

1. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
2. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.
3. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
4. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
5. Unload pavers at job site in such a manner that no damage occurs to the product.
6. Storage and Protection:
  - a. Store materials protected such that they are kept free from mud, dirt, and other foreign materials.
  - b. Store concrete paver cleaners and sealers per manufacturer's instructions.
  - c. Cover bedding sand and joint sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.

**PROJECT/SITE CONDITIONS**

1. Environmental Requirements:
  - a. Do not install sand or pavers during heavy rain or snowfall.
  - b. Do not install sand and pavers over frozen base materials.

- c. Do not install frozen sand or saturated sand.
  - d. Do not install concrete pavers on frozen or saturated sand.
2. Extra Materials: Provide an additional five percent of paver material for use by owner for maintenance and repair.
3. Pavers shall be from the same production run as installed materials

## **MATERIALS**

1. Interlocking concrete paver blocks.
- a. Interlocking concrete paver manufacturers:
    - 1) Pavestone, Co., Kansas City, MO.
    - 2) Paveloc Industries, Inc., Marengo, IL
    - 3) Borgert Products, St. Joseph, MN.
  - b. Paver Type: Holland.
  - c. Color: as selected by Landscape Architect.
  - d. Color Pigment Material Standard: Comply with ASTM C 979.
  - e. Material Standard: Comply with material standards set forth in ASTM C 936.
    - 1) Average compressive strength of 55 MPa with no individual unit under 50 MPa.
    - 2) Average water absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C 140.
    - 3) Resistance to 50 freeze-thaw cycles when tested in accordance with ASTM C 67.
  - f. Material shall be manufactured in individual layers on production pallets.
  - g. Materials shall be manufactured to produce a solid homogeneous matrix in the produced unit.
2. Bedding and joint sand:
- a. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
  - b. Sieve according to ASTM C 136.
  - c. For bedding sand, do not use limestone screenings, stone dust, mason sand, or sand that does not conform to the grading requirements of ASTM C 33.
  - d. For bedding sand, conform to the following grading requirements of ASTM C 33 with modifications as shown:

### Grading Requirements for Bedding Sand

Sieve Size	Percent Passing
9.500 mm	100
4.750 mm	95 to 100
2.360 mm	85 to 100
1.180 mm	50 to 85
0.600 mm	25 to 60
0.300 mm	10 to 30
0.150 mm	2 to 10
0.075 mm	0 to 1

- e. For joint sand, conform to the grading requirements of ASTM C 144 with modifications as shown:

<u>Grading Requirements for Joint Sand</u>		
Sieve Size	Natural Sand	Manufactured Sand
	Percent Passing	Percent Passing
4.750 mm	100	100
2.360 mm	95 to 100	95 to 100
1.180 mm	70 to 100	70 to 100
0.600 mm	40 to 75	40 to 100
0.300 mm	10 to 35	20 to 40
0.150 mm	2 to 15	10 to 25
0.075 mm	0 to 1	0 to 10

3. Edge restraints: provide edge restraints installed around the perimeter of all interlocking concrete paving unit areas as detailed and as specified below:
  - a. Material: Steel, painted or galvanized; aluminum; plastic, or approved equal.
  - b. Plastic edging is only acceptable if it is specifically designed for pavement edge restraint. Landscape edging for planting beds is not acceptable.
  - c. L-shaped with smooth vertical surface that abuts pavers.
  - d. Secured with spikes to the size and material recommended by the manufacturer for the edge restraint system.
4. Geotextile Fabric: material acceptable to interlocking concrete paver block manufacturer.

#### **BASE PREPARATION**

1. Excavate subgrade to the elevation required to meet finished grade of installed grass pavers as shown on the plans.
2. Compact the upper 600 mm of the subgrade to a uniform density of not less than 95 percent of maximum density per ASTM D698. The moisture content of the subgrade material shall be adjusted to not more than 3 percent above or below the optimum moisture content.
3. Install aggregate base course to the depth indicated on the Plans.
  - a. Extend base course 300 mm beyond proposed edge of pavement.
  - b. Compact base to a uniform density of not less than 98 percent of maximum density per ASTM D698.
  - c. Base surface tolerance:  $\pm 10$  mm over a 3 m straight edge
4. Edge restraint:
  - a. Install edge restraints per the drawings and manufacturer's recommendations.
  - b. Mount directly to finished aggregate base. Do not install on bedding sand.
  - c. The minimum distance from the outside edge of the base to the spikes shall be equal to the thickness of the base.

## **EXAMINATION**

1. General Contractor shall inspect and accept that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.
  - a. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
  - b. Verify that geotextiles, if applicable, have been placed according to drawings and specifications.
  - c. Verify that aggregate base materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
  - d. Verify location, type, and elevations of edge restraints.
2. Do not proceed with installation of bedding sand and interlocking concrete pavers until subgrade soil and base conditions are corrected by the Contractor or designated subcontractor.

## **PAVER INSTALLATION**

1. Prior to spreading sand bedding course, verify aggregate base is dry and meets material, installation and grade specifications. Verify that aggregate base and geotextile is ready to support sand, edge restraints, pavers and imposed loads.
2. Spread bedding sand evenly over the base course and screed to a nominal 25 mm thickness, not exceeding 40 mm thickness. Spread bedding sand evenly over the base course and screed rails, using the rails and/or edge restraints to produce a nominal 25 mm thickness, allowing for specified variation in the base surface.
3. Do not disturb screeded sand. Screeded area shall not substantially exceed that which is covered by pavers in one day.
4. Do not use bedding sand to fill depressions in the base surface.
5. Lay pavers in pattern(s) shown on drawings. Place units hand tight without using hammers. Make horizontal adjustments to placement of laid pavers with rubber hammers and pry bars as required.
6. Provide joints between pavers between 2 and 5 mm wide. No more than 5% of the joints shall exceed 6 mm wide to achieve straight bond lines. Joint (bond) lines shall not deviate more than  $\pm 15$  mm over 15 m from string lines.
7. Fill gaps at the edges of the paved area with cut pavers or edge units. Cut pavers to be placed along the edge with a double blade paver splitter or masonry saw. Adjust pattern at pavement edges such that cutting of edge pavers is minimized.
8. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and joint sand.
9. Use a low-amplitude plate compactor capable of at least minimum of 18 kN at a frequency of 75 to 100 Hz to vibrate the pavers into the sand.
10. Remove any cracked or damaged pavers and replace with new units.

11. Simultaneously spread, sweep and compact dry joint sand into joints continuously until full. This will require at least 4 to 6 passes with a plate compactor. Do not compact within 2 m of unrestrained edges of paving units.
12. All work within 2 m of the laying face must shall be left fully compacted with sand-filled joints at the end of each day or compacted upon acceptance of the work. Cover the laying face or any incomplete areas with plastic sheets overnight if not closed with cut and compacted pavers with joint sand to prevent exposed bedding sand from becoming saturated from rainfall.
13. Allow excess joint sand to remain on surface to protect pavers from damage from other trades. Remove excess sand when directed by the Engineer. Surface shall be broom clean after removal of excess joint sand.

#### **FIELD QUALITY CONTROL**

1. The final surface tolerance from grade elevations shall not deviate more than  $\pm 10$  mm under a 3 m straightedge.
2. Check final surface elevations for conformance to drawings.
3. The surface elevation of pavers shall be 3 to 6 mm above adjacent drainage inlets, concrete collars or channels.
4. No greater than 3 mm difference in height between adjacent pavers.
5. After work in this section is complete, the Contractor shall be responsible for protecting work from damage due to subsequent construction activity on the site.

#### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

1. The work of subgrade preparation, installing aggregate base, sand setting bed, geotextile, edge restraint, interlocking concrete paver block and any incidental items specified or shown on the detail will be measured as the total square meter area of the interlocking concrete paver block in place.
2. The work of preparing subgrade, furnishing and installing aggregate base, sand setting bed, geotextile, edge restraint, interlocking concrete paver block and any incidental items specified or shown on the detail will be paid for by square meter in place for the item "Interlocking Concrete Paver Block". This price shall be considered full compensation for all work prescribed.

### **CONCRETE TERRACE**

#### **DESCRIPTION**

1. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, tools, excavation, backfilling, finishing and incidentals necessary to perform the work of constructing terraces as indicated on the plans.
2. This work shall be done in accordance with this Section 908 of the Standard Specification for concrete slope protection, except as modified by this specification.

## REFERENCES

1. Standard Specifications for Highway Construction, Nebraska Department of Roads, 1997, Metric Units Edition.
2. American Concrete Institute (ACI)
  - a. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
  - b. ACI 303R-91 - Guide to Cast-in-Place Architectural Concrete.
  - c. ACI 309 - 1972[78] CH. 7 - Recommended Practice for Consolidation of Concrete.
  - d. ACI 347 - 1978 CH. 5.2 - Recommended Practice for Concrete Formwork.

## SUBMITTALS

1. Shop drawings showing the plan and elevation of each terrace, including joint locations, end, corner and edge treatments and other special conditions. Include a typical cross section of the proposed imprint pattern depth and spacing.
2. Concrete mix: cement type, aggregate gradation, slump, water/cement ratios, plasticizers and additives.
3. Shop drawings, examples or manufacturer's data showing the proposed method of achieving the specified pattern.
4. Proposed manufacturer's data for coloring system.
5. Compliance Certification by release agent manufacturer for local regulations controlling volatile organic compounds (VOC) content.

## QUALITY ASSURANCE

1. Construct a full-scale demonstration panel at least thirty (30) days prior to start of terrace construction.
  - a. Panel shall be used for the purpose of demonstrating the quality and appearance of the concrete, coloring agents and imprinting systems.
  - b. Panel size shall be two (2) meters long and one-and-one-half (1.5) meters wide and at the thickness required by the detail. The panel shall be built along a slope with a 2:1 gradient. Footings and reinforcement, as shown on the detail, shall not be required for the demonstration panel.
  - c. Use actual job specific materials, methods and workmanship, including concrete mix, placement rate, vibrating, pressures, coloring system, imprinting system, release agents, color sealer, joint sealing, and stripping practices.
  - d. In addition, demonstrate patching and repair procedures for spalled concrete, and voids caused by honeycombing or bugholes.
  - e. Incorporate formwork accessories and minimum one contraction and one expansion joint.
  - f. Arrange a review by the Engineer and Landscape Architect of the completed panel. The Engineer and Landscape Architect's approval of the panel must be obtained before starting work on the actual contract item.

- g. If initial demonstration panel is not acceptable, the deficiencies shall be evaluated, in writing, and corrections discussed between the Contractor, Engineer, Landscape Architect and Owner. Additional panels shall be constructed as required to obtain the agreed upon standard for the project.
  - h. Accepted demonstration panel will be standard by which remaining work will be evaluated for technical and aesthetic merit.
  - i. Accepted demonstration panel is a prerequisite to beginning job formwork. Submit variations from demonstration materials or techniques for approval prior to use.
  - j. Contractor shall remove and dispose of demonstration panel when construction of all terraces is complete and accepted.
2. The Contractor performing the work of this section shall specialize in performing the work of this section, including coloring and imprinting concrete: Contractor's experience
- a. The Contractor shall have at least five (5) years experience and within three (3) years preceding the acceptance of the Contractor's Proposal.
  - b. The Contractor shall be trained in the coloring system manufacturer's techniques to achieve the desired color appearance and consistency.

## **PROJECT/SITE CONDITIONS**

- 1. Coordinate terrace construction with other work in the area.
- 2. Protect surrounding areas as needed to preserve condition, finish and appearance of complete work. Avoid precipitation, dust, and debris. Protect reinforcing steel from exposure to release agents.
- 3. Use one concrete supplier for uniformity of color and texture.

## **MATERIALS**

- 1. Concrete, joint filler and reinforcing steel shall meet the requirements of Section 908.02, except that concrete shall be Class "47B-20".
- 2. Concrete imprinting pattern: Fluted fractured fin to match form liner pattern "Fluted Fractured Fin" by Symons Corporation, 200 East Touhy Avenue, Des Plaines, Illinois 60018.
- 3. Concrete coloring system: Dry-shake color hardener, colored release agent, curing compound and sealer. The terrace color shall appear to be two-toned dark sepia brown. To achieve this, the color hardener color shall be "Russet" and the release agent shall be "Cordovan Brown", as shown by the color charts for Lithochrome Color Hardener, by Scofield Systems, contact Mark Choo, (641) 755-3569. Colors of hardener and release agent to match reference samples as approved by the Project Manager/HDR Landscape Architect. Curing compound and sealers to be compatible with hardener and release agents.

## **CONSTRUCTION METHODS**

- 1. Layout terrace to the locations and elevations shown on the plans.
- 2. Prepare the subgrade and construct terrace in the same manner as specified for concrete slope protection in Section 908.01 except as modified by the following requirements.
  - a. Place reinforcing as shown on the details in the plans.
  - b. Expansion joint spacing: place an expansion joint at 9 m on center.
  - c. Contraction joint spacing: place a contraction joint at 3 m on center.

- d. Float concrete to a uniform surface.
3. Apply color hardener evenly to the surface of fresh concrete by the dry-shake method using a minimum of 27.21 Kg. per 9.29 square meters. Apply hardener in two or more shakes, floated after each shake and troweled only after final floating. Follow manufacturer's recommendations to achieve desired affect as approved on demonstration panel.
4. Apply release agent evenly to troweled surface, at rate recommended by manufacturer, prior to imprinting.
5. While concrete is in plastic stage, imprint pattern to surface.
  - a. Place fin lines of pattern perpendicular to horizontal edge of terrace bottom. Channels and fin lines within desired pattern are intended to extend from terrace top to bottom and allow for drainage.
  - b. Layout patterns so that construction and expansion joints occur along channel line of pattern. Do not allow the vertical line of the fin portion of the pattern to cross over a joint line.
  - c. Clean imprinting tool before each use. Replace damaged tool whose continued use or repair would negatively impact the aesthetics of the concrete finish
6. Apply curing method, as recommended by the manufacturer, immediately after completing imprinting process.
7. After the initial curing period, seal the colored and imprinted concrete surface as recommended by the manufacturer.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

1. The work of excavation, subgrade preparation, reinforcement, concrete construction, color application, finishing and any incidental items specified or shown on the detail will be measured as the total square meter area of the terrace in place.
2. The work of excavation, subgrade preparation, reinforcement, concrete construction, color application, finishing and any incidental items specified or shown on the detail will be paid for by square meter in place for the item "Concrete Terrace". This price shall be considered full compensation for all work prescribed.
3. The sample panel shall not be paid for directly but shall be considered subsidiary to the various bid items.

## **STONE PAVING**

### **GENERAL**

1. This section specifies the requirements for preparation and installation of stone paving as indicated on the plans.
2. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, tools, excavation, backfilling, services, and incidentals necessary to perform the work of this section.

3. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

1. American Society for Testing Materials (ASTM)
  - a. ASTM C 127-01 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  - b. ASTM C 33 Standard Specification for Concrete Aggregates.
  - c. ASTM D 698-00a Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
2. Standard Specifications for Highway Construction, Nebraska Department of Roads, 1997, Metric Units Edition.

## SUBMITTALS

1. Prior to obtaining stone to be used on Project, submit the following to the Engineer for Engineer's review and approval:
  - a. Submit samples of the proposed stone and deliver the samples, at the Contractor's expense, to a place designated by the Engineer.
  - b. Indicate stone source, including address and telephone number.
  - c. Submit test results on proposed stone showing compliance with specified tests.
2. Submit data indicating that aggregate base and setting bed meet specified standards and gradations.

## MATERIALS

1. Stone shall meet the following test criteria:
  - a. Specific gravity of stone shall be tested in accordance with ASTM C 127-01. The specific gravity of acceptable stone shall be not less than (2.60).
  - b. Absorption of stone shall be tested in accordance with ASTM C 127-01. The percent absorption of acceptable stone shall be not more than (2.0).
2. Grout: 2 part sand and 1 part Portland cement dry mixture.
3. Sand setting bed: per ASTM C 33.
4. Aggregate base: coarse aggregate per Table 1033.03A, Class F aggregate in the Standard Specifications.
5. Concrete edge: concrete per Section 1002 of the Standard Specifications

6. Perforated pipe underdrain: per Section 914 of the Standard Specification except the measurement and payment articles shall not apply.

## **CONSTRUCTION**

1. Coordinate installation of stone with finished grading and installation of terrace walls.
2. Stake upper limits of stone paving. Obtain Engineer's approval prior to installation. Engineer may field adjust limits
3. Excavate subgrade to the elevation required to meet finished grades of installed stone paving as shown on the plans.
4. Compact the upper 600 mm of the subgrade to a uniform density of not less than 98 percent of maximum density per ASTM D698. The moisture content of the subgrade material shall be adjusted to not more than 3 percent above or below the optimum moisture content.
5. Install concrete edge along the upper limits of stone paving as shown on the Plans and approved by the Engineer.
6. Prior to installing aggregate base course, uniformly apply soil sterilant over subgrade surface to the limits of stone paving.
7. Install perforated pipe underdrain as indicated on the plans. Field adjust pipe location as required for pipe to drain toward nearest inlet.
8. Install aggregate base course to the depth indicated on the Plans. Compact base to a uniform density of not less than 98 percent of maximum density per ASTM D698.
9. Install sand setting bed to a uniform depth indicated on the Plans.
10. Place stone securely on sand setting bed as shown on the Plans.
11. Fill spaces between stones with grout to approximately 25 MM below the top surface of the stones.
12. Spray entire stone and grout surfaces with a fine water mist for a minimum of three times. Complete wet the grout surface each time the mist is applied.
13. Spray grout surface with a clear curing compound.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

1. The work of subgrade preparation, aggregate base, sand setting bed, grout, concrete edge, stone paving and any incidental items specified or shown on the detail will be measured as the total square meter area of the stone paving in place.
2. The work of preparing subgrade, furnishing and installing aggregate base, sand setting bed, grout, soil sterilant, concrete edge and stone paving and any incidental items specified or shown on the detail will be paid for by square meter in place for the item "Stone Paving". This price shall be considered full compensation for all work prescribed.

3. The work of furnishing and installing perforated pipe underdrain shall not be measured or paid for directly but will be subsidiary to items for which direct payment is made.

## **GRASS PAVERS**

### **GENERAL**

1. This section specifies the requirements for preparation and installation of grass pavers as indicated on the plans.
2. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, tools, excavation, backfilling, services, and incidentals necessary to perform the work of this section.
3. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

1. American Society for Testing Materials (ASTM)
  - a. ASTM C 127-01 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  - b. ASTM C 136 Method for Sieve Analysis for Fine and Coarse Aggregate.
  - c. ASTM C 1319-95 Standard Specification for Concrete Grid Paving Units.
  - d. ASTM C 140 Sampling and Testing Concrete Masonry Units
  - e. ASTM C 33 Standard Specification for Concrete Aggregates.
  - f. ASTM D 5268 Specification for Topsoil Used for Landscaping Purposes.
  - g. ASTM D 698-00a Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
2. Standard Specifications for Highway Construction, Nebraska Department of Roads, 1997, Metric Units Edition.

### **SUBMITTALS**

1. Shop or product drawings or product data indicating layout of grass paver area.
2. Submit full size samples of grass paver units.
3. Submit test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C 1319.
4. Submit data indicating that aggregate base and setting bed meet specified standards and gradations.

5. Verify source and content of topsoil.

### **DELIVERY, STORAGE AND HANDLING**

1. Grass pavers shall be delivered to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift. The units shall be unloaded at the job site in such a manner that no damage occurs to the product.
2. Bedding sand and topsoil shall be covered with a secure waterproof covering to prevent exposure to rainfall or removal by wind.

### **PROJECT CONDITIONS**

1. Sand or grass pavers shall not be installed during heavy rain or snowfall.
2. Sand and grass pavers shall not be installed over frozen base materials.
3. Frozen sand shall not be installed.

### **MATERIALS**

1. Grass Pavers:
  - a. Pavers shall be Grasstone™, as manufactured by PaveStone®, Co.: Turfstone™ as manufactured by UNI® licensed producers, Grassblock™, as manufactured by Grass Concrete Limited, or approved equal.
  - b. Shape: lattice
  - c. Size: 600 mm x 400 mm
  - d. Thickness: minimum 80 mm
2. Sand setting bed: per ASTM C 33.
3. Aggregate base: coarse aggregate per Table 1033.03A, Class F aggregate in the Standard Specifications.

### **CONSTRUCTION**

1. Coordinate installation of grass pavers with finished grading.
2. Stake limits of grass pavers. Obtain Engineer's approval prior to installation. Engineer may field adjust limits
3. Excavate subgrade to the elevation required to meet finished grade of installed grass pavers as shown on the plans.
4. Compact the upper 600 mm of the subgrade to a uniform density of not less than 95 percent of maximum density per ASTM D698. The moisture content of the subgrade material shall be adjusted to not more than 3 percent above or below the optimum moisture content.
5. Install aggregate base course to the depth indicated on the Plans. Extend base course 300 mm beyond proposed edge of pavement. Compact base to a uniform density of not less than 98 percent of maximum density per ASTM D698.

6. Install sand setting bed to the depth indicated on the Plans. The sand shall be spread evenly over the base course and screeded to a nominal 25 mm thickness, not exceeding 40 mm thickness. The screeded sand should not be disturbed. Sufficient sand shall be placed in order to stay ahead of the laid pavers. Bedding sand shall not be used to fill depressions in the base surface.
7. Place grass pavers on sand setting bed as shown on the Plans and per manufacturer's recommendations. Pavers shall be free of foreign material before installation. Straight pattern lines shall be maintained.
8. Fill paver units with topsoil. Sweep excess topsoil off of paver units.
9. Broadcast grass seed at the rate specified for the mix designated on the plans for this area. Cover seeded pavers with mulch as specified in the Standard Specifications for seeding.
10. Do not allow traffic over pavers until a sufficient stand of grass as been established, as determined by the Engineer.

#### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

1. The work of excavation, subgrade preparation, aggregate base, sand setting bed, edge restraint, grass pavers, topsoil and any incidental items shown on the detail will be measured as the total square meter area of the grass pavers in place.
2. The work of preparing subgrade, furnishing and installing aggregate base, sand setting bed, edge restraints, grass pavers, topsoil placement and any incidental items shown on the detail will be paid for by square meter in place for the item "Grass Pavers". This price shall be considered full compensation for all work prescribed.
3. The work of seeding shall not be measured or paid for directly but will be subsidiary to items for which direct payment is made.

#### **JACKING CULVERT PIPE**

Paragraph 1. of Subsection 731.05 in the Metric Edition of the Standard Specifications is amended to include the following:

Pay Item	Pay Unit
Jacking ____mm Storm Sewer Pipe, Type ____	Meter(m)

#### **TEMPORARY BULKHEAD FOR STORM SEWER**

This work shall consist of furnishing and installing temporary bulkhead for storm sewers as needed for phasing.

Temporary bulkheads shall be constructed of 18mm exterior grade plywood. The outside

diameter of the bulkhead shall be the outside diameter of the sewer pipe plus 300 mm.

Work for furnishing and installing the temporary bulkheads shall be considered incidental to the work related to furnishing and installing of storm sewer, and shall not be paid for directly.

### **PEDESTRIAN RAILING (CHAIN LINK TYPE)**

Paragraph 1. of Subsection 716.05 in the 1997 Metric Edition of the Standard Specifications is amended to include the following:

Pay Item	Pay Unit
_____ m Pedestrian Railing (Chain Link Type)	Meter (m)

### **MECHANICALLY STABILIZED EARTH (MSE) WALLS WITH CONCRETE FACING PANELS (S7-3-0302)**

Table 714.04 in the 1997 English Edition of the Standard Specifications is void and superseded by the following:

<b>Table 714.04</b>		
<b>Property</b>	<b>Requirement</b>	<b>Test Method</b>
Resistivity	Minimum 3000 ohm-cm, at 100% saturation	AASHTO T 288
ph	Acceptable Range 5-10	AASHTO T 289
Chlorides	Maximum 100 ppm	AASHTO T 291
Sulfates	Maximum 200 ppm	AASHTO T 290

Paragraph 5.d. of Subsection 714.02 in the 1997 English Edition of the Standard Specifications is void and superseded by the following:

A copy of all test results performed by the Contractor, which includes: AASHTO T 27, AASHTO T 90, AASHTO T 99, AASHTO T 104, AASHTO T 236, AASHTO T 288, AASHTO T 289, AASHTO T 290, and AASHTO T 291, shall also be furnished to the Engineer.

Paragraph 3. of Subsection 714.04 in the Standard Specifications is amended to provide that the Random Backfill shown in the plans will not be measured for payment, but shall be considered subsidiary to the item "Select Granular Backfill for MSE Walls".

**PRECAST/PRESTRESSED CONCRETE STRUCTURAL UNITS  
(S7-5-0302)**

Table 705.03 in Section 705 in the Standard Specifications is void and superseded by the following:

**Table 705.03**

<b>Required Concrete Sampling and Testing</b>		
<b>Test</b>	<b>Contractor Test Samples*</b>	<b>Department Correlation Test Samples</b>
Yield ASTM C138 Air meter measuring bowl.	One per day	One per 10 Contractor tests (for each mix)
Air content ASTM C 231 (0.8% variation allowed)	One per load	One every 5 production days. (for each mix)
Concrete Temperature ASTM C 1064	One per load	One every 5 production days. (for each mix)
<b>Concrete Compressive Strength</b>		
28-day strength ASTM C 31 Section 9.3 Cure	Two cylinders – each from a different load; and one from the last load	One set of two cylinders every 5 production days. (for each mix)
56-day strength (Used only if 28-day strength is less than specified.) ASTM C 31 Section 9.3 Cure	Two cylinders – each from a different load and from same load as 28-day break.	N/A
<p>* At least 6 cylinders shall be made each production day and at least 2 cylinders are required from each load.</p> <p>* Cylinders shall be 4 inches (100 mm) by 8 inches (200 mm).</p> <p>* Contractor test samples and Department correlation test samples shall be taken independently.</p>		

**DIRECT TENSION INDICATORS  
(S7-6-1003)**

Paragraph 10.h.(1) of Subsection 708.03 in the Standard Specifications is void and superseded by the following:

- (1) High strength fasteners shall be installed using either the Turn-of-Nut Method or Direct Tension Indicators (DTIs).

Paragraph 10.h. of Subsection 708.03 in the Standard Specifications is amended to include the following:

Direct Tension Indicators (DTIs):

- (1) Self-indicating type DTIs that meet the requirements of ASTM F959/F959M shall be used.
- (2) DTIs shall be installed in accordance with Division II, Article 11.5.6.4.7 of the AASHTO Standard Specifications, 16<sup>th</sup> edition.
- (3) The Contractor shall provide to the Engineer a detailed inspection instructions prepared by the manufacturer for approval.
- (4) At the start of work, representative samples shall be submitted to the NDOR Materials and Research Division for testing in the tension calibration device to demonstrate that the DTIs supplied are within the compression load ranges in Table 3 of ASTM F959/F959M.
- (5) Installation and tightening of individual bolts with DTIs shall be in accordance with manufacturer instructions.
- (6) The Direct Tension Indicators shall be stored in an environment that preserves the surface condition supplied by the manufacturer.
- (7) Reuse of Direct Tension Indicators is not allowed.

**SHEAR CONNECTORS  
(S7-7-1002)**

Shear connectors are now to be installed according to OSHA Instruction, Directive No. CPL 2-1.34 dated March 22, 2002.

Section 708 in the Standard Specifications is amended as follows:

1. Paragraph 24. of Subsection 708.03 is void.
2. Paragraph 3. of Subsection 708.04 is void.
3. Paragraphs 1. and 5. of Subsection 708.05 are void.

### **CONCRETE BRIDGE FLOORS (S7-8-1102)**

Paragraph 2.b. of Subsection 706.03 in the Standard Specifications is void and superseded by the following:

- b. Bridge floor concrete shall not be placed when the ambient air or concrete temperature is above 90°F (32°C).

Table 706.01 in Subsection 706.03 is void and superseded by the following:

**Table 706.01**

<b>Temperature and Wind Velocity Limitations</b>	
<b>Air Temperature in the Shade</b>	<b>Maximum Wind Velocity</b>
90°F (32°C)	10 mph (16 kph)
77°F (25°C)	16 mph (25 kph)
68°F (20°C)	22 mph (35 kph)
59°F (15°C)	28 mph (45 kph)
50°F (10°C)	40 mph (65 kph)

### **STEEL STRUCTURES (S7-9-0903)**

Paragraph 16.a of Subsection 708.03 in the Standard Specifications is void and superseded by the following:

- a. Rolled beams and plate girders which are manufactured to a specified yield point of 50,000 psi (345 MPa) or less may be heat curved in accordance with the Standard Specifications when so indicated in the plans or in the Special Provisions.

Paragraph 20.a. (1) of Section 708.03 of the Standard Specifications for Highway Construction is void and superseded by the following:

- a. (1) The Contractor shall give the Engineer 30 days advance notice of shop work and provide a copy of the anticipated production schedule. The Engineer shall be notified three working days (Saturdays, Sundays and Holidays are excluded) before actual fabrication start time so inspection can be scheduled.

### **PILE SOIL-SETUP (S7-10-0703)**

Paragraph 5. of Subsection 703.05 in the Standard Specifications is void and superseded by the following:

5. All pile soil-setup factors ordered by the Engineer will be paid for at the rate of \$750.00 each. Multiple soil-setup factors taken for any one group and within one hour of each other will be considered one soil-setup factor and payment will be a total of \$750.00.

### **CONCRETE BRIDGE RAILS (S7-11-1203)**

Section 704 in the Standard Specifications is amended to include the following:

All concrete rails on bridges and approach slabs, with the exception of "Jersey" shaped rails, shall be cast-in-place. Slip-forming will be permitted only on "Jersey" shaped rails.

### **ELASTOMERIC BEARINGS**

#### **Description**

1. This work shall consist of furnishing and installing elastomeric bearing devices at the locations shown on the plans.
2. Prior to fabrication, the Contractor shall submit shop drawings to the Engineer for review.

#### **Material Requirements**

1. The elastomeric bearings shall consist of a laminated bearing pads conforming to the requirements of the Standard Specifications, 1997 Metric Edition, Section 1068 – Elastomeric Bearings and Laminated Bearing Pads.
2. a. All components for the bearing assemblies shall be fabricated and certified by the manufacturer for the complete assembly. The certification shall state that all materials used in the fabrication of the bearing assemblies comply with the requirements of this Specification. The assemblies shall be suitably packaged to prevent damage during shipment and storage.  
b. Testing shall be in accordance with the AASHTO Standard Specifications for Highway Bridges. The Engineer shall be allowed to witness all testing and approve the testing agency or other parties involved in the testing operation.
3. The manufacturer of the elastomeric bearing assemblies shall provide to the Engineer all appropriate certified mill tests reports for all materials used in the manufacturing process.

#### **Construction Methods**

1. The Contractor shall provide and install the elastomeric bearing assemblies as prescribed in the plans.

#### **Basis of Payment**

1. 

<u>Pay Item</u>	<u>Pay Unit</u>
Elastomeric Bearing	Each (ea)
2. Payment is full compensation for all work prescribed in this Section.

## **BRIDGE SHORING AND TEMPORARY BRIDGE SHORING**

Paragraph 1 of Subsection 701.02 of the 1997 Metric Edition of the Standard Specifications is void and superseded by the following:

1. a. The contractor shall excavate and place shoring as necessary to insure safe access to work areas.
- b. (1) Adequate shoring must be installed by the Contractor during phased construction to retain the existing roadway fills, proposed roadway fills and traffic surcharge, where applicable.
- (2) The shoring shall not be left exposed to traffic at any time.
- (3) Shoring shall be designed by a Professional Engineer registered in the State of Nebraska.
- (4) The calculations and a shoring plan shall bear the seal of the designer and four copies of each shall be submitted to the Engineer before construction. These calculations and plans will be for informational purposes only. The Contractor is solely responsible for the satisfactory construction and performance of the shoring.
- (5) Shoring indicated on the plans as Bridge Shoring will not be pulled. Any removal required shall be by flame cutting unless approved otherwise by the Engineer. Flame cutting shall be to a minimum of 100mm below the bottom of the roadway paving or approach slab and as required to allow construction of the piers, abutments or grade beams.
- (6) Shoring indicated in the plans as Temporary Bridge Shoring shall be removed by the Contractor.
- (7) Bridge Shoring and Temporary Bridge Shoring shall be measured for payment by the Lump Sum and paid for as BRIDGE SHORING or TEMPORARY BRIDGE SHORING. The price shall be full compensation for designing, furnishing, installing and maintaining the shoring, pulling temporary shoring, removing permanent shoring to the limits required, and for all labor, materials, equipment, tools and incidentals necessary to complete the work.

## **OVERHEAD SIGN SUPPORT**

### **DESCRIPTION**

This work shall consist of furnishing and installing overhead sign supports of the following types:

1. Ground-mounted overhead sign trusses
2. Ground-mounted overhead cantilever sign trusses
3. Bridge-mounted overhead sign trusses
4. Bridge-mounted overhead sign brackets

The work shall include the design and construction of new support footings for the ground-mounted overhead sign supports, design and fabrication of overhead sign trusses and overhead cantilever sign trusses (both ground and bridge-mounted), fabrication of the overhead sign brackets, preparation of the existing bridge structure for bridge-mounted sign brackets and installation of a the new sign supports and signs for all types of overhead sign supports.

For ground-mounted sign supports, the Contractor shall verify ground elevations and then have the manufacturer proceed with the foundation design. It will be the Contractor's responsible to obtain geotechnical information prior to beginning the design effort.

For bridge-mounted overhead sign trusses, the Contractor will need to obtain anchor bolt sizes and the diameter of anchor bolt circles from the sign support manufacturer for incorporation of the anchor bolts into the bridge barrier.

For bridge-mounted overhead sign brackets, working drawings shall be submitted for review in accordance with Section 105 of the Standard Specifications.

## **MEASUREMENT AND PAYMENT**

Overhead Sign Supports shall be paid for at the contract unit price per each for the item "Overhead Sign Support, Location \_\_\_\_." This price shall be considered full compensation for **obtaining the geotechnical information; designing the foundations; construction of the foundations; designing overhead sign truss and overhead cantilever sign truss structures; preparation of the existing bridge structure for overhead sign brackets; installation of the sign structure and signs;** and all labor, equipment, and incidentals necessary to complete the work.

## **1070mm CONCRETE "F"-SHAPE BARRIER**

### **DESCRIPTION**

This work shall consist of constructing a 1070 mm tall reinforced concrete barrier as shown on the plans. The work includes furnishing and placing epoxy coated reinforcing and concrete for the barrier as well as furnishing and placing epoxy coated reinforcing in the attached pavement.

In order to provide a smooth and uniform surface for the colored concrete coating, all formwork for the barrier shall utilize steel forms. Snap-off ties within the form (snap ties) shall not be permitted.

All concrete F-shaped barriers shall be cast in place. The barriers shall receive a rubbed finish.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The barrier shall be paid for at the unit price per meter for the item "Concrete Class 47BD-30 Barrier Curb F-Shape." The payment shall be full compensation for all materials, labor, equipment, tools and incidentals to complete the work.

## **TEMPORARY WALL**

### **DESCRIPTION**

The Contractor shall design, install and remove the temporary retaining wall shown on the plans to support the surcharge fill east of the Big Papillion Creek and south of West Dodge Road. After removal, the material shall become the property of the Contractor and shall be disposed of in a manner satisfactory to the Engineer. No temporary retaining wall material shall be left in place above or below grade. The face of the temporary wall shall be constructed approximately vertical. Silt fence shall be installed at the top of the temporary wall. The Contractor shall submit a design to the Engineer for review prior to construction. Details and calculations for the wall shall be prepared and sealed by professional engineer registered to practice in the State of Nebraska.

If the temporary wall is designed as a mechanically stabilized earth structure, the design shall be in general conformance with the special provision for "Wire Mesh Mechanically Stabilized Earth Wall." However, the provisions for a concrete facing shall not apply and the wall shall only require a maximum design life of five years. The allowable bearing pressure of the foundation soils is 140 kPa.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The temporary retaining wall shall be paid for by the each for "Temporary Wall." This price shall be full compensation for designing, installing, maintaining, removing and disposing of the temporary wall, including the silt fence, and for all equipment, tools, labor materials and incidentals necessary to complete the work.

## **TEMPORARY SLOPE PROTECTION**

### **DESCRIPTION**

This work shall consist of constructing temporary slope protection for the existing 120<sup>th</sup> Street Bridge as shown on the plans. The work includes partial removal of the existing concrete slope protection, removal of shoulder surfacing, excavation of earth under the removed area of slope protection, drilling and epoxy grouting dowel bars into the existing slope protection, and furnishing and placing a concrete filler fabric mat as a temporary slope protection.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The temporary slope protection shall be paid for at the unit price per square meter for the item "Temporary Slope Protection." The payment shall be full compensation for all materials, labor, equipment, tools and incidentals to complete the work.

## **CONCRETE BARRIER CURB SPECIAL**

### **DESCRIPTION**

This work shall consist of constructing a reinforced concrete barrier between the columns of the existing 120<sup>th</sup> Street Bridge as shown on the plans. The work includes partial removal of existing concrete at the base of the existing 120<sup>th</sup> Street Bridge Pier, drilling and epoxy grouting dowel bars into the existing pier columns and footing, and furnishing and placing epoxy coated reinforcing and concrete for the barrier.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The barrier shall be paid for at the unit price per meter for the item "Concrete Barrier Curb Special." The length shall be measured at mid-height of the barrier. Payment shall be full compensation for all materials, labor, equipment, tools and incidentals to complete the work.

## **CONCRETE BRIDGE BARRIER**

Section 704 of the Standard Specifications is amended to include the following:

All concrete barriers on bridges and approach slabs, with the exception of "Jersey" shaped barriers, shall be cast-in-place. Slip-forming will be permitted only on "Jersey" shaped barriers.

In addition, in order to provide a smooth and uniform surface for the colored concrete coating, all concrete barriers on bridges and approach slabs shall utilize steel forms. Snap-off ties within the form (snap ties) shall not be permitted.

## **CONCRETE BARRIER TRANSITIONS**

### **DESCRIPTION**

This work shall consist of constructing various concrete barrier transitions to accommodate changes in height, changes in shape or special geometry transitions as shown in the plans. The work includes furnishing and placing epoxy coated reinforcing steel and concrete for the barrier transitions as well as furnishing and placing epoxy coated reinforcing steel in the attached pavement as required. If noted on the plans, the work also includes application of a concrete color coating to the barrier transition for the limits described.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

The barrier transition will be paid for at the contract unit price per each for the following items. The payment shall be full compensation for all Class 47BD-30 concrete, epoxy coated reinforcing steel, preformed joint filler, joint sealant, concrete color coating (where shown on the plans) and all other materials, labor, equipment, tools and incidentals to complete the work.

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete Class 47BD-30 Barrier Transition Section "F"-Shape Barrier to Median Barrier	Each
Concrete Class 47BD-30 Barrier Transition Section "F"-Shape Barrier to Curb	Each
Concrete Class 47BD-30 Barrier Transition Section Vertical Barrier to Curb	Each
Concrete Class 47BD-30 Barrier Transition Section Type A	Each
Concrete Class 47BD-30 Barrier Transition Section Type B	Each
Concrete Class 47BD-30 Barrier Transition Section Type C	Each

## **APPLICATION OF CONCRETE COATINGS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. This section specifies the requirements for preparation and coating (painting) of concrete bridge components including girders, rails/curbs, piers, abutments, wing walls, MSE walls and slope protection as well as rails/curbs on approach roadways.
- B. The Contractor shall prepare concrete surfaces and apply coatings in accordance with these specifications and manufacturer's recommendations.
- C. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, services, and incidentals necessary to perform the work of this section.
- D. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

#### **1.02 REFERENCES** - The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

- A. Equipment and Coating Manufacturer's Published Instructions
- B. American Society for Testing Materials (ASTM)
  - 1. ASTM D 3359 Standard Test Methods for Measuring Adhesion by Tape Test
  - 2. ASTM D 4138 Standard Test Methods for Measurement of Dry Film Thicknesses of Protective Coating Systems by Destructive Means
  - 3. ASTM D 4262 Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces

4. ASTM D 4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
5. ASTM D 4285 Standard Test Method for Indicating Oil or Water in Compressed Air
6. ASTM D 4414 Standard Practice for Measurement of Wet Film Thickness by Notch Gages
7. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926 Occupational Safety and Health Regulations for the Construction Industry
2. 29 CFR 1926.20 General Safety and Health Provisions
3. 29 CFR 1926.21 Safety Training and Education
4. 29 CFR 1926.59 Hazard Communication
5. 29 CFR 1926.103 Respiratory Protection
6. 29 CFR 1926.104 Safety Belts, Lifelines, and Lanyards
7. 29 CFR 1926.105 Safety Nets
8. 29 CFR 1926.352 Fire Prevention
9. 29 CFR 1926.451 Scaffolding

D. Society for Protective Coatings (SSPC)

1. SSPC-SP 13 Surface Preparation of Concrete

**1.03 QUALIFICATIONS AND EXPERIENCE**

- A. The Contractor performing the work of this section shall be a company specializing in performing the work of this section, having within three (3) years preceding the acceptance of the Contractor's Proposal, successfully completed at least two contracts similar in scale to this project.

**1.04 SUBMITTALS**

- A. The Contractor shall submit a letter from the coating manufacturer that acknowledges the acceptability of the specified systems for the various substrates to be painted, and the acceptability of the specified methods of surface preparation.

- B. The Contractor shall provide written application instructions from the manufacturer, which shall include mixing and potlife requirements, recommended application equipment, etc.
- C. The Contractor shall provide Product Data Sheets, along with Material Safety Data Sheets (MSDS) for all coating products including thinners and cleaning agents.
- D. The Contractor shall provide a test application of the color coatings for review and approval of the final color tones. Unless otherwise designated by the Engineer, the test application shall consist of fully coating Pier 22W as well as the south face of the prestressed concrete bridge girder (if applicable), deck slab, and barrier rail for 9.0 meters either side of this pier. Color combinations shall be as shown in the contract plans. Actual coating materials may utilize any of the pre-approved coating systems noted in Part 2 of these special provisions. However, the color tones associated with color codes A & B shown in the plans shall be formulated to match the following color numbers of the Sherwin Williams Company:

Color A: SW 7012 (Creamy)  
Color B: SW 7010 (White Duck)

Color C as designated in the plans shall match either Sherwin Williams color number SW 6055 (Fiery Brown) for a prestressed concrete girder superstructure or color number 30045 of Federal Standard Number 595a (January 2, 1968) for a steel plate girder superstructure.

The coatings shall be applied so they can weather through at least one winter season prior to final approval of the colors by the Engineer. Upon approval of the final colors, the concrete coatings may be applied by the Contractor to the remaining bridge, wall and barrier elements. The contractor shall not order coating materials for final production coating until the Engineer provides approval of the test colors or direction to alter the colors.

## **1.05 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

- A. Unless noted as subsidiary in the plans, the application of coatings will not be measured but will be paid for by the lump sum for the items "Concrete Coatings at Sta. \_\_\_\_" and "Concrete Coating". This price shall be considered full compensation for all work prescribed including the test application of color coatings and any recoating of the test application area needed if the final colors are revised.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Coatings** – Only the following coating systems shall be used.

- 1. The Contractor shall provide one of the following coating systems for application to concrete surfaces as shown on the plans.

Carboline Company

- a. Prime: Carbocrete Sealer WB Stain System
- b. Finish: Carbocrete Sealer WB Stain System

(Note: The Carbocrete Sealer WB Stain System is achieved by mixing Carbocrylic 3359 and Carbocrete Sealer WB.)

Prime coat mix ratio: 4 parts (minimum) Carbocrete Sealer WB to  
1 part Carbocrylic 3359

Finish coat mix ratio: 1 part Carbocrete Sealer WB to  
4 parts Carbocrylic 3359

Contact: Tom Calzone – Carboline Company Representative (800) 848-4645

ICI Devoe Coatings

- a. Prime: Anvil 1900 Series Siliconized Acrylic Concrete Stain
- b. Finish: Anvil 1900 Series Siliconized Acrylic Concrete Stain

Contact: Gary Jepsen – ICI Devoe Coatings Representative (402) 331-1133

NOX-CRETE, Inc.

- a. Prime: Nox-Carb
- b. Finish: Nox-Carb

Contact: NOX-CRETE Products Group (402) 341-1976

Sherwin-Williams Company

- a. Prime: HB-100 or HB-150 Water Repellent
- b. Finish: SWD D.O.T. Bridge and Highway Concrete Sealer B97-Series

Contact: Joe Wishard – Sherwin-Williams Company Representative  
(402) 592-0770

2. The Contractor shall provide a finish coat in a color and gloss approved by the Engineer. The finish colors for the bridge, MSE wall and rail/curb elements shall be as specified in Part 1 – General, Section 1.04 D of these special provisions.
3. The Contractor shall provide all paint materials in sealed, original, containers that are properly marked and labeled to allow verification with applicable material safety data sheets, application precautions, and instructions. Labeling shall include the manufacturer's name, type of material, brand name, color designation, date of manufacture, shelf life, contract or order number under which the material has been ordered, lot and batch numbers, quantity, handling, thinning, and application instructions.

B. Cleaning Agents, Detergents and Etches

4. The Contractor shall provide an ample supply of potable water for the cleaning operations. Cleaning agents, detergents or surface etches shall be used as necessary to achieve a clean surface in accordance with the manufacturer's recommendations.

**2.02 EQUIPMENT**

A. Surface Preparation Equipment

1. The Contractor shall provide all necessary equipment, such as pressure washing equipment, abrasive blast equipment, brushes and other tools as necessary to conduct the work as specified in this section.

B. Paint Application Equipment

2. The Contractor shall provide all spray equipment, rollers, brushes and daubers to conduct the work as specified in this section.

**2.03 CONTAINMENT MATERIALS**

- A. The Contractor shall supply all equipment and materials needed to contain all overspray, paint drips and spills. This may include, but is not limited to: ground covers, rigging, scaffolding, planking and containment screens or tarpaulin materials
- B. The Contractor shall use materials that are free of loose dust and debris when brought onto the construction site.

**PART 3 – EXECUTION**

**3.01 TECHNICAL REPRESENTATION BY MATERIAL MANUFACTURERS**

- A. The Contractor shall arrange for a qualified technical representative of the paint manufacturer to visit the site to verify that the quality of surface preparation and product application are satisfactory for the coating system. Visits are required during the pre-production surface preparation demonstration and at the start of the project. Additional visits may be requested by the Engineer.
- B. The Contractor shall have the manufacturer summarize the results of the inspections in writing, together with recommendations. The Contractor shall provide copies of the manufacturer's reports to the Engineer within 7 days after the visits.

### **3.02 PROTECTION OF SURFACES AND SURROUNDING PROPERTY**

- A. Tarps shall be provided to contain all overspray, paint drips and spills.
- B. The Contractor shall use diligence to assure that vehicles, structures, buildings, equipment, hardware, fixtures, and other materials are protected from overspray, paint spillage, and other damage.
- C. In addition to tarps, the Contractor shall use protective coverings, shields, or masking as necessary to protect bridge surfaces that are not designated to receive surface preparation or coating.
- D. The Contractor shall maintain all protective coverings during the entire period the work is being performed, and remove all coverings upon completion of the work.
- E. All costs associated with furnishing tarps and other materials, installing and removing of tarps, shall not be paid for directly but shall be considered subsidiary to the items for which direct payment is provided.
- F. The Contractor shall be responsible for the cleanup of any spills. All cleanup shall be done at no additional cost and to the satisfaction of the Engineer.
- G. When tarps are used, the Contractor shall secure them firmly to the bridge to avoid being dislodged during heavy winds. If tarps become dislodged, the Contractor shall stop work immediately and secure the loose tarps.
- H. When sustained winds are 40 mph or above, the Contractor shall drop and secure the tarps.

### **3.03 SURFACE PREPARATION**

- A. Pre-Production Surface Preparation Demonstration
  - 1. Prior to proceeding with production activities, the Contractor shall conduct cleaning and paint application procedures in a representative test area(s) selected by the Engineer. The purpose is to establish the degree of cleaning and observe the paint application procedures that will be performed throughout the project as defined in these specifications. The Contractor shall thoroughly document the testing process photographically and in writing. Documentation shall be submitted by the Contractor to the Engineer within 7 days of the demonstration.
  - 2. The Contractor shall arrange for representatives of the coating manufacturer to be present during this testing.
  - 3. The Contractor shall not proceed with production activities until the Engineer agrees that the test area(s) conform with the requirements of this section.
  - 4. Throughout the duration of the project, the Contractor shall maintain the quality of surface preparation established in the test area(s), and as defined in these specifications.

**B. Surface Cleaning Requirements**

5. Surfaces shall be cleaned in accordance with manufacturer's recommendations.

**C. Compressed Air Cleanliness**

6. The Contractor shall provide compressed air that is free from moisture and oil contamination for use in any operation in which the air may impinge upon the surface.
7. The Contractor shall use the white blotter test in accordance with ASTM D4285 to verify the cleanliness of the compressed air. The Contractor shall conduct the test at least once per shift for each compressor system. Sufficient freedom from oil and moisture is confirmed if soiling or discoloration are not visible on the paper.
8. If air contamination is evidenced, the Contractor shall examine the work completed since the last satisfactory test for evidence of contamination, and conduct any necessary clean up or repair. The Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air.

**3.04 PAINT STORAGE, MIXING, AND HANDLING**

**A. Testing of Paint Samples**

1. The Engineer reserves the right to conduct tests of the paint materials at any time during the period of field painting. The tests will be conducted to confirm that the material, as supplied, complies with the compositional information provided by the manufacturer in the original submittals.
2. When the Engineer decides to conduct tests, the Engineer will collect a representative pint or quart sample of each component of paint at the construction site. The samples will be transferred to metal containers, identified, sealed and signed in the presence of the Contractor.
3. If the laboratory test results show that the material being used does not comply with the information provided in the Submittals, the Contractor shall be directed to stop painting, and to remove and repaint all surfaces coated with rejected paint, all at no additional cost.

**B. Paint Storage**

1. The Contractor shall store all flammable materials in approved storage containers at locations approved by the Engineer.
2. The Contractor shall store all paint, thinners, and solvents in accordance with OSHA regulations and the requirements of the paint manufacturer. The Contractor shall store the paint and solvents under cover, out of direct sunlight. The Contractor shall maintain the temperature between 40°F (4°C) and 90°F (32°C), unless the requirements of the manufacturer are more restrictive.

3. The Contractor shall not permit smoking in paint storage, mixing, and application areas.
4. The Contractor shall keep all containers of paint unopened until required for use.
5. The Contractor shall not open or mix paints in the storage area.
6. The Contractor shall not return mixed paints to the storage area.
7. The Contractor shall not permit the accumulation of empty paint cans, combustibles, and other debris. The Contractor shall remove waste chemical solutions, oily rags, and waste daily.
8. The Contractor shall maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.
9. The Contractor shall keep storage area neat and orderly.
10. The Contractor shall take all necessary precautionary measures to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of materials.

C. Mixing and Thinning of Coating Materials

1. The Contractor shall not use paint that has exceeded its shelf life.
2. When required by the manufacturer, the Contractor shall warm paints stored at less than 50°F (10°C) to above 50°F (10°C) prior to mixing.
3. The Contractor shall utilize proper ventilation in the mixing area to prevent injury to workmen or the accumulation of volatile gases.
4. The Contractor shall mix all coatings in accordance with the requirements of the coating manufacturer using mechanical equipment such as a Jiffy mixer.
5. When using two component materials, the Contractor shall mix only complete kits. Mixing of partial kits is not allowed.
6. The Contractor shall not use two component materials beyond the pot life established by the manufacturer's written instructions.
7. The Contractor shall not thin any paints unless approved in writing by the paint manufacturer and the Engineer. If thinning is required and authorized, the Contractor shall use only those types, brands, and amounts of thinner stipulated by the coating manufacturer. The Contractor shall comply with VOC limits after thinning.
8. The Contractor shall deliver paint ready mixed to approved tints and colors. Construction site tinting is prohibited.

### **3.05 COATING APPLICATION**

#### **A. General**

1. The Contractor shall apply the coatings in accordance with the requirements of this section, and the coating manufacturer.
2. In the event of a conflict between the manufacturer's technical data and the requirements of this section, the Contractor shall comply with this section unless the requirements of the manufacturer are more restrictive. When the manufacturer's requirements are more restrictive, the Contractor shall advise the Engineer of the discrepancies in writing, and comply with the more restrictive requirement. The decision of the Engineer will be final.

#### **B. Quality of Surface Preparation Prior to Painting**

1. The surface shall exhibit the specified degree of cleaning immediately prior to painting. The Contractor shall reclean deficient areas.

#### **C. Surface Cleanliness Between Coats**

1. The Contractor shall thoroughly clean the surface of each coat prior to the application of the next coat to remove dirt, dust, and other interference material. The Contractor shall pay particular attention to the removal of detrimental residue from surfaces such as corners and pockets.
2. The Contractor shall clean the surfaces by brushing, vacuuming, or blowing down with compressed air.
3. If grease or oil have become deposited on the surface of any of the applied coats, the Contractor shall remove by solvent cleaning in accordance with SSPC-SP1 prior to the application of the next coat.

#### **D. Ambient Conditions During Coating Application - The Contractor shall apply coatings under the following conditions unless the requirements of the coating manufacturer are more restrictive. The Contractor shall not apply coatings under less restrictive conditions without written approval of the coating manufacturer, and specific written authorization from the Engineer.**

1. Surface and Air Temperatures - Between 50°F (10°C) and 100°F (38°C).
2. Relative Humidity - Less than 90%.
3. Dew Point - Surface temperature at least 5°F (3°C) above the dew point temperature of the surrounding air.
4. Frost/Rain - The Contractor shall not apply coatings to surfaces containing frost or free standing water, or during rain, fog, or similar detrimental weather conditions.

5. The Contractor shall remove and replace any paint that is exposed to unacceptable conditions (e.g., rain or dew) prior to adequate curing.
- E. Methods of Application - The Contractor shall apply all coats in accordance with the manufacturer's recommendations. In all cases, overspray, drips, splashes and spills must be controlled.
- F. Recoat Times
  1. The Contractor shall apply each coat only after the previous coat has been allowed to dry as required by the manufacturer's written instructions, but as soon as possible to minimize the length of time that the coating is exposed to dust and contamination.
  2. The Contractor shall not allow any coat to remain exposed for longer than the manufacturer's written instructions for maximum recoat time prior to recoating.
  3. If a coat exceeds the manufacturer's maximum recoat times for any reason, the Contractor shall remove and replace the coating. As an alternative, the Contractor shall provide written instructions from the coating manufacturer for the specialized preparation that can be undertaken (e.g., scarifying the surface) to properly prepare the surface to receive the next coat. The specialized steps can be undertaken only if approved by the Engineer in writing. The Contractor shall perform the specialized cleaning or removal and replacement of the coatings at no additional cost.

### **3.06 REPAIR OF DAMAGE AND UNACCEPTABLE COATINGS**

- A. Surface Preparation of Localized Areas
  1. The Contractor shall repair localized damage, and unacceptable coatings.

### **3.07 HOUSEKEEPING AND WASTE DISPOSAL**

- A. The Contractor shall not store any paint or equipment on bridge structures.
- B. At the end of each day at a minimum, the Contractor shall haul empty paint cans and other debris to the waste storage area.
- C. The Contractor shall remove all paint drips, splashes, and overspray from surfaces not intended to be painted. The Contractor shall remove by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- D. The Contractor shall handle, store, transport, and dispose of all wastes, hazardous and non-hazardous, in strict accordance with Federal, State and Local regulations.

### **3.08 INSPECTION**

- A. The Engineer will inspect all phases of the work to verify that it is in accordance with the requirements of this section. The Contractor shall facilitate this inspection as required, including providing the Engineer with advance notice of scheduled work, allowing ample time for the inspections and access to the work. Inspections may

include, but are not limited to, surface preparation, pre-painting cleanliness, paint application, dry film thickness, film appearance and continuity, and adhesion. The Contractor shall not proceed with subsequent phases of the work until the preceding phase has been approved by the Engineer.

- B. The inspection by the Engineer in no way relieves the Contractor of the responsibility to comply with all requirements of this section, and to provide comprehensive inspections of its own to assure compliance with the approved Quality Control Inspection Plan.
- C. The Contractor shall furnish, until final acceptance of the coating system, all equipment and instrumentation needed for self-inspection of all phases of the work.

### **3.09 ONE-YEAR ANNIVERSARY INSPECTION**

- A. A One-Year Anniversary Inspection will be conducted approximately twelve months after tentative acceptance of the painting under the entire Contract. The Contractor shall participate in this inspection with the Engineer.
- B. The Contractor shall repair, at no additional cost, all locations where the coating exhibits disbonding, cracking, or other such defects, and perform all repairs in accordance with the requirements of this specification, and the coating manufacturer's written instructions.
- C. Final payment will be made following the completion of the work necessary to correct the deficiencies discovered during the One-Year Anniversary Inspection

## **SPECIAL SURFACE COATING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. This section specifies the requirements for preparation and coating of the Ashlar stone formed finish on retaining walls 10, 11, 12, 13, 20, 21, 22, 23 & 24.
- A. The Contractor shall prepare concrete surfaces and apply coatings in accordance with these specifications and manufacturer's recommendations.
- B. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, services, and incidentals necessary to perform the work of this section.
- C. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

#### **1.02 REFERENCES** - The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

- A. Equipment and Coating Manufacturer's Published Instructions.

B. American Society for Testing Materials (ASTM)

1. ASTM D 3359 Standard Test Methods for Measuring Adhesion by Tape.
2. ASTM D 4138 Standard Test Methods for Measurement of Dry Paint Thickness of Protective Coating Systems by Destructive Means
3. ASTM D 4262 Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
4. ASTM D 4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
5. ASTM D 4285 Standard Test Method for Indicating Oil or Water in Compressed Air
6. ASTM D 4414 Standard Practice for Measurement of Wet Film Thickness by Notch Gages
7. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926 Occupational Safety and Health Regulations for the Construction Industry
2. 29 CFR 1926.20 General Safety and Health Provisions
3. 29 CFR 1926.21 Safety Training and Education
4. 29 CFR 1926.59 Hazard Communication
5. 29 CFR 1926.103 Respiratory Protection
6. 29 CFR 1926.104 Safety Belts, Lifelines, and Lanyards
7. 29 CFR 1926.105 Safety Nets
8. 29 CFR 1926.352 Fire Prevention
9. 29 CFR 1926.451 Scaffolding

D. Society for Protective Coatings (SSPC)

1. SSPC-SP 13 Surface Preparation of Concrete

**1.03 QUALIFICATIONS AND EXPERIENCE**

A. The Contractor performing the work of this section shall specialize in performing the work of this section.

1. The Contractor shall have at least five (5) years experience and within three (3) years preceding the acceptance of the Contractor's Proposal, successfully completed at least two contracts similar in scale to this project.

2. The Contractor coating retaining walls shall be trained in the coating manufacturer's special techniques to achieve realistic stone surfaces.

#### **1.04 SUBMITTALS**

- A. A minimum of three weeks prior to commencing production coating of the wall surfaces, the Contractor shall submit a letter from the coating manufacturer that acknowledges the acceptability of the specified systems for the various substrates to be painted, the acceptability of the specified methods of surface preparation and compatibility of the specified system to the proposed anti-graffiti coating.
- B. Prior to beginning coating application, the Contractor shall provide written application instructions from the manufacturer, which shall include mixing, potlife requirements, recommended application equipment, etc.
- C. The Contractor shall submit a Compliance Certification by the coating manufacturer for local regulations controlling VOC content.
- D. Prior to beginning coating application, the Contractor shall provide Product Data Sheets, along with Material Safety Data Sheets (MSDS) for all coating products including thinners and cleaning agents.
- E. A minimum of one month before commencing production coating of walls, the Contractor shall submit examples of the proposed stone, represented through pictures, actual rock pieces or other means to show the intended colors to be simulated by the color staining system. The desired colors to be simulated for this project should match the tans, beiges and yellow hues found in limestone within the Minnesota and Iowa region. The Engineer shall determine final approval of the selected colors.
- F. Prior to performing the work of this section, the Contractor shall demonstrate surface preparation and coating application procedures on a representative test area in accordance with Subsection 3.02 of this special provision. The Contractor shall thoroughly document the testing process photographically and in writing. Documentation shall be submitted by the Contractor to the Engineer within 7 working days of the demonstration.
- G. Material Manufacturer's site reports
  1. The Contractor shall submit to the Engineer a copy of the field summary reports prepared by the coating manufacturer's representative upon completion of each site visit.
  2. The Contractor shall provide each report within one week after the site visit.
- H. Inspection Log or Report
  1. The Contractor shall maintain a daily log or daily report of all quality control inspections and test results in compliance with the approved Quality Control Inspection Plan.

2. Whenever the color coating operation is in progress, the Contractor shall submit a copy of the log or report form package to the Engineer each seven calendar days.

#### **1.05 PROJECT CONDITIONS**

- A. Color staining work may not proceed until Contractor has provided written verification of the compatibility of the anti-graffiti coating with the color staining system, and the Engineer has approved the application of the anti-graffiti coating on the sample panel.
- B. Schedule color stain application with earthwork, back filling of any wall areas, bridge construction and flatwork construction, making sure that all simulated stone texture is colored to the limits shown on the plans. Delay adjacent plantings until color application and subsequent anti-graffiti coating, if specified, is completed. Coordinate work to permit coloring applications without interference from other trades.

#### **1.06 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

- A. The work of furnishing and applying color coatings to the ashlar stone surfaces of walls will not be measured but shall be paid for by the lump sum for the item "Special Surface Coating". This price shall be considered full compensation for all work prescribed.
- B. The sample panel shall not be paid for directly but shall be considered subsidiary to the bid item "Special Surface Coating".

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Color stain for simulated stone finish:
  1. Special penetrating stain mix as provided by manufacturer, shall achieve color variations present in the natural stone being simulated for this project.
  2. Stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight or weathering.
  3. The following products are acceptable:
    - a. Prime coat  
TK-290 Tri-Siloxane  
TK Products, a division of Sierra Corporation  
11499 West 47<sup>th</sup> Street  
Minnetonka, MN 55343  
(952) 938-7223

Top Coat(s)  
CRI Pigmented Stain  
Custom Rock International  
1156 Homer Street  
St Paul, Minnesota 55116  
800-637-2447

- b. H&C HB-100 and HB-150 Water Repellents  
B-97 SWD D.O.T. Bridge and Highway Concrete Sealer  
Sherwin-Williams Company  
(402) 592-0770  
Joe Wishard – representative
- c. Carbocrete Sealer WB Stain System  
(Mixture of Carbocrete 3359 & Carbocrete Sealer WB)  
Carboline Company  
350 Hanley Industrial Curt  
St. Louis, MO 63144-1599  
(417) 860-7467  
Brian Cates - representative

- 4. The Contractor shall provide all paint materials in sealed, original, containers that are properly marked and labeled to allow verification with applicable material safety data sheets, application precautions, and instructions. Labeling shall include the manufacturer's name, type of material, brand name, color designation, date of manufacture, shelf life, contract or order number under which the material has been ordered, lot and batch numbers, quantity, handling, thinning, and application instructions.

B. Mortar Joints: Joints shall be colored and textured to simulate real mortar.

C. Cleaning Agents, Detergents and Etches:

- 1. The Contractor shall provide an ample supply of potable water for the cleaning operations. Cleaning agents, detergents or surface etches shall be used as necessary to achieve a clean surface in accordance with the manufacturer's recommendations.

## **2.02 EQUIPMENT**

A. Surface Preparation Equipment

- 1. The Contractor shall provide all necessary equipment, such as pressure washing equipment, abrasive blast equipment, brushes and other tools as necessary to conduct the work as specified in this section.

B. Coating Materials Application Equipment

- 1. The Contractor shall provide all spray equipment, rollers, brushes and daubers to conduct the work as specified in this section.

## **2.03 CONTAINMENT MATERIALS**

- A. The Contractor shall supply all equipment and materials needed to contain all over spray, paint drips and spills. This may include, but is not limited to: ground covers, rigging, scaffolding, planking and containment screens or tarpaulin materials.
- B. The Contractor shall use materials that are free of loose dust and debris when brought onto the construction site.

## **PART 3 – EXECUTION**

### **3.01 TECHNICAL REPRESENTATION BY MATERIAL MANUFACTURERS**

- A. The Contractor shall arrange for a qualified technical representative of the paint manufacturer to visit the site to verify that the quality of surface preparation and product application are satisfactory for the coating system. Visits are required during the pre-production surface preparation demonstration and at the start of the project. The Engineer may request additional visits if corrective action needs to be taken and verified by the technical representative.
- B. The Contractor shall have the manufacturer summarize the results of the inspections in writing, together with recommendations. The Contractor shall provide copies of the manufacturer's reports to the Engineer within one week after the visits.

### **3.02 PRE-PRODUCTION SURFACE PREPARATION AND COATING APPLICATION DEMONSTRATION**

- A. Prior to proceeding with production surface preparation and coating applications, the Contractor shall conduct surface preparation, coating application and coating repair procedures on a sample panel. The purpose is to establish the degree of cleaning and observe the paint application procedures that will be performed throughout the project as defined in these specifications. The accepted sample panel shall be the standard by which remaining work will be evaluated for technical and aesthetic merit. In addition, the completed sample panel shall demonstrate the following:
  - 1. Final coloration of cast stone concrete surface to accurately simulate the appearance of real stone including the multiple colors, shades, flecking, and veining that is apparent in real stone.
  - 2. The colors that may be apparent from aging, such as staining from oxidation, rusting and/or organic staining from soil and /or vegetation.
  - 3. The type of material used to simulate mortared joints.
  - 4. The method of repair, recoating and other procedures necessary to make unacceptable finishes meet the requirements of this specification.
- B. The sample panel used for the demonstration shall be the panel constructed by the Contractor and accepted by the Engineer to demonstrate the ashlar stone form liner finish.

- C. The Contractor shall arrange for a representative of the coating manufacturer to be present during this demonstration.
- D. The Contractor shall not proceed with production surface preparation activities until the Engineer agrees that the sample panel conforms with the requirements of this section.
- E. Throughout the duration of the project, the Contractor shall maintain the quality of surface preparation and coating application established on the sample panel and as defined in these specifications.
- F. Requests for substitute materials or techniques that vary from those demonstrated on the sample panel shall be submitted to the Engineer for approval prior to use on production surfaces. The Engineer may require the use of substitute materials or techniques to be satisfactorily demonstrated on the sample panel.

### **3.03 PROTECTION OF SURFACES AND SURROUNDING PROPERTY**

- A. The Contractor shall use protective coverings, shields, or masking as necessary to protect surfaces that are not designated to receive coating
  - 1. When tarps are used, the Contractor shall secure them firmly to avoid being dislodged during heavy winds. If tarps become dislodged, the Contractor shall stop work immediately and secure the loose tarps. When sustained winds are 64 km/hr (40 mph) or above, the Contractor shall drop and secure the tarps.
  - 2. The Contractor shall maintain all protective coverings during the entire period the work is being performed, and remove all coverings upon completion of the work.
  - 3. All costs associated with furnishing tarps and other containment materials, or installing and removing of tarps, shall not be paid for directly but shall be considered subsidiary to the items for which direct payment is provided.
- B. The Contractor shall use diligence to assure vehicles, structures, buildings, equipment, hardware, fixtures, and other materials are protected from over spray, paint spillage, and other damage.
- C. The Contractor shall be responsible for the cleanup of any spills. All cleanups shall be done at no additional cost and to the satisfaction of the Engineer.

### **3.04 SURFACE PREPARATION**

- A. Surface Cleaning Requirements
  - 1. The Contractor shall clean surfaces in accordance with manufacturer's recommendations.
  - 2. For simulated stone surfaces, the Contractor shall clean surface prior to application of stain materials to assure that surface is free of latency, dirt, dust, grease, efflorescence, paint, or other foreign material, following manufacturer's instructions for surface preparation. Do not sandblast. Preferred method to

remove latency is pressure washing with water, minimum 20,684 kPa (3000 psi) (a rate of 11 to 15 liters/minute (3 to 4 gallons/minute)), using fan nozzle perpendicular to and at a distance of 0.3 to 0.6 meters (1 to 2 feet) from surface. Completed surface shall be free of blemishes, discoloration, surface voids and unnatural form marks.

3. If pressure washing is used, the Contractor shall allow surface to dry in accordance with the coating manufacturers recommendations. Test locations that are likely to be slow in drying for dampness in accordance with ASTM D-4263.

**B. Compressed Air Cleanliness**

1. The Contractor shall provide compressed air that is free from moisture and oil contamination for use in any operation in which the air may impinge upon the surface.
2. The Contractor shall use the white blotter test in accordance with ASTM D4285 to verify the cleanliness of the compressed air. The Contractor shall conduct and document the test at least once per shift for each compressor system. Sufficient freedom from oil and moisture is confirmed if soiling or discoloration is not visible on the paper.
3. If air contamination is evidenced, the Contractor shall examine the work completed since the last satisfactory test for evidence of contamination, and conduct any necessary clean up or repair. The Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air.

**3.05 COATING MATERIALS STORAGE, MIXING, AND HANDLING**

**A. Testing of Coating Materials Samples**

1. The Engineer reserves the right to conduct tests of the coating materials at any time during the period of field painting. The tests will be conducted to confirm that the material, as supplied, complies with the compositional information provided by the manufacturer in the original submittals.
2. When the Engineer decides to conduct tests, the Engineer will collect a representative pint or quart sample of each component of coating material at the construction site. The samples will be transferred to metal containers, identified, sealed and signed in the presence of the Contractor.
3. If the laboratory test results show that the material being used does not comply with the information provided in the Submittals, the Contractor shall be directed to stop work, and to remove and recoat all surfaces coated with the rejected material, all at no additional cost.

**B. Coating Material Storage**

1. The Contractor shall store all flammable materials in approved storage containers at locations approved by the Engineer.

2. The Contractor shall store all coatings, thinners, and solvents in accordance with OSHA regulations and the requirements of the coatings manufacturer. All coating materials and solvents shall be stored under cover and out of direct sunlight. A temperature between 4 degrees Celsius (40° F) and 32 degrees Celsius (90° F) shall be maintained in the storage area unless the requirements of the manufacturer are more restrictive. The containers used in storage of coatings shall be maintained in a clean condition, free of foreign materials and residue
3. The Contractor shall not permit smoking in coating material storage, mixing, and application areas. Accumulation of empty paint cans, combustibles, and other debris shall not be permitted. Waste chemical solutions, oily rags, and waste shall be removed daily. The Contractor shall keep the storage area neat and orderly.
4. All containers of coating material shall be unopened until required for use. The Contractor shall not open or mix coating materials in the storage area. Mixed coating materials shall not be returned to the storage area.
5. The Contractor shall take all necessary precautionary measures to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of materials.

C. Mixing and Thinning of Coating Materials

1. The Contractor shall not use coating material that has exceeded its shelf life.
2. When required by the manufacturer, the Contractor shall warm coating materials stored at less than 10 degrees Celsius (50° F) to above 10 degrees Celsius (50° F) prior to mixing.
3. The Contractor shall use proper ventilation in the mixing area to prevent injury to workmen or the accumulation of volatile gases. The Contractor shall mix all coatings in accordance with the requirements of the coating manufacturer using mechanical equipment such as a Jiffy mixer.
4. When using two component materials, the Contractor shall mix only complete kits. Mixing of partial kits is not allowed. Do not use two component materials beyond the pot life established by the manufacturer's written instructions.
5. The Contractor shall not thin any paints unless approved in writing by the paint manufacturer and the Engineer. If thinning is required and authorized, use only those types, brands, and amounts of thinner stipulated by the coating manufacturer. The Contractor shall comply with VOC limits after thinning.
6. The Contractor shall deliver coating materials ready mixed to approved tints and colors. Construction site tinting is prohibited.

### **3.06 COATING APPLICATION**

#### **A. General**

1. The Contractor shall apply the coatings in accordance with the requirements of this section, the coating manufacturer, and SSPC-PA 1.
2. In the event of a conflict between the manufacturer's technical data and the requirements of this section, the Contractor shall comply with this section unless the requirements of the manufacturer are more restrictive. When the manufacturer's requirements are more restrictive, the Contractor shall advise the Engineer of the discrepancies in writing, and comply with the more restrictive requirement. The decision of the Engineer will be final.

#### **B. Quality of Surface Preparation Prior to Coating**

1. The surface shall exhibit the specified degree of cleaning immediately prior to coating. The Contractor shall re-clean deficient areas.

#### **C. Surface Cleanliness Between Coats**

1. The Contractor shall thoroughly clean the surface of each coat prior to the application of the next coat to remove dirt, dust, and other interference material. Pay particular attention to the removal of detrimental residue from surfaces such as corners and pockets.
2. The Contractor shall clean the surfaces according to the manufacturer's recommendation for the color staining system.

#### **D. Ambient Conditions During Coating Application - The Contractor shall apply coatings under the following conditions unless the requirements of the coating manufacturer are more restrictive. The Contractor shall not apply coatings under less restrictive conditions without written approval of the coating manufacturer, and specific written authorization from the Engineer.**

1. Surface and Air Temperatures - Between 10 degrees Celsius (50° F) and 38 degrees Celsius (100° F).
2. Relative Humidity - Less than 90%.
3. Dew Point - Surface temperature at least 3 degrees Celsius (5° F) above the dew point temperature of the surrounding air.
4. Frost/Rain - The Contractor shall not apply coatings to surfaces containing frost or free standing water, or during rain, fog, or similar detrimental weather conditions.
5. The Contractor shall remove and replace any paint that is exposed to unacceptable conditions (e.g., rain or dew) prior to adequate curing.

#### **E. Methods of Application - The Contractor shall apply all coats in accordance with the manufacturer's recommendations. In all cases, over spray, drips, splashes and spills must be controlled.**

**F. Recoat Times**

1. The Contractor shall apply each coat only after the previous coat has been allowed to dry as required by the manufacturer's written instructions, but as soon as possible to minimize the length of time that the coating is exposed to dust and contamination.
2. The Contractor shall not allow any coat to remain exposed for longer than the manufacturer's written instructions for maximum recoat time prior to recoating.
3. If a coat exceeds the manufacturer's maximum recoat times for any reason, the Contractor shall remove and replace the coating. As an alternative, the Contractor shall provide written instructions from the coating manufacturer for the specialized preparation that can be undertaken (e.g., scarifying the surface) to properly prepare the surface to receive the next coat. The specialized steps can be undertaken only if approved by the Engineer in writing. The Contractor shall perform the specialized cleaning or removal and replacement of the coatings at no additional cost.

**3.07 REPAIR OF DAMAGE AND UNACCEPTABLE INSTALLATIONS**

- A. The Contractor shall repair localized damage and unacceptable finishes in the manner demonstrated on the approved sample panel.

**3.08 HOUSEKEEPING AND WASTE DISPOSAL**

- A. The Contractor shall not store any coating materials or equipment on or against the retaining wall.
- B. At the end of each day at a minimum, the Contractor shall haul empty paint cans and other debris to the waste storage area.
- C. The Contractor shall remove all drips, splashes, and over spray from surfaces not intended to be coated. Remove by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- D. The Contractor shall handle, store, transport, and dispose of all wastes, hazardous and non-hazardous, in strict accordance with Federal, State and Local regulations.

**3.09 INSPECTION**

- A. The Engineer will inspect all phases of the work to verify that it is in accordance with the requirements of this section. The Contractor shall facilitate this inspection as required, including providing the Engineer with advance notice of scheduled work, allowing ample time for the inspections and access to the work. Inspections may include, but are not limited to, surface preparation, pre-painting cleanliness, paint application, dry film thickness, film appearance and continuity, adhesion, and appearance. The Contractor shall not proceed with subsequent phases of the work until the Engineer has approved the preceding phase.
- B. The inspection by the Engineer in no way relieves the Contractor of the responsibility to comply with all requirements of this section, and to provide comprehensive

inspections of its own to assure compliance with the approved Quality Control Inspection Plan.

- C. The Contractor shall furnish, until final acceptance of the special surface coating installation, all equipment and instrumentation needed for self-inspection of all phases of the work.

### **3.10 ONE-YEAR ANNIVERSARY INSPECTION**

- A. A One-Year Anniversary Inspection will be conducted approximately twelve (12) months after tentative acceptance of the coating under the entire Contract. The Contractor shall participate in this inspection with the Engineer.
- B. The Contractor shall repair, at no additional cost, all locations where the coating exhibits debonding, cracking, or other such defects, and perform all repairs in accordance with the requirements of this specification, and the coating manufacturer's written instructions.
- C. Final payment will be made following the completion of the work necessary to correct the deficiencies discovered during the One-Year Anniversary Inspection.

## **ANTI-GRAFFITI COATING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. This section specifies the requirements for applying a non-sacrificial, matte gloss, anti-graffiti protective coating immediately over cured special surface coatings specified for the project's walls.
- B. The Contractor shall protect surrounding areas, prepare wall surfaces and apply the anti-graffiti coatings in accordance with these specifications and manufacturer's recommendations.
- C. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, services, and incidentals necessary to perform the work of this section.
- D. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

#### **1.02 REFERENCES** - The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

- A. Equipment and Coating Manufacturer's Published Instructions.
- B. American Society for Testing Materials (ASTM)
  - 1. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape.

2. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
3. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926 Occupational Safety and Health Regulations for the Construction Industry
2. 29 CFR 1926.20 General Safety and Health Provisions
3. 29 CFR 1926.21 Safety Training and Education
4. 29 CFR 1926.59 Hazard Communication
5. 29 CFR 1926.103 Respiratory Protection
6. 29 CFR 1926.104 Safety Belts, Lifelines, and Lanyards
7. 29 CFR 1926.105 Safety Nets
8. 29 CFR 1926.352 Fire Prevention
9. 29 CFR 1926.451 Scaffolding

**1.03 QUALIFICATIONS AND EXPERIENCE**

- A. The manufacturer shall have at least five (5) experience producing anti-graffiti coating capable of being used on vertical surfaces.
1. The following manufacturers are acceptable:
    - a. SWD Invisi-Shield  
Sherwin-Williams Company  
1156 Homer Street  
St Paul, Minnesota 55116  
(402) 592-0770  
Joe Wishard – representative
    - b. Permaseal 1496  
TK Products  
11400 West 47<sup>th</sup> Street  
Minnetonka, MN 55343  
800-441-2129
    - c. VandIGuard Non-Sacrificial Graffiti Coating  
Rainguard International Products Company  
3334 E. Coast Hwy  
Corona del Mar, CA 92625

949-675-2811

- B. The Contractor performing the work of this section shall have at least three (3) years experience applying anti-graffiti coating over vertical surfaces.

#### **1.04 SUBMITTALS**

- A. Submit a letter from the anti-graffiti coating manufacturer that acknowledges the compatibility of the specified systems with the color staining system being used, and the acceptability of the specified methods of surface preparation.
- B. Provide written application instructions from the manufacturer, which shall include equipment, application methods and rates, and other manufacturer's recommendations.
- C. Submit a Compliance Certification by the coating manufacturer for local regulations controlling VOC content.
- D. Use a section of the approved sample panel created to show the form liner finish and color stain system as a base to demonstrate the application, appearance and compatibility of the anti-graffiti coating.
  - 1. Arrange a review by the Engineer of the completed sample panel. The Engineer's approval of the anti-graffiti coating on the panel must be obtained before starting the color staining work.
  - 2. The accepted sample panel shall be the standard by which remaining work will be evaluated for technical and aesthetic merit.
  - 3. Variations in material used or techniques demonstrated on the sample panel shall be submitted to the Engineer for approval prior to use.

#### **1.05 PROJECT CONDITIONS**

- A. Apply anti-graffiti coating immediately after color staining is cured.
- B. Schedule anti-graffiti coating application with earthwork, back filling of any wall areas, and flatwork construction, making sure that all simulated stone texture has been colored and protected to the limits shown on the plans. Delay adjacent plantings until anti-graffiti application is completed. Coordinate work to permit applications without interference from other trades.

#### **1.06 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

- A. The work of furnishing and applying anti-graffiti coating will not be measured but shall be paid for by lump sum for the item "Anti-graffiti Coating". This price shall be considered full compensation for all work prescribed.
- B. Work of furnishing and applying anti-graffiti coating to the sample panel shall not be paid for directly but shall be considered subsidiary to the pay item "Anti-graffiti Coating".

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

A. Anti-graffiti coating:

1. Urethane based sealant, which provides an invisible, non-sacrificial penetrating barrier.
2. Coating shall dry as a matte or satin finish. High gloss finish is unacceptable.
3. Low volatile organic content (VOC) material, with a VOC less than 400 grams/liter.
4. Coating shall be resistant to weather, humidity, abrasion, acid, alkali, salt spray, ultra-violet rays, and petroleum products.
5. Allows vapor transmission when tested in accordance with ASTM-E96.
6. The application of the coating product shall not result in yellowing or color change to the surface.
7. Coating shall have the capability of having all types of paints and graffiti materials completely removed without damaging the surfaces to which the coating is applied
8. Removal of graffiti shall not result in "shadowing" of the base surface upon removal of graffiti.
9. Manufacturer recommended cleaning products for removal of graffiti shall be non-toxic and biodegradable
10. Provide all coating materials in sealed, original, containers that are properly marked and labeled to allow verification with applicable material safety data sheets, application precautions, and instructions. Labeling shall include the manufacturer's name, type of material, brand name, gloss designation, date of manufacture, shelf life, contract or order number under which the material has been ordered, lot and batch numbers, quantity, handling, thinning, and application instructions.

## **PART 3 – EXECUTION**

### **3.01 PROTECTION OF SURFACES AND SURROUNDING PROPERTY**

- A. Use protective coverings, shields, or masking as necessary to protect surfaces that are not designated to receive anti-graffiti coating.
1. When tarps are used, secure them firmly to avoid being dislodged during heavy winds. If tarps become dislodged, stop work immediately and secure the loose tarps. When sustained winds are 40 mph or above, drop and secure the tarps.

2. Maintain all protective coverings during the entire period the work is being performed, and remove all coverings upon completion of the work.
  3. All costs associated with furnishing tarps and other materials, installing and removing of tarps, shall not be paid for directly but shall be considered subsidiary to the items for which direct payment is provided.
- B. Use diligence to assure vehicles, structures, buildings, vegetation, equipment, hardware, fixtures, and other materials are protected from over spray, spillage, and other damage.
- C. The Contractor shall be responsible for the cleanup of any spills. All cleanups shall be done at no additional cost and to the satisfaction of the Engineer.
- D. When applying coating adjacent to occupied buildings, cover air intakes and air conditioning vents, which could carry fumes into buildings. Coordinate shutdown of air handling equipment with building owners throughout application process. Vents shall remain covered and air handling equipment shall remain inactive until surfaces are visibly dry or until odor has dissipated. Maintain adequate ventilation when working in confined areas.
- E. Over spray to non-porous surfaces shall be removed in accordance with the manufacturer's recommendations.

### **3.02 SURFACE PREPARATION**

- A. Prior to application of anti-graffiti coating, the simulated stone color staining must be cured per manufacturer's recommendations to ensure effective protection.
- B. Take precautions to protect new construction from graffiti "tagging" prior to application of anti-graffiti coating. Any graffiti that does occur prior to application of anti-graffiti coating shall be completely removed at the Contractor's expense and to the satisfaction of the Engineer prior to applying coating.
- C. Surface Cleaning Requirements
1. Surfaces to be treated shall be clean, dry, and free of oil, dirt, grease, efflorescence or any other coating, which may inhibit penetration and adhesion of coating.
  2. If surface requires cleaning prior to applying anti-graffiti coating, clean surface in accordance with manufacturer's recommendations.
  3. Abrasive blasting and chemical cleaning shall not be allowed.
  4. Pressure washed surfaces, if allowed by the color stain manufacturer, shall be allowed to dry 48 hours prior to coating.
  5. All caulking should be completed prior to application of coating.

### **3.03 APPLICATION**

- A. Application shall be by means of brush, roller or sprayer in accordance with the manufacturer's recommendations.
  - 1. The number of coats applied shall be determined by the manufacturer's recommendations for compatibility with the selected color stain system.
  - 2. Coating material shall not be diluted in any way. If surface is still glistening five to ten minutes after application and complete absorption has not occurred, excess amount shall be wiped off and the amount of product being applied shall be decreased.
- B. Spray Application
  - 1. A low-pressure setting (approximately 275 KPa) shall be used to avoid atomization of coating material.
  - 2. Spray equipment shall be fitted with fan tip, stainless steel or brass fittings and gaskets suitable for solvent solutions.
  - 3. First coat shall be applied in a saturating spray application from the top down. Apply sufficient coating to create 100 millimeters to 150 millimeters of rundown below the contact point.
  - 4. If required, additional coats shall be applied as soon as the previous coat is dry to the touch.
  - 5. Follow each spray application with the clean bristle broom brushing to avoid excessive build-up.
- C. Brush and Roller Application
  - 1. Utilize nylon or other synthetic material resistant to solvent solutions.
  - 2. Apply sufficient product to thoroughly saturate the surface. Avoid excessive overlapping and take care to brush out runs and drips to avoid build-up.

### **3.04 INSPECTION**

- A. The Engineer will inspect all phases of the work to verify that it is in accordance with the requirements of this section. The Contractor shall facilitate this inspection as required, including providing the Engineer with advance notice of scheduled work, allowing ample time for the inspections and access to the work. Inspections may include, but are not limited to, surface preparation, pre-coating cleanliness, coating application, and final appearance. The Contractor shall not proceed with subsequent phases of the work until the Engineer has approved the preceding phase.
- B. The inspection by the Engineer in no way relieves the Contractor of the responsibility to comply with all requirements of this section, and to provide comprehensive inspections of its own to assure compliance with the approved Quality Control Inspection Plan.

- C. The Contractor shall furnish, until final acceptance of the anti-graffiti coating, all equipment and instrumentation needed for self-inspection of all phases of the work.

## **FORM LINER (ASHLAR STONE FINISH)**

### **PART 1 - GENERAL**

#### **1.01 SCOPE**

- A. This section specifies the requirements for using form liners to create the specified Ashlar Stone form liner finish where required for the cast-in-place retaining walls.
- B. The Contractor shall prepare concrete surfaces and apply form liners in accordance with these specifications and manufacturer's recommendations.
- C. The Contractor or its subcontractor(s) shall furnish all labor, materials, equipment, services, and incidentals necessary to perform the work of this section.
- D. This work shall be done in accordance with this specification and as directed by the Engineer. The Contractor shall conduct all work in strict compliance with all applicable Federal, State, and Local laws, codes, rules and regulations.

#### **1.02 REFERENCES** - The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

- A. American Concrete Institute (ACI):
  - 1. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
  - 2. ACI 301 CH. 13 - Specifications for Structural Concrete.
  - 3. ACI 303R-91 - Guide to Cast-in-Place Architectural Concrete.
  - 4. ACI 309 - 1972[78] CH. 7 - Recommended Practice for Consolidation of Concrete.
  - 5. ACI 347 - 1978 CH. 5.2 - Recommended Practice for Concrete Formwork

#### **1.03 QUALIFICATIONS AND EXPERIENCE**

- A. The manufacturer shall have at least five (5) years experience making stone masonry molds to create formed concrete surfaces to match natural stone shapes and surface textures.
- B. The following form liner manufacturers are acceptable:
  - 1. Custom Rock International  
1156 Homer Street  
St Paul, Minnesota 55116  
800-637-2447

2. Architectural Polymers  
2040 West Penn Pike  
New Ringgold, PA 17960  
570-386-3111
  3. Scott Systems, Inc.  
1788 Helena Street  
Aurora, CO 80011  
303-341-1400
  4. Symons Corporation  
200 East Toohey Street  
Des Plaines, IL 60018  
847-298-3200
- A. The Contractor performing the work of this section shall specialize in performing the work of this section, including pouring vertically formed architectural concrete.
1. The Contractor shall have at least five (5) years experience and within three (3) years preceding the acceptance of the Contractor's Proposal, successfully completed at least two contracts similar in scale to this project.
  2. The Contractor shall be trained in the form liner manufacturer's special techniques to achieve realistic stone surfaces.

#### **1.04 SUBMITTALS**

- A. Submit a letter from the form liner manufacturer that acknowledges the acceptability of the specified methods of surface preparation.
- B. Submit examples of Ashlar stone, represented through pictures, actual rock pieces or other means to show the intended textures to be simulated by the form liner. The desired appearance is represented by Pattern 1501, Large Sandstone Ashlar, by Custom Rock International.
- C. Submit a Compliance Certification by release agent manufacturer for local regulations controlling VOC content.
- D. Submit shop drawings showing the plan and elevation of each wall. The shop drawings shall also include details to show the overall pattern, joint locations, form tie locations, end, corner and edge treatments, piece marks for precast concrete members, and other special conditions.
- E. Submit samples and descriptions of form ties and show the method of separation when forms are removed.
- F. Construct a sample panel of the architectural finish, at least thirty (30) days prior to the beginning of actual wall construction that meets the following specifications:
  1. Construct sample at a location specified by the Engineer.

2. Size: minimum three (3) meters in length and two (2) meters in height.
3. Half of the sample panel area shall demonstrate the use of the ashlar stone form liner for a cast-in-place application and half of the sample panel area shall demonstrate the use of the ashlar stone form liner for precast MSE wall panels. The area used for demonstrating precast MSE wall panels may be constructed by cast-in-place methods but should demonstrate the configuration of the stone elements in the 1500mm x 1500mm panel shapes that represent the precast MSE panels.
4. The sample panel shall demonstrate form liner butt joints and the continuation of the pattern through wall expansion joints, control joints or joints between simulated precast MSE wall panels.
5. Sample panel shall be created using actual job specific materials, methods and workmanship, including concrete mix (cement type, aggregate gradation, slump, water/cement ratios, plasticizers and additives), forming system (ties, liner, and formwork), form release agents, placement rate, form pressures, joint sealing, vibrating and stripping practices.
6. Provide an area on the panel to demonstrate patching and repair procedures for spalled concrete, and voids caused by honeycombing or bugholes.
7. Finish the panel in a manner that it meets the specifications for surface preparation for special surface coatings.
8. Arrange a review by the Engineer of the completed sample panel. The Engineer's approval of the panel must be obtained before starting form liner work on actual contract.
9. The accepted sample panel shall be the standard by which remaining work will be evaluated for technical and aesthetic merit. The accepted sample panel is a prerequisite to beginning job formwork.
10. Variations in material used or techniques demonstrated on the sample panel shall be submitted to the Engineer for approval prior to use.

#### **1.05 METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

- A. The work of furnishing and installing form liners will not be paid directly, but shall be considered subsidiary to other work items on the plans.
- B. Construction of the sample panel and ultimate demolition/removal of the panel after completion of production walls shall not be paid for directly but shall be considered subsidiary to the various bid items.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

#### **A. Form liners:**

1. Reusable high-strength urethane, easily attachable to forms.
2. Molds shall be removable without causing deterioration of surface or underlying concrete.
3. Molds shall not compress more than six (6) millimeters when concrete is poured at rate of three (3) vertical meters per hour.

#### **B. Ashlar Stone Pattern**

1. Formed concrete surface using simulated stone masonry molds designed to closely duplicate the appearance of natural stone.
2. The form liner stone sizes are classified as specified below:
  - a. Large Stone sizes:
    - (1). Height: 1-meter maximum and 0.3-meter minimum.
    - (2). Length: 1.5-meters maximum and 1-meter minimum.
  - b. Small Stone sizes:
    - (1). Height: 0.6-meter maximum and 0.3-meter minimum.
    - (2). Length: 1-meter maximum and 0.6-meter minimum.
3. Relief in stone pattern:
  - a. Maximum 75-millimeters
  - b. Minimum 20-millimeters.
4. Joint width: maximum 30 millimeters and minimum 12 millimeters.
5. Patterning of simulated stone masonry shall appear natural and non-repeating. Provide a minimum of at least six (6) unique mold patterns.
  - a. Three (3) patterns shall contain a mixture of stones that meet classifications for large stone and small stone sizes.
  - b. Three (3) patterns shall contain a mixture of stones that meet only the small stone size classification.

C. Release Agent:

1. Compatible with simulated stone masonry molds and with color stain system to be applied to surface.
2. No paraffin or other material that suppresses the absorption of the coating material shall be used.
3. Consult the manufacturer of the selected special surface coating system to verify acceptable release agents.

D. Form ties:

1. Shall be made of either metal or fiberglass.
2. Metal ties, which result in a portion of the tie permanently embedded in the concrete, shall be designed to separate at least one inch back from finished surface, leaving only a neat hole that can be plugged with patching material.

### **PART 3 – EXECUTION**

#### **3.01 FORM LINER PREPARATION**

- A. Before placing concrete, verify that the lines and leveling of formwork are within allowable tolerances.
- B. On multiple use liners, clean liner before each use. Replace damaged liners whose continued use or repair would negatively impact the aesthetics of the concrete finish.
- C. Apply form liner compatible release agent at rate recommended by manufacturer. Attempt to schedule concrete pour soon after application of release agent to avoid precipitation, dust, and debris. Protect reinforcing steel from exposure to release agents

#### **3.02 INSTALLATION**

- A. Form liners:
  1. Seal form liner joints, form liner accessories' joints, and tie holes to prevent cement paste from bleeding.
  2. Provide solid backing at form liner butt joints to prevent deflection.
  3. Construct form liner and accessories to sizes, shapes, lines and dimension shown.
  4. Provide openings, offsets, keyways, recesses, chamfers, blocking, and screeds as required to achieve the specified finish.
  5. Drill or pierce liner to accommodate form ties.

6. Anchor liner to form on centers not to exceed one-half meter. Decrease centers as necessary to accommodate form-stripping pressures without damaging liner intended for multiple use.
7. Install backup strips as required to prevent deflection of the liner due to form pressures.

B. Form ties:

1. Place form ties at thinnest points of molds (high points of finished wall).
2. Neatly patch the hole remaining after disengaging the protruding portion of the tie so that it will not be visible after coloring the concrete surface.

C. Seams:

1. Match the texture and shape of the surrounding stone, avoiding visible seams or mold marks.
2. If the pattern selected has molds connecting through the middle of the stones, carefully remove the seam line created by abutting molds.
3. Form stripping and related construction shall avoid creating defects in the finished surface.

D. Top of wall and corners:

1. Where stone texture continues across the top of a wall or around a corner, finish the area to form a continuous pattern that matches the intended relief and texture of the adjacent stones.
2. Hand carve and emboss the wet, pliable concrete, aligning rustication joints with those in the form pattern.

E. Stone size relationship to wall height:

1. The maximum size of any individual stone within the form liner pattern shall not exceed 1-meter in height or 1.5 meters in length. No more than twenty (20) percent of the total visible wall area shall contain stones with the maximum height or length.
2. The minimum size of any individual stone within the form liner pattern shall not be less than 0.3-meters in height or 0.6 meters in length. No more than twenty (20) percent of the total visible wall area shall contain stones with the minimum height and length.
3. Where the height of the visible wall face is less than 1.3 meters in height, only the patterns using the small stone size classification shall be used in the form liner arrangements.

### **3.03 REPAIR OF DAMAGE AND UNACCEPTABLE INSTALLATIONS**

- A. Repair localized damage and unacceptable finishes in the manner demonstrated on the approved sample panel.

### **3.04 INSPECTION**

- A. The Engineer will inspect all phases of the work to verify that it is in accordance with the requirements of this section. The Contractor shall facilitate this inspection as required, including providing the Engineer with advance notice of scheduled work, allowing ample time for the inspections and access to the work. Inspections may include, but are not limited to, surface preparation, surface finish, pattern repetition, and appearance. The Contractor shall not proceed with subsequent phases of the work until the Engineer has approved the preceding phase.
- B. The inspection by the Engineer in no way relieves the Contractor of the responsibility to comply with all requirements of this section, and to provide comprehensive inspections of its own to assure compliance with the approved Quality Control Inspection Plan.
- C. The Contractor shall furnish, until final acceptance of the form liner installation, all equipment and instrumentation needed for self-inspection of all phases of the work.

### **FORM LINER (FRACTURED FIN FINISH)**

The fractured fin finish on the back of the bridge barriers and the 1070 mm Concrete "F" Shaped Barriers shall be formed using one of the following approved products:

Form Liner #109, Fractured Fin  
Scott Systems, Inc.  
1788 Helena Street  
Aurora, CO 80011  
(303) 341-1400

$\frac{3}{4}$ " Fractured Fin  
Symons Corporation  
200 East Toohey Avenue  
Des Plaines, IL 60018  
(847) 298-3200

Form Liner #375, Ripped Rope  
The Greenstreak Group  
3400 Tree Court Industrial Boulevard  
St. Louis, MO 63122  
(800) 325-9504

Release agents used shall be compatible with the concrete color coating system to be applied to the surface. No paraffin or other material that suppresses the absorption of the coating system shall be used. Consult the manufacturer of the selected coating system to verify acceptance of release agents.

The cost of the formliners, materials, labor and incidentals associated with the placing and removal of the fractured fin forms shall not be paid for directly but shall be considered subsidiary to the items "Class 47BD-30 Concrete for Bridges" and "Class 47BD-30 Concrete for Barrier".

## **PAINTING STRUCTURAL STEEL FOR SUPER STRUCTURE**

Paragraph 1.a.5 of Subsection 709.03 in the Standard Specifications shall be replaced with the following:

Weathering steel shall not be painted except at the girder ends at bridge expansion joints. The area to be painted at the bridge deck expansion joints shall include all structural steel, including diaphragm members, within 3 meters of the centerline of bearing. For the top flange of Bridge Girders, the top surface of the flange shall only require the prime coat. The color of the finish coat shall be a red-brown pigment to match color number 30045 of Federal Standard number 595a dated January 2, 1968. Painting of structural steel shall be subsidiary to STEEL SUPERSTRUCTURE AT STA. \_\_\_\_.

Paragraph 1.a.6 of Subsection 709.03 in the Standard Specifications shall be replaced with the following:

Unless noted in the plans, galvanized surfaces shall not be painted. Painting of galvanized surfaces noted in the plans shall be in accordance with the special provisions for Cleaning , Surface Preparation and Painting of Galvanized Surfaces.

## **CLEANING, SURFACE PREPARATION, AND PAINTING OF GALVANIZED SURFACES**

### **1.0 GENERAL**

#### **A. Description**

For the galvanized steel designated for painting on the plans, the work shall consist of the following:

1. Surface cleaning of the galvanized steel surface.
2. Surface preparation for painting of the galvanized steel surface.
3. Application of an intermediate coat of polyamide epoxy.
4. Application of a topcoat of aliphatic polyurethane that matches the color listed in the contract documents.

All cleaning, preparation for painting, and painting shall be done in the same shop to ensure single source responsibility of the entire coating system. In addition, the sequence of operation shall be submitted to the Engineer describing the procedure used in preparing the galvanized surface, the brand names of the paint to be used, and certification that the paint that is used is compatible with galvanized surfaces.

## B. References

The publications listed below form a part of this specification to the extent referenced. Unless otherwise noted, the latest revision of the standards in effect at the time of bid applies.

1. Equipment and Coating Manufacturer's Published Instructions
2. American Society for Testing Materials (ASTM)
  - a. ASTM A 123 Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - b. ASTM A 780 Standard Practice for Repair of Damaged and Uncoated areas of Hot-Dip Galvanized Coatings
  - c. ASTM D 4138 Standard Test Method for Measurement of Dry Paint Thickness of Protective Coating Systems by Destructive Means
  - d. ASTM D 4285 Standard Test Method for Indicating Oil or Water in Compressed Air
  - e. ASTM D 4414 Standard Test Method for Measurement of Wet Film Thickness by Notch Gauges
  - f. ASTM E 376 Standard Test Method for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods
3. Society for Protective Coatings (SSPC)
  - a. SSPC-SP1 Solvent Cleaning
  - b. SSPC-SP2 Hand Tool Cleaning
  - c. SSPC-SP3 Power Tool Cleaning
  - d. SSPC-SP7 Brush-off Blast Cleaning
  - e. SSPC-PS27 Alkyd Coating System Materials Specification, Performance Based

## 2.0 MATERIALS

The two-coat epoxy/polyurethane paint system shall be one of the paint systems identified below with the noted dry film thicknesses (dft):

Carboline Paint Co

Intermediate Coat: 893 Epoxy (65 µm to 100 µm (2.5 mils to 4 mils) dft)

Top Coat: 133 HB Polyurethane (50 µm to 100 µm (2 mils to 4 mils) dft)

Ameron Protective Coating

Intermediate Coat: 385 Epoxy (100 µm to 150 µm (4 mils to 6 mils) dft)  
Top Coat: 450 SA Polyurethane (50 µm to 100 µm (2 mils to 4 mils) dft)

Sherwin-Williams Company

Intermediate Coat: Recoatable Epoxy Primer, B67 Epoxy (65 µm to 100 µm (2.5 mils to 4 mils) dft)  
Top Coat: Corothane II B65 W200 Series Polyurethane (50 µm to 100 µm (2 mils to 4 mils) dft)

International / Porter

Intermediate Coat: Interseal 670 (65 µm to 100 µm (2.5 mils to 4 mils) dft)  
Top Coat: 990 PHA010 (50 µm to 100 µm (2 mils to 4 mils) dft)

All materials used in the coating system shall be compatible and from the same manufacturer.

All materials shall be in unopened, original, dated containers from the manufacturer. Material used must be within manufacturer's shelf life.

All materials shall have been and continue to be stored in such a manner as to prevent freezing and/or overheating. Manufacturer recommendations shall be followed as to maximum and minimum storage temperatures.

### 3.0 CONSTRUCTION

#### A. Surface Preparation of Galvanized Surfaces

The galvanized steel surfaces shall be prepared and primed as soon after galvanizing as possible but the surfaces shall be primed within 24 hours of the galvanizing operations. There should be no visible signs of zinc oxide or zinc hydroxide, which first appear as a fine white powder.

#### B. Surface Smoothing

Zinc high spots shall be removed by cleaning with hand or power tools as describe in SSPC SP2 or SP3. The zinc should be removed until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods. After cleaning, the surface shall be inspected for conformance to the required zinc thickness in accordance with ASTM A 123 utilizing a magnetic or eddy current type thickness instrument in accordance with ASTM E 376. Any item falling below the required zinc thickness, before or after removal of any high spots, shall be repaired in accordance with practice ASTM A 780.

#### C. Surface Cleaning

Hot dip galvanized surfaces must be clean and free of oil and grease before they are painted.

Absolutely no water quenching or chromate conversion coating is allowed of the galvanized surface that is to be painted, as they will interfere with the adhesion of the paint coatings to the zinc surface.

Any of the following methods as deemed necessary by the paint manufacturer shall be used for surface cleaning of the galvanized surfaces:

1. Aqueous Alkaline Cleaning

An alkaline solution, with a pH of 11 to 13 may be used to remove traces of oil, grease, or dirt. Alkaline cleaner may not be used for removal of heavy build-up of zinc oxide or wet storage stain. The solution can be applied through immersion in a tank filled with the solution, sprayed, or brushed with a soft bristle brush. After cleaning, rinse thoroughly in hot water or water under pressure. Heated drying to accelerate the complete removal of water from the surface should be used.

2. Solvent Cleaning

Typical cleaning solvents, such as mineral spirits or high-flash naphtha, can be used to remove oil and grease. The procedure to be used is as specified in SSPC SP1. Proper rags or brushes should be used to wipe the galvanized parts. These rags or brushes should be cleaned or recycled often since oil can accumulate on their surfaces and be transferred back to the galvanized part. After cleaning, rinse thoroughly in hot water or water under pressure. Allow to dry completely before proceeding.

D. Surface Preparation

Any of the following methods as per the written recommendation of the paint manufacturers may be used to prepare the galvanized surface for painting:

1. Sweeping Blasting

Abrasive sweep or brush blasting which uses a rapid nozzle movement will roughen the galvanized surface profile. The abrasive material shall provide a stripping action without removing excess zinc layers. Particle size should be in the 200  $\mu\text{m}$  to 500  $\mu\text{m}$  (8 mils to 20 mils) range. Materials that can be used are aluminum/magnesium silicate, soft mineral sands with a mohs hardness of 5 or less, corundum, limestone, and organic media such as corncobs or walnut shells. The purpose of the sweep blasting is to deform not to remove the galvanized metal. Any area falling below the required zinc thickness, before or after the sweep blasting should be repaired in accordance with ASTM A 780. The procedure for this process can be found in SSPC SP7. Sweep blasting of zinc shall not be less than 110 square meters per hour (130 square yards per hour) using these types of abrasives. Substrate should be maintained at a temperature greater than 3°C (5°F) above the dew point temperature. Following abrasive blast cleaning, surfaces should be blown down with clean, compressed air. The formation of zinc oxide on the blasted surface will begin very quickly so the paint coating should be applied immediately, within 60 minutes, after sweep blasting.

2. Wash Primer Treatment

This process involves the use of a metal conditioner to neutralize surface oxides and hydroxides along with etching the surface. One example of a wash primer is SSPC-Paint Specification No. 27. The process is based on three primary components: a hydroxyl-containing resin; a pigment capable of reacting with resin and acid; and an acid capable of making the resin insoluble by reacting with the resin, the pigment, and the zinc surface. The result is a film of approximately 8  $\mu\text{m}$  to 13  $\mu\text{m}$  (0.3 mils to 0.5 mils). Failures can occur if the film exceeds 13  $\mu\text{m}$  (0.5 mils).

The film is usually applied by spray, but may be applied by soft bristle brush, dip, or roller coater. Using these latter coating methods, it may be difficult to control the film thickness.

For drying time prior to topcoating, follow the manufacturer's instructions.

This wash primer treatment may be better suited to certain types of paint systems. See SSPC-Paint Specification No. 27 for the best match of this treatment to a paint system.

### 3. Acrylic Passivation/Pretreatment

The passivation/pretreatment process consists of applying an acidic acrylic solution to the newly galvanized surface and then allowing it to dry, forming a thin film coating. When applied, the solution first reacts with the zinc surface forming a passivating conversion coating while simultaneously forming an acrylic coating suitable for painting on top of the passivation layer. The underlying conversion coating provides strong adhesion to the galvanized surface while the thin film acrylic layer provides barrier protection that inhibits corrosion and provides a highly compatible surface for the application of organic paint films. There are versions of these solutions that contain chrome and versions without chrome.

The application methods for these water-based treatments are dipping, flow coating, spraying, or other appropriate means. Following application, the coating is dried in an oven or in air. In some instances the coating is applied to hot galvanized articles in which case separate drying is not necessary. Rinsing is not required. The coating is approximately 1  $\mu\text{m}$  (0.04 mils) thick.

Painting is possible any time during a period of four months after application as long as the surface is free of visible zinc oxides or zinc hydroxides. However, if harmful contaminants such as dust, dirt, oils, grease, or deposits are present, they must be removed with a mild alkaline degreasing solution, pH 11.5 maximum, followed by a thorough rinse with hot water (60°C (140°F) maximum temperature) or a pressure wash, and then, thoroughly dried. This treatment may be applied in the galvanizing plant or later in the paint shop. When applied in the paint shop, the surface must first be appropriately cleaned as described above to remove contaminants picked up after galvanizing.

### E. Final Painting

All material must be applied under conditions within the following tolerances. Permanent records should be kept of the processing conditions during the complete finishing process:

1. Air temperature 10°C (50°F) minimum and 32°C (90°F) maximum.
2. Steel surface temperature 10°C (50°F) minimum and 37°C (100°F) maximum.
3. Humidity 85% maximum.
4. Steel temperature at least 3°C (5°F) above the dew point.

All surfaces must be dry and free from dust, dirt, oil, grease, or other contaminants.

Total thickness including epoxy intermediate coat and urethane topcoat shall not exceed the sum of the dry film thicknesses for the intermediate and top coats noted in Section 2.0 - Materials.

After the painted galvanized steel has been erected in the field, all areas where the shop paint has been damaged shall be touched up with the same materials as specified for shop application. All paint materials for the shop and the field touch-ups shall be supplied by the same paint manufacturer.

The paint manufacturer's product data sheets shall be submitted to the Engineer prior to the start of work and the requirements as outlined in the data sheets shall be followed. The intermediate coat of epoxy shall be applied in two applications.

The coating shall be packaged in separate containers bearing a label clearly showing the name of the manufacturer, brand name of the product, lot number, and date of manufacture.

The topcoat shall match the color listed in the contract documents. Samples of the topcoat color shall be submitted to Engineer.

Special handling will be required to prevent any damage to the paint system during lifting, shipping, and installation.

Any defect or damage to the paint system after completing construction shall be properly prepared and repainted as per the manufacturer's specifications. All steel surfaces to be repainted shall be free of contaminants including dirt or concrete. All paint used for repairs shall be from the same manufacturer of the paint used for the shop painting. Adjacent surfaces not to receive paint shall be adequately protected by masking or other means of protection.

#### F. Shop Conditions

The surfaces to be painted after surface preparation must remain free of moisture and other contaminants. The Contractor shall control the operations to insure that dust, dirt, or moisture does not come in contact with surfaces prepared or painted that day. In addition to the manufacturer's written instructions for surface preparation and painting, the following conditions shall apply (when in conflict, the most restrictive conditions shall govern):

The minimum steel and air temperatures shall be 4°C (40°F). Painting shall not be applied to steel that is at a temperature that will cause blistering, porosity, or be otherwise detrimental to the life of the painted surfaces. Painting shall not be applied when the steel surface temperature is less than 3°C (5°F) above the dew point. Painting shall not be applied to wet, damp, or frosted surfaces. Paint shall not be applied when the relative humidity is above 85%.

Work accomplished under unfavorable weather conditions will be considered unacceptable and complete recleaning and painting of these areas will be required at no additional cost to the Contracting Authority.

#### G. Equipment

All cleaning and painting equipment shall include gauges capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air, water, or paint as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order.

Spray painting and surface preparation equipment shall utilize filters, traps, or separators recommended by the manufacturer of the equipment and shall be kept clean. The methods and intervals for cleaning the filters, traps, and separators shall be as recommended by the manufacturer of the equipment. In addition, paint pots shall be equipped with air operated continuous mixing devices.

Pressure type abrasive air blasting equipment shall be capable of providing the minimum required pressure and volume, free of oil, water, and other contaminants.

Prior to beginning all painting operations, air equipment shall pass the requirements of ASTM D 4285. This test will be repeated as determined by the Engineer.

#### H. Quality Control.

The Contractor shall conduct a quality control program that ensures that the work accomplished complies with these specifications. The quality control program shall consist of:

1. Qualified personnel to manage the program and conduct quality control tests.
2. Proper quality measuring instruments.
3. Quality Control Plan.
4. Condition and quality recording procedures.

The personnel managing the quality control program shall have experience and knowledge of industrial coatings and the measurements needed to assure quality work. The personnel performing the quality control tests shall be trained in the use of the quality control instruments. These personnel shall not perform surface preparation and painting. Painters shall perform wet film thickness measurements.

The Contractor shall supply all necessary equipment to perform quality control testing of shop conditions, equipment, surface preparation, and profile and paint film thickness. The Contractor's personnel, in accordance with the equipment manufacturer's recommendations, shall calibrate these instruments.

The Contractor shall implement a Quality Control Plan approved by the Engineer including a schedule of required measurements and tests as outlined herein, procedures for correcting unacceptable work, and procedures for improving surface preparation and painting quality as a result of quality control findings. The Contractor shall supply and use forms approved by the Engineer to record the results of quality control tests. These reports shall be available at the work site for review by the Engineer.

The purpose of the quality control program is to assist the Contractor in the proper performance of the work. Quality control tests performed by the Contractor will not be used as the sole basis for acceptance of the work.

#### 4.0 METHOD OF MEASUREMENT

No separate measurements will be made.

#### 5.0 BASIS OF PAYMENT

The cost of cleaning, surface preparation, and painting of galvanized structural steel shall be included in the contract price for the items that have galvanized steel designated for painting as listed in the contract documents. This incidental cost shall include all labor, materials, and equipment to complete the cleaning, surface preparation, and painting in accordance with these special provisions. It shall also include any costs to repaint or repair the paint system after erection.

### DRAINAGE SYSTEM AT STATION \_\_\_\_\_

The second sentence of Section 706.03.13.a of the Standard Specifications shall be deleted and replaced with the following:

This work includes furnishing and installing the drain boxes, pipes, anchors, supports and connections associated with the bridge drainage system as well as furnishing and installing the drainage troughs under the bridge deck joints according to the details shown on the plans.

Add the following paragraphs after Paragraph b under Section 706.03.13:

- c. The neoprene drainage troughs shall utilize EPDM (Ethylene Propylene Diene Monomer) compounded elastomer conforming to the following minimum physical properties:

<b>Property</b>	<b>Test Method</b>	<b>Specification</b>
Color		Gray/Black
Specific Gravity	ASTM D 297	1.18+0.03
Tensile Strength	ASTM D 412	9650 kPa (1.4 ksi)
Elongation	ASTM D 412	300% min
Tear Resistance	ASTM D 624	22 N/mm (125 lb./ in) min
Shore A Hardness (5 sec)	ASTM D 2240	60+10
Ozone Resistance	ASTM D 1149	(7days/100pphm/ 104 F, 50% Ext.) No Cracks
Heat Aging	ASTM D 573 (7days/116C (240F))	Ten. min 8275 kPa (1.2 ksi) Elongation min 210%
Brittleness Temperature	ASTM D 746	- 59C (-75 F)
Permeability, Water Vapor	ASTM E 96 Proc. BW	2.0 perm-mils

- d. When installing the deck joint drainage troughs, the contractor shall install the concrete inserts, stainless steel bolts, support plates and neoprene troughs so that the system is watertight and provides positive drainage. The contractor may use a silicon bead between the membrane and steel support plates to assure that the joint is watertight. The contractor shall exercise care in installing the neoprene membrane. At the time of final inspection, the neoprene troughs shall be free of holes or any damage.

Add the following paragraph after Paragraph 2 under Section 706.04 – Method of Measurement

3. The drainage troughs for the bridge deck joints shall be included in the pay Item “Drainage System At Station \_\_\_\_” and shall include the neoprene troughs, concrete inserts, stainless steel bolts, flat steel plates, steel end trough as well as all labor and incidentals necessary to complete the work as shown on the plans.

## **DRILLED SHAFTS**

It is not the intent of these Special Provisions to unnecessarily restrict the contractor in his construction methods, techniques, or equipment. The following are considered to be minimum requirements necessary to provide adequate foundations.

### **1.0 DESCRIPTION OF WORK**

This work consists of constructing drilled shafts including the furnishing and placing of reinforcing steel and concrete, all in accordance with the contract documents.

Throughout this special provision, the terms “drilled shaft” and “shaft” are used interchangeably and shall include the upper cased portion of the shaft and the socket, which shall be defined as that portion of the drilled shaft below the bottom of the permanent casing.

### **2.0 DRILLED SHAFT INSTALLATION PLAN**

Two weeks prior to the pre-construction conference, the Contractor shall submit a list containing at least three projects completed in the last three years on which the Contractor has installed drilled shafts of a diameter and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects. The Contractor shall also submit a signed statement that the Contractor has inspected the project site and all the subsurface information made available in the contract documents.

No later than one month prior to constructing the drilled shafts, the Contractor shall submit a drilled shaft installation plan for review by the Engineer. This plan shall provide information on the following:

- A. Name and experience record of the driller and drilled shaft superintendent in charge of drilled shaft operations for this project. The drilled shaft superintendent shall have a minimum of five years experience in drilled shaft construction.
- B. List of proposed equipment to be used including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, core sampling equipment, tremies or concrete pumps, casing, slurry equipment, airlift pumps, etc.
- C. Details of overall construction operation sequence and the sequence of shaft construction in groups.
- D. Details of shaft excavation methods.

- E. When the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods and disposal procedures.
- F. Details of methods to clean the shaft excavation.
- G. Details of reinforcement placement, including support and centralization methods.
- H. Details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods.
- I. Details for permanent casing including installation methods, diameter and casing thickness.
- J. The names and qualifications of the personnel and a listing of the equipment to be used for the Crosshole Sonic Log (CSL) testing.

The Engineer will evaluate the drilled shaft installation plan for conformance with the contract documents. Within 14 days after receipt of the plan, the Engineer will notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the contract documents.

### **3.0 TRIAL SHAFT INSTALLATION**

If a trial drilled shaft is required by the contract documents, the Contractor shall demonstrate the adequacy of his methods, techniques and equipment by successfully constructing an unreinforced concrete, trial shaft in accordance with this specification's requirements. This trial shaft shall be positioned away from production shafts in the location shown on the plans or as directed by the Engineer. The trial shaft shall be drilled to the maximum depth of any production shaft shown in the plans. Failure by the Contractor to demonstrate to the Engineer the adequacy of methods and equipment shall be reason for the Engineer to require alterations in equipment and/or method by the Contractor to eliminate unsatisfactory results. Any additional trial holes required to demonstrate the adequacy of altered methods or construction equipment shall be at the Contractor's expense. Once approval has been given to construct production shafts, no changes will be permitted in the methods or equipment used to construct the satisfactory trial shaft without written approval of the Engineer.

Unless otherwise shown in the contract documents, the trial shaft hole shall be filled with unreinforced concrete in the same manner that production shafts will be constructed. The concreted trial shaft shall be cut off 0.6 m (2 feet) below finished grade and left in place. The disturbed area at the site of the trial shaft hole shall be restored as nearly as practical to its original condition.

### **4.0 MATERIALS**

Materials shall meet the required specifications:

- A. Concrete

Provide the class of concrete specified in the plans that complies with the requirements of NDOR Standard Specification for Highway Construction section 1002.

Concrete slump shall be as follow:

<u>Slump Range</u>	<u>Typical Condition</u>
180mm – 230mm (7-9 inches)	Placing under drilling fluid
150mm-200mm (6-8 inches)	All other conditions

To achieve the required slump range Type D or Type G admixture shall be used. This will increase the slump range without adding water.

**B. Reinforcing Steel**

Reinforcing steel shall be ASTM A 615M/A 615 or ASTM A 706M/A 706, Grade 420 (Grade 60).

**C. Casing**

Casing shall be of sufficient thickness to carry working stress and loads imposed on the casing during construction. The minimum casing thickness shall be 8 mm (5/16 inch).

## **5.0 PROTECTION OF EXISTING STRUCTURES**

The Contractor shall control his operations to prevent damage to existing structures and utilities. Preventive measures shall include, but are not limited to, selecting construction methods and procedures that will prevent caving of the shaft excavation, and monitoring and controlling the vibrations from construction activities such as the driving of casing or sheeting, drilling of the shaft, or from blasting, if permitted.

## **6.0 GENERAL METHODS AND EQUIPMENT**

The Contractor shall perform the excavations required for shafts, through whatever materials are encountered, to the dimensions and elevations shown in the plans or otherwise required by the specifications and special provisions. The Contractor's methods and equipment shall be suitable for the intended purpose and materials encountered. The permanent casing method shall be used for all drilled shaft locations unless otherwise authorized in writing by the Engineer. Blasting shall only be permitted if specifically stated on the plans or authorized in writing by the Engineer.

**A. Drilling Equipment**

The excavation and drilling equipment shall have adequate capacity, including power, torque and down thrust to excavate a hole of both the maximum diameter and to a depth of 25 percent beyond the depths shown on the plans.

The excavation and overreaming tools shall be of adequate design, size and strength to perform the work shown in the plans or described herein. When the

material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drill buckets, grooving tools, and/or underreaming tools, the Contractor shall provide special drilling equipment, including but not limited to: rock core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to construct the shaft excavation to the size and depth required. Approval of the Engineer is required before excavation by blasting is permitted.

Sidewall overreaming shall be required when the sidewall of the hole is determined by the Engineer to have softened due to excavation methods, swelled due to delays in concreting, or degraded because of slurry cake buildup. Overreaming thickness shall be a minimum of 13 mm (1/2 inch) and a maximum of 75 mm (3 inches). Overreaming may be accomplished with a grooving tool, overreaming bucket or other approved equipment. The thickness and elevation of sidewall overreaming shall be as directed by the Engineer. The Contractor shall bear all costs associated with both sidewall underreaming and additional shaft concrete placement.

**B. Excavation**

Shaft excavations shall be made at locations and to the top of shaft elevations, estimated bottom of shaft elevations, shaft geometry, minimum socket lengths and dimensions shown in the contract documents. The Contractor shall extend bottom of shaft elevations when the Engineer determines that the material encountered during excavation is unsuitable and/or differs from that anticipated in the design of the drilled shaft. All shafts shall be advanced to the minimum socket lengths and to the bottom of shaft elevation, whichever is deeper as determined by the Engineer.

**C. Obstructions**

The Contractor shall remove surface and subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials such as old concrete foundations and natural materials such as ironstone layers and boulders. Special procedures and/or tools shall be employed by the Contractor after the hole cannot be advanced using conventional augers, drilling buckets and/or underreaming tools. Such special procedures/tools may include but are not limited to: chisels, boulder breakers, core barrels, air tools, hand excavation, temporary casing, and increasing the hole diameter. Blasting shall not be permitted unless specifically approved in writing by the Engineer. No separate payment will be made for removing obstructions.

**D. Lost Tools**

Drilling tools that are lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including, but not limited to, costs associated with the repair of hole degradation due to removal operations or an excessive time that the hole remains open.

## **7.0 SHAFT CONSTRUCTION**

The drilled shafts shall be constructed by the permanent casing method as necessary to produce sound, durable concrete foundation shafts free of defects.

The Contractor shall maintain a drilling log during shaft excavation. The log shall contain information such as the description and approximate top and bottom depth of each soil or rock material encountered; drilling time in each strata; description of the tools and drill rigs used and any equipment changes necessitated by changing ground conditions; seepage or ground water encountered and remarks. Two copies of the log, signed by the Contractor and the Engineer's representative, shall be furnished to the Engineer within one week after completion of the excavation.

The Contractor shall clean the base of each shaft so that a minimum of 50% of the base will have less than 13 mm (0.5 in) of sediment at the time of concrete placement. The maximum depth of sediment or debris at the base of the shaft shall not exceed 38 mm (1.5 in).

Disposal of excavated material as well as any slurry and/or water removed from the shaft excavation by the Contractor shall be in accordance with applicable specifications for disposal of excavated materials.

No foundation piling shall be driven or boring performed either by pile hammer or drilled shaft method, within a radius of 6 m (20 feet) of concrete that has taken its initial set until the concrete has attained a compressive strength of 10 MPa (1,500 psi).

### **A. Casings**

Casings shall be steel, smooth, clean, watertight and of ample strength and thickness to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified diameter of shaft and the outside diameter of any excavation made below the casing shall not be less than the specified diameter of the socket. No extra compensation will be allowed for concrete required to fill an oversized casing.

The use of an oversized excavation to install the permanent casing is not permitted. The use of a two-casing system to install the drilled shaft is not permitted. The casing shall maintain intimate contact with the surrounding soils at all times to minimize disturbance, formation of voids and loss of ground.

The casing shall have cutting teeth in its leading edge to permit it to seat into the rock and form a watertight seal against groundwater under artesian conditions. It is the Contractor's responsibility to adequately seat the casing. Once the casing is seated into the rock and the hole is sealed, the Contractor shall cut the casing so that the top of casing is at the top of shaft elevation. After cutting, the casing shall be ground smooth.

### **B. Allowable Tolerances**

The shafts shall be installed as shown on the applicable design drawing and in accordance with these special provisions.

1. The bottom of shaft elevations have been estimated from the boring data. The location and log of each boring is shown on the plan.
2. No shaft shall be off center from its design location more than 75 mm (3 in.) at the top of the shaft.
3. No vertical shaft shall be out of plumb more than 1 percent of its length.
4. The reinforcement steel cage shall be set at no less than 75 mm (3 in.) above the bottom of the excavated shaft prior to placement of concrete.
5. The top elevation of the shaft shall have a tolerance of + 25 mm (1 inch) or – 75 mm (3 inches) from the plan top-of-shaft elevation.
6. Excavation equipment and methods shall be designed so that the completed shaft excavation will have a flat bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of 30 mm/m (3/8 inch/foot) of diameter.

Drilled shaft excavations and completed shafts not constructed within the required tolerances are unacceptable. The Contractor shall be responsible for correcting all unacceptable shaft excavations and completed shafts to the satisfaction of the Engineer. Materials and work necessary, including engineering analysis and redesign, to complete corrections for out of tolerance drilled shaft excavations shall be furnished without either cost to the Department.

## **8.0 SLURRY**

Slurry may be used to support the hole in the socket if caving occurs below the permanent casing.

Mineral or polymer slurries shall be employed when slurry is used in the drilling process unless other drilling fluids are approved in writing by the Engineer. Mineral slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the mineral suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

During construction, the level of the slurry shall be maintained at a height sufficient to prevent caving of the hole. In the event of a sudden significant loss of slurry to the hole, the construction of that foundation shall be stopped until either a method to stop slurry loss or an alternate construction procedure has been approved by the Engineer.

Mineral slurry shall be premixed thoroughly with clean fresh water and adequate time (as prescribed by the mineral manufacturer) allotted for hydration prior to introduction into the shaft excavation. Slurry tanks of adequate capacity will be required for slurry circulation, storage, and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without the written permission of the Engineer. Desanding equipment shall be provided by the Contractor as necessary to control slurry sand content to less than 4 percent by volume at any point in the borehole at the time the slurry is introduced.

The Contractor shall take all steps necessary to prevent the slurry from "setting up" in the shaft. Such methods may include but are not limited to: agitation, circulation and/or adjusting the properties of the slurry. Disposal of all slurry shall be done off site in suitable areas by the Contractor.

Control tests using suitable apparatus shall be carried out on the mineral slurry by the Contractor to determine density, viscosity and pH. An acceptable range of values for those physical properties is shown in the table given in this section:

<b>MINERAL SLURRY (Sodium Bentonite or Attapulgite in Fresh Water) Acceptable Range of Values</b>			
Property (Units)	At Time of Slurry Introduction	In Hole at Time of Concreting	Test Method
Density (kN/m <sup>3</sup> )	10.1* - 10.8*	10.1* - 11.8*	Density Balance
Density (pcf)	64.3* - 69.1*	64.3* - 75.0*	Density Balance
Viscosity (sec. /quart**)	28 - 45	28 - 45	Marsh Funnel
PH	8 - 11	8 - 11	pH paper, pH meter

\* Standard measurements are in seconds per quart, not seconds per liter.  
One sec. / quart = 1.06 sec. / liter, but 1 quart, not 1 liter, of slurry should be used in the test.

Notes:

- Tests should be performed when the slurry temperature is above 4.5 degrees Celsius (40 degrees Fahrenheit).
- If desanding is required sand content shall not exceed 4 percent (by volume) at any point in the borehole as determined by the American Petroleum Institute sand content test when the slurry is introduced.

Tests to determine density, viscosity and pH value shall be performed during the shaft excavation to establish a consistent working pattern. A minimum of four sets of tests shall be made during the first 8 hours of slurry use. When the results show consistent behavior the testing frequency may be decreased to one set every four hours of slurry use.

Slurry properties at the time of mixing and at the time of concreting must be in conformance with the written recommendations of the manufacturer. However, whatever product is used, the sand content at the base of the drilled shaft excavation shall not exceed 1 percent.

If the Contractor proposes to use a blended mineral-polymer slurry, the Contractor shall submit a detailed report specific to the project prepared and signed by a qualified slurry consultant describing the slurry materials, the mix proportions, mixing methods and quality control methods.

If polymer slurry, or blended mineral-polymer slurry, is proposed, the Contractor's slurry management plan shall include detailed provisions for controlling the quality of the slurry, including tests to be performed, the frequency of those tests, the test methods, and the maximum and/or minimum property requirements that must be met to ensure that the slurry meets its intended functions in the subsurface conditions at the construction site and with the construction methods that are to be used. The slurry management plan shall include a set of the slurry manufacturer's written recommendations and shall include the following tests, as a minimum: Density test (API 13B-I, Section 1), viscosity test (Marsh funnel and cup, API 13B-I, Section 2.2, or approved viscometer), pH test (pH meter, pH paper), and sand content test (API sand content kit, API 13B-I, Section 5).

If approved by the Engineer, the Contractor may use only water as a drilling fluid. In that case, all of the provisions in the table shown in this section for mineral slurries shall be met, except that the maximum density shall not exceed 11.0 kN/m<sup>3</sup> (70 pcf ).

The Contractor shall insure that a heavily contaminated slurry suspension, which could impair the free flow of concrete, has not accumulated in the bottom of the shaft. Prior to placing concrete in any shaft excavation, the Contractor shall take slurry samples using a sampling tool approved by the Engineer. Slurry samples shall be extracted from the base of the shaft and at intervals not exceeding 3 m (10 feet) up the slurry column in the shaft, until two consecutive samples produce acceptable values for density, viscosity, and pH.

When any slurry samples are found to be unacceptable, the Contractor shall take whatever action is necessary to bring the slurry within specification requirements. Concrete shall not be poured until the slurry in the hole is re-sampled and test results produce acceptable values.

During construction, the level of mineral or blended mineral-polymer slurry in the shaft excavation shall be maintained at a level not less than 1.2 m (4 feet) above the highest expected piezometric pressure head along the depth of the shaft, and the level of polymer slurry shall be maintained at a level not less than 1.8 m (6 feet) above the highest expected piezometric pressure head along the shaft. If at any time the slurry construction method fails, in the opinion of the Engineer, to produce the desired final results, then the Contractor shall both discontinue this method and propose an alternate method for approval of the Engineer.

If a slurry cake builds up on the shaft sidewalls, the Contractor shall remove it prior to concrete placement at no additional cost. If mineral slurry is used, the shaft sidewalls shall be reamed prior to placement of the reinforcement.

## **9.0 EXCAVATION INSPECTION**

The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. The dimensions and alignment shall be determined by the Contractor under the direction of the Engineer. Final shaft depths shall be measured with a suitable weighted tape or other approved methods after final cleaning. Shaft cleanliness shall be determined by visual inspection for dry shafts or other methods deemed appropriate for wet shafts. For dry shafts, the sidewalls shall be visually free of cuttings that may have smeared on the walls during removal or insertion of the drilling tools.

## **10.0 REINFORCING STEEL CAGE CONSTRUCTION AND PLACEMENT**

The reinforcing steel cage, consisting of longitudinal bars, ties, cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted, and prior to concrete placement. Internal stiffeners shall be removed as the cage is placed in the borehole so as not to interfere with the placement of concrete.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances. Concrete spacers or other approved non-corrosive spacing devices shall be used at sufficient intervals [near the bottom and at intervals not exceeding 3 m (10 feet) up the shaft] to ensure concentric spacing for the entire cage length. Spacers shall be constructed of approved material equal in quality and durability to the concrete specified for the shaft. The spacers shall be of adequate dimension to insure a minimum 75 mm (3 inch) annular space between the outside of the reinforcing cage and the side of the excavated hole. Approved cylindrical concrete feet (bottom supports) shall be provided to insure that the bottom of the cage is maintained the proper distance above the base.

## **11.0 CONCRETE PLACEMENT**

Concrete placement shall be performed in accordance with the applicable section of NDOR Standard Specification for Highway Construction and with the requirements herein.

Concrete shall be placed as soon as possible after reinforcing steel placement. Concrete placement shall be continuous from the bottom to the top of the shaft. Concrete placement shall continue after the shaft excavation is filled until good quality concrete is evident at the top of shaft. Concrete shall be placed either by free fall or through a tremie or concrete pump. The free fall placement shall only be permitted in dry holes. Concrete placed by free fall shall fall directly to the base without contacting either the rebar cage or hole sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

The elapsed time from the beginning of concrete placement in the shaft to the completion of the placement shall not exceed 2-hours. Admixtures such as water reducers, plasticizers, and retarders shall not be used in the concrete mix unless permitted in the contract documents. All admixtures, when approved for use, shall be adjusted for the conditions encountered on the job so the concrete remains in a workable plastic state throughout the 2-hour placement limit.

The Contractor may request a longer placement time provided he or she supplies a concrete mix that will maintain a slump of 100 mm (4 inches) or greater over the longer placement time as demonstrated by trial mix and slump loss tests. The trial mix and slump loss tests shall be conducted using concrete and ambient temperatures appropriate for site conditions.

### **A. Tremies**

Tremies may be used for concrete placement in either wet or dry holes. Tremies used to place concrete shall consist of a tube of sufficient length, weight, and diameter to discharge concrete at the bottom of the excavated shaft. The tremie shall not contain aluminum parts that will have contact with the concrete. The tremie inside diameter shall be at least 6 times the maximum size of aggregate used in the concrete mix but shall not be less than 250 mm (10 inches). The inside and outside surfaces of the tremie shall be clean and smooth to permit

both flow of concrete and unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends, which restrict concrete placement.

The tremie used for wet excavation concrete placement shall be watertight. Underwater or under slurry placement shall not begin until the tremie is placed to the bottom of the excavated shaft, and the concrete shall be kept completely separated from the water or slurry prior to the time it is discharged. Valves, bottom plates or plugs may be used for this purpose only if concrete discharge can begin within one tremie diameter of the base of the drilled shaft. Plugs shall either be removed from the excavation or be of a material, approved by the Engineer, which will not cause a defect in the shaft if not removed. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall be immersed at least 1.5 m (5 feet) in concrete at all times after starting the flow of concrete. The flow of the concrete shall be continuous. The level of the concrete in the tremie shall be maintained above the level of slurry or water in the borehole at all times to prevent water or slurry intrusion into the shaft concrete.

If at any time during the concrete pour, the tremie line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete level, the shaft shall be considered defective. In such case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall removal directed by the Engineer and repour the shaft. All costs of replacement of defective shafts shall be the responsibility of the Contractor.

## **B. Pumped Concrete**

Concrete pumps and lines may be used for concrete placement in either wet or dry excavations. All pump lines shall have a minimum 100 mm (4-inch) diameter and be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the bottom of the excavated shaft.

For wet excavations, a plug or similar device shall be used to separate the concrete from the fluid in the hole until pumping begins. The plug shall either be removed from the excavation or be of a material, approved by the Engineer, that will not cause a defect in the shaft if not removed.

The discharge orifice shall remain at least 1.5 m (5 feet) below the surface of the fluid concrete. When lifting the pump line during concreting, the Contractor shall temporarily reduce the line pressure until the orifice has been repositioned at a higher level in the excavation.

If at any time during the concrete pour the pump line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete level, the shaft shall be considered defective. In such case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall removal directed by the Engineer, and repour the shaft. All costs of replacement of defective shafts shall be the responsibility of the Contractor.

**C. Drop Chutes**

Drop chutes may be used to direct placement of free-fall concrete in excavations where the maximum depth of water does not exceed 75 mm (3 inches). Free fall placement is not permitted in wet excavations. Drop chutes shall consist of a smooth tube of either one-piece construction or sections that can be added and removed. A drop chute can also be a hopper with a short tube to direct the flow of concrete. Concrete may be placed through either the hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. If concrete placement causes the shaft excavation to cave or slough, or if the concrete strikes the rebar cage or sidewall, the Contractor shall reduce the height of free fall and/or reduce the rate of concrete flow into the excavation. If caving or sloughing of the borehole walls occurs during free-fall placement of concrete, the shaft shall be considered defective. In such case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall removal directed by the Engineer and repour the shaft. All costs of replacement of defective shafts shall be the responsibility of the Contractor. If concrete placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, the Contractor shall use either tremie or pumping techniques to accomplish the pour.

**12.0 CROSSHOLE SONIC LOG (CSL) TESTING**

**A. Description**

If required in the contract documents, Crosshole Sonic Log (CSL) testing shall be utilized to evaluate the integrity of drilled shaft foundations. CSL testing measures the response of an ultrasonic pulse passing from a signal source in one access tube to a receiver in a second access tube. In uniform, good quality concrete, the CSL test will produce records of consistent travel times and signal amplitudes and correspond to a reasonable concrete pulse velocity from the bottom to the top of the shaft. Longer travel times and lower signal strength in the record indicate the presence of irregularities such as poor quality concrete, voids, honeycombs, or soil intrusions.

**B. Access Tubes for Crosshole Sonic Log Testing**

1. **Tubes:** The access tubes shall be 51 mm (2-inch) I.D. schedule 40 steel pipe. The selected pipes must have a round, regular internal diameter free of defects or obstructions, including any at the pipe joints, in order to permit free, unobstructed passage of the source and receiver probes. The pipes must be watertight and free from corrosion with clean internal and external faces to insure smooth passage of the probes and to secure a good bond between the concrete and the tubes.

The pipes shall each be fitted with a watertight shoe on the bottom and a removable cap on the top. A minimum of two pipes are required and for drilled shafts greater than 610 mm (2 feet) in diameter, one additional tube shall be added for each 305 mm (1 foot) increase in diameter.

2. **Installation:** If required, the contractor shall install access tubes for crosshole sonic log testing to permit access for the crosshole sonic test probes. The access tubes shall be evenly spaced around the perimeter of the reinforcing cage and securely attached to the interior of the reinforcement cage of the shaft. The tubes shall be as near to vertical and parallel as possible. Even moderate bending of the tubes will result in large regional variations of the data. The tubes shall extend from 150 mm (6 inches) above the bottom of the drilled shaft to at least 1.2 m (4 feet) above the construction joint. Under no circumstances should the tubes be allowed to rest on the bottom of the excavated shaft. During placement of the reinforcement cage, care shall be exercised as to not damage the tubes.

After placement of the reinforcement cage, the tubes shall be filled with clean water as soon as possible and the tube tops capped to keep debris out. The tubes must be filled with water and capped either before the pouring of the concrete or no later than 4 hours after the pouring of the concrete, otherwise debonding of the access tubes from the concrete will occur resulting in data which indicates poor quality concrete. Care shall be taken during the removal of the caps from the pipes after installation so as not to apply excess torque, hammering, or other stresses which could break the bond between the tubes and the concrete.

Upon completion of the CSL testing and acceptance of the drilled shaft by the Engineer, the water shall be removed from the access tube and any other drilled holes. The access tubes and the holes shall then be completely filled with grout. The access tubes shall be filled using grout tubes that extend to the bottom of the holes. The access tubes are to be cut off flush with the top of the drilled shaft.

3. **Grout:** Grout for filling the access tubes at the completion of the crosshole sonic log tests shall consist of Portland cement, water, and a water reducing admixture and shall be mixed in the following proportions:

Portland Cement Type I or II	1 Sack (49.2 kg (94lbs))
Water	17 liters (4.5 Gallons) Maximum
Water Reducing Admixture	Manufacturer's Recommendation
Fly Ash (Optional)	9 kg (20 lbs.) Maximum

### 13.0 METHOD OF MEASUREMENT

Drilled shafts shall be measured by the lineal meter for each diameter of completed concrete drilled shaft listed. Sockets shall be measured by the lineal meter for each diameter of concrete socket listed. The length for the Drilled Shafts shall be determined as the difference between the plan top of shaft elevation and the bottom of the permanent casing. The length of the Socket shall be determined as the difference between the bottom of the permanent casing and the bottom of shaft elevation.

### 14.0 BASIS OF PAYMENT

This work will be paid for at the contract unit price for the items "DRILLED SHAFT, \_\_\_\_" and "SOCKET, \_\_\_\_" and shall include all costs for drilling, excavation, furnishing and placing concrete and reinforcing steel, furnishing and placing permanent casing and all incidental work and materials necessary to construct the shafts according to the plans and these special provisions.

No payment will be made for drilled shafts rejected due to installation tolerances. Clearing of all obstructions encountered during excavation shall be resolved as directed by the Geotechnical Engineer. No payment shall be made for the length of drilled shaft remaining above the finished elevation except where specifically authorized.

## **WIRE MESH MECHANICALLY STABILIZED EARTH WALL (WITH CAST-IN-PLACE CONCRETE FACING)**

### **1.0 GENERAL REQUIREMENTS**

This work shall consist of furnishing materials and placement for a wire mesh retaining wall with a cast-in-place concrete facing. The wall shall be constructed in accordance with these specifications and in conformance with the lines, grades, design and dimensions shown on the plans or otherwise established.

- A. The wall supplier shall be the same as those shown on the NDOR Approved Products List., for Mechanically Stabilized Earth (MSE) Walls with Concrete Face Panels.
- B. Submittals: Design drawings and calculations signed and sealed by a professional engineer registered to practice engineering in the State of Nebraska shall be submitted to the engineer for approval. Contractor submittals shall comply with Section 105.02 of the 1997 Metric Edition of the Standard Specifications.
- C. A representative of the wall supplier shall attend the pre-construction meeting to address any issues specific to the requirements of the wire mesh retaining wall.

### **2.0 DESIGN REQUIREMENTS**

- A. The design of the wall shall consider the internal stability of the reinforced soil mass and the wall design shall be in accordance with acceptable engineering practice and these specifications. The design life of the structure shall be 75 years unless otherwise specified by the owner.
- B. The wall supplier shall take into account the height of the temporary surcharge when sizing the length and spacing of the soil reinforcing members
- C. Design Height: The structure's design height, H, shall be from the bottom of the wire facing to the top of the temporary surcharge.
- D. Soil reinforcement length: The soil reinforcement length shall be the same length from top to bottom of wall. The minimum soil reinforcement length shall be as required to achieve a minimum depth of structure, measured from the front face of wall to the end of the soil reinforcements, greater than or equal to 70 percent of the design height, H.
- E. Design parameters: The soil parameters shown on the plans shall be used for the design of the wall. Passive resistance in front of the wall shall be assumed to be zero for design purposes.

F. Minimum Factors of Safety for Internal Stability:

Reinforcement yield: FS = 1.8 @ end of service life

Reinforcement pullout in soil: FS = 1.5 against 13 mm deformation. The maximum allowable reinforcement tension shall not exceed two-thirds of the pullout resistance determined at 13 mm deformation.

Connection of reinforcements to facing units: The maximum allowable reinforcement tension shall not exceed one-half of the ultimate breaking load of the connection.

G. Minimum Factors of Safety for external stability:

Sliding of the mass: FS = 1.5

Overturning of the mass: FS = 2.0

H. Allowable reinforcement Tension: The allowable reinforcement tensile stress at the end of the service life shall not exceed 55 percent of the yield strength of the steel (i.e. FS = 1.8 against yield of steel at end of service life). A sacrificial thickness of 1.422 mm shall be considered in the analysis of the allowable reinforcement tension. In addition, the sacrificial thickness shall be applied to all components of the wall system including any backing mats or screens.

I. State of Stress: The lateral earth pressure to be resisted by the soil reinforcements at each reinforcement layer shall be calculated using the appropriate coefficient of earth pressure, K, times the vertical stress at each reinforcement layer. The vertical soil stress at each reinforcement layer shall consider the local equilibrium of all the forces acting above the layer under investigation.

### 3.0 MATERIALS

The contractor shall make his own arrangements to purchase the materials covered by this section of the specifications.

A. Wire facing, soil reinforcements and attachment devices;

1. Wire Facing and Soil Reinforcing Mesh: Wire facing and soil reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A-82 and welded into the finished configuration in accordance with ASTM A-185. Galvanizing shall conform to the minimum requirements of ASTM A-123.
2. Attachment devices: Attachment devices shall be fabricated from cold drawn steel wire conforming to the minimum requirements of ASTM A-82 and shall be galvanized in accordance with ASTM A-123.

B. Soil Retention Materials:

1. When shown on the plans, an expanded metal screen or welded wire fabric (wwf) backing mat shall be placed behind the wire facing to retain the soil. The screen or WWF mesh shall be hot-dipped galvanized in accordance with ASTM A-123 and shall be sized to safely maintain its soil retention properties for the full 75-year service life.
2. Geotextile Fabric: Where required by the wall supplier, Geotextile fabric shall be placed within the reinforced fill. Geotextile fabric shall comply with the requirements of the wall supplier.

- C. Reinforced backfill: Reinforced backfill shall conform to the following gradation limits as determined by AASHTO T-27.

Reinforced Backfill	
Sieve Size	Percent Passing
4 inches (100 mm)	100
3 inches (75 mm)	75-100
No. 200 (75 µm)	0-15

In addition, the reinforced backfill material shall conform to the following requirements:

1. Plasticity Index: The Plasticity Index (P.I.), as determined by AASHTO T-90, shall not exceed 6.
2. Electrochemical Requirements: The backfill material shall have a minimum resistivity of 3000 ohm-cm at 100% saturation when tested in accordance with AASHTO T-228. In addition, the pH of the backfill material shall be in the range of 5 to 10 as determined in accordance with AASHTO T-289. The maximum soluble salt content of the reinforced backfill material shall not exceed 100 ppm chlorides and 200 ppm sulfates as determined in accordance with AASHTO T-291 and T-290 respectively. If the minimum resistivity exceeds 5000 ohm-cm at 100% saturation, the requirement of testing for chlorides and sulfates may be waived.

The contractor shall furnish to the engineer a Certificate of Compliance certifying that the reinforced backfill materials comply with this section of the specifications. A copy of all test results performed by the contractor, which are necessary to assure compliance with the specifications, shall also be furnished to the engineer. Backfill not conforming to this specification shall not be used without the written consent of both the engineer and the wall supplier.

#### 4.0 CONSTRUCTION

- A. Wall Excavation: Unclassified excavation shall be in accordance with the requirements of the general specifications and in reasonably close conformity with the limits shown on the plans. All excavation cuts and slopes shall comply with O.S.H.A. requirements.
- B. Foundation Preparation: Prior to wall construction, the foundation, if not in rock shall be compacted as directed by the engineer. Any unsuitable foundation material, as determined by the engineer, shall be excavated and replaced with granular material and shall be compacted in accordance with Section 4.4, Backfill Placement.
- C. Wall erection: The wall system components shall be constructed in accordance with the wall system supplier's recommendations and construction manual. The wall shall be constructed vertical or as near vertical as the wall system will allow. The overall vertical tolerance of the wall and the horizontal alignment tolerance shall not exceed the tolerances shown in the plans.

- D. **Backfill Placement:** Backfill placement shall closely follow erection of each course of wire facing units. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. Any wall materials that become damaged or disturbed during backfill placement shall be either removed and replaced at the contractor's expense or corrected as directed by the engineer. Any misalignment or distortion of the wall elements due to placement of backfill outside the limits shown on the plans shall be corrected as directed by the engineer.

Reinforced backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T-99 method C or D (with oversize correction, as outlined in note 7). Reinforced backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-99, method C or D (with oversize correction, as outlined in note 7). The maximum lift thickness after compaction shall not exceed 300 mm, regardless of the vertical spacing between layers of soil reinforcements. The contractor shall decrease this lift thickness, if necessary, to obtain the specified density.

Prior to placement of the soil reinforcements, the reinforced backfill elevation, after compaction, shall be 50 mm above the connection elevation from a point approximately 600 mm behind the facing to the free end of the soil reinforcements, unless otherwise shown on the plans.

Compaction within 900 mm of the facing shall be achieved by at least three (3) passes of a lightweight mechanical tamper, roller or vibratory system. No soil density tests need be taken within this area. Care shall be exercised in the compaction process to avoid misalignment of the facing. Heavy compaction equipment shall not be used to compact backfill within 900 mm of the wall face. At the end of each day's operation, the contractor shall slope the last level of backfill away from the wall facing to direct runoff of rainwater away from the wall face. In addition, the contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

- E. **Cast-In-Place Concrete Facing:** Concrete shall conform to the project plans and specifications and shall have a 28-day compressive strength of 20 MPa. Reinforcing steel shall be deformed bars conforming to ASTM A-615 or A-617, Grade 420 and shall be epoxy coated.

The concrete facing shall be constructed after the welded wire panels and backfill are completed to full height and after the temporary surcharge has been removed. The CIP fascia wall shall be cast as shown on the plans. All expansion joints and contraction joints shall be vertical and continuous from bottom to top of the wall. No horizontal joints will be permitted.

## **5.0 MEASUREMENT AND PAYMENT**

- A. The quantity for "WireMesh MSE Wall" shall be measured by the square meter of vertical wall surface including the vertical surface for the temporary surcharge as

shown in the plans. The quantity for "Cast-in-Place Wall Facing" shall be measured by the square meter of final wall surface area as shown in the plans. The wall surface area is based on the projected vertical surface area and no extra area shall be measured for locations where the wire mesh wall wraps around drainage inlet structures. No adjustment in the pay quantities will be made if the computed quantities, based on the working drawings, vary from the plan quantities. The quantities shall include furnishing and fabricating all materials, erecting the wall and furnishing the reinforced concrete facing.

- B. The quantity of "Select Granular Backfill for MSE Walls" is measured by the cubic meter and computed using the plan dimensions. No adjustment in the pay quantity will be made if the computed quantity, based on working drawings, varies from the plan quantity. The quantity shown is based on a volume equal to 70 percent of the height.
- C. Excavation for the wire faced MSE Wall will not be measured and paid for separately, but shall be subsidiary to the appropriate pay item requiring the excavation.
- D. Payment is full compensation for all work prescribed in this Section.

#### **PREPARATION OR REMOVAL OF EXISTING STRUCTURE (Bridge at Station 86+88.67)**

Scrape samples of paint were not taken from the existing structure located at Station 86+88.67.

The paint on the existing structure is believed to contain the metal lead in excess of 80,000 ppm, the metal chromium in excess of 200 ppm, and may also contain other toxic metals.

Removal of paint containing hazardous metals at the levels indicated by this analysis could create exposure conditions above regulatory limits for health and safety requirements.

Any test results provided by the Department are for bidding purposes only. The Contractor is required to conduct their own monitoring at project start-up, and adjust worker protection and work practices according to the results.

#### **PREPARATION OF BRIDGE AT STA. 86+88.67**

The preparation of the existing bridge shall be in accordance with Sections 203 and 704 of the Standard Specifications for Highway Construction and include the following:

Extreme caution shall be exercised in removing any part of the existing bridge so that no material or debris will be permitted to fall into the streambed below. The contractor shall take adequate precautions to protect all traffic and roadways.

The preparation includes removal of the three exterior girder lines on the right (south) side of the bridge as shown in the plan. The contractor shall exercise care during the removal of the slab and girders not to damage the adjacent girders.

**38 mm CONDUIT IN BRIDGE  
(Bridge at Sta. 86+88.67)**

This work consists of furnishing and installing an electrical conduit system as shown in the plans. It shall include all labor and materials, including the 38 mm and 19 mm conduit and fittings, junction boxes, expansion fittings, drains, excavation, backfill, and all equipment, tools and incidentals necessary to complete the work.

Junction boxes shall be 250 mm x 150 mm x 150 mm, NEMA type 4, watertight and dust-tight. Boxes shall be of machineable quality gray iron castings, outside flanged with recessed cover, and designed for flush mounting in masonry. Cover and box shall be galvanized. Cover shall be gasketed and secured to the box with hex head stainless steel screws. Conduit entrance into the box shall be through slip holes.

All electrical conduit and fittings shall be PVC and bear the UL Label. Fittings used with liquid-tight flexible conduit must be approved for the application.

The conduit system shall be installed under the direct supervision of a journeyman electrician or lineman and shall conform to the requirements of the National Electric Code and the Standard Specifications.

The electrical conduit system shall be measured for payment by the number of linear meters shown in the plans within the limits defined for this item.

The electrical conduit system, in place and accepted by the Engineer, will be paid for at the contract unit price per linear meter for the item "38 mm CONDUIT IN BRIDGE". This price and payment shall be full compensation for furnishing and installing the complete electrical conduit system as shown in the plans. The 19 mm conduit shall be subsidiary to the 38 mm conduit.

**PVC-COATED FLEXIBLE GALVANIZED STEEL CONDUIT**

PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit shall be core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked. The extruded PVC outer jacket shall be positively locked to the steel core. Conduit shall be liquid and vapor-tight and in accordance with UL 360.

The protective coating of the conduit shall be maintained. Repair conduit with a patching compound of the same material as the coating, provided by the manufacturer of the conduit. A self-adhesive, highly conformable, cross-linked silicone composite strip, followed by a protective coating of vinyl tape may also be used. Total nominal thickness shall be 40 mil. Repair surfaces that will be inaccessible after installation prior to installation.

The item "19 mm PVC Coated GRS Conduit" will be measured and paid for by the meter.

## **PILES AND PILE DRIVING (Piles Requiring Vibratory Hammers)**

To reduce noise, all HP 310 mm x 79 kg and HP 360 mm x 132 kg steel piling for piers 10W through 34W on Bridge 1, and for piers 10E through 34E on Bridge 2 shall be driven with a vibratory hammer to an elevation below cut-off equal to 75 percent of the piles order length. The vibratory hammer shall be of sufficient size to install the piling to this required depth. Once the 75 percent depth is reached, the vibratory hammer shall be removed and the remainder of the pile length shall be driven in accordance with Section 703 in the Standard Specifications. All piling in a group may be driven with a vibratory hammer to the 75 percent depth prior to switching hammers and driving to design bearing.

## **PREPARATION OF EXISTING STRUCTURE AT STA. 1001+88.49**

### **GENERAL DESCRIPTION**

This item shall be in accordance with all pertinent provisions of Section 701 of the Standard Specifications and shall include the following:

The removal of the entire existing superstructure including the concrete deck, steel girders and bearing devices.

The removal of the existing abutment and wing concrete. Extreme care shall be used when removing the abutment concrete so as not to damage the existing steel piling or the existing concrete sheet piling shown to be incorporated into the new work.

The removal of portions of the existing piers to the limits and elevations shown on the plans.

The cleaning and roughening of the existing concrete coming into contact with the new work.

The removal of portions of the existing approach slabs and/or the existing pavement to the extent and limits required to build the new approach slabs.

The furnishing and placing of epoxy compound and the drilling of holes for the dowel bars as shown on the plans.

The existing structure will be used to maintain traffic during Phase 1 Construction. The removals shall be done in phases according to the details shown on the plans.

Broken concrete resulting from the preparation shall be made available for use as riprap, as shown on the plans. All other material resulting from the preparation will become the property of the contractor and shall be promptly removed from the right of way. Broken concrete riprap shall be prepared in accordance with the provisions of section 906 of the standard specifications.

### **HAZARDOUS OR TOXIC MATERIALS**

Paragraph 3 of subsection 732.01 in the Supplemental Specifications is void and superseded by the following:

Scrape samples of paint from the existing structure were not obtained or tested. However, due to the age of the structure, it is expected that lead and/or chromium could

be present at levels sufficient to create conditions above regulatory limits for health and safety requirements. In lieu of actual test results, for the purpose of bid prices and prosecution of work, the contractor shall assume the existence of these toxic constituents and shall perform removal and disposal operations for supporting structural steel in compliance with Section 732 - "LEAD-BASED PAINT REMOVAL" of the Supplemental Specifications.

## **REMOVE STRUCTURE AT STA. 3008+58.4**

### **GENERAL DESCRIPTION**

Work under this item shall include the removal of the existing 120<sup>th</sup> Street Bridge over West Dodge Road. Removal shall be staged in accordance with the staging plans and the SPECIAL PROSECUTION AND PROGRESS special provision.

Removal of the 120<sup>th</sup> Street Bridge shall be in accordance with Section 203.02 of the Specifications. Removal shall include the removal of the Concrete Barrier Curb Special and the Temporary Slope Paving installed in an earlier phase of this contract.

### **HAZARDOUS OR TOXIC MATERIALS**

Paragraph 3 of subsection 732.01 in the Supplemental Specifications is void and superseded by the following:

Scrape samples of paint from the existing structure were not obtained or tested. However, due to the age of the structure, it is expected that lead and/or chromium could be present at levels sufficient to create conditions above regulatory limits for health and safety requirements. In lieu of actual test results, for the purpose of bid prices and prosecution of work, the contractor shall assume the existence of these toxic constituents and shall perform removal and disposal operations for supporting structural steel in compliance with Section 732 - "LEAD-BASED PAINT REMOVAL" of the Supplemental Specifications.

## **REMOVAL OF TEMPORARY SURCHARGE**

### **DESCRIPTION**

This work shall consist of removal of the temporary surcharge placed as part of this contract for construction of Walls 10, 11, 12 and 13. Temporary surcharge shall not be removed prior to the minimum waiting period specified in the Roadway 2K sheets.

The work shall include removal of the surcharge soil and that portion of the temporary MSE wall facing and soil reinforcement straps within the surcharge zone. The Contractor shall exercise care in removing the wire mesh wall facing and soil reinforcing straps in the surcharge zone so as not to damage portions of the MSE wall to remain.

All soil and MSE wall materials removed from the surcharge zone shall become the property of the Contractor and shall be removed from the project site and disposed of in accordance with state and local laws.

## **MEASUREMENT AND PAYMENT**

The quantity for removal of temporary surcharge shall not be measured but shall be paid for as "Excavation (Established Quantity)". This price shall be considered full compensation for removing the surcharge soil, wire mesh facing and soil reinforcing straps in the surcharge zone as well as all labor, equipment and incidentals to complete the work.

## **STAY-IN-PLACE BRIDGE FORMS**

Except for the structure located at STA. 1001+88.490, steel stay-in-place forms will be allowed for concrete floor slabs on steel or precast concrete "I" girders. Stay-in-place forms shall be used for interior areas only, where the forms are supported on both sides by girders. Stay-in-place forms must be adjustable to maintain proper slab thickness and shall be designed so no measurable settlement of forms occurs when the concrete deck is poured. Stay-in-place form support systems must be designed so as to maintain a minimum ½ inch (12 mm) clearance between the form support and the bridge deck reinforcing steel. Removable forms must be used outside of the exterior girders.

The form corrugations shall be filled with polystyrene strips to prevent excess slab dead load.

The Contractor must submit four copies of the stay-in-place form design plans and computations to the Engineer prior to construction. These plans and computations are for information only. The Contractor is responsible for the performance of the stay-in-place forms.

Steel stay-in-place form material shall conform to the requirements of ASTM A 653/A 653M Coating Designation G615/Z500.

The stay-in-place forms will not be measured and paid for directly but shall be considered subsidiary to the item Class 47BD-\_\_\_\_\_ Concrete for Bridges.

## SEEDING

Subsection 803.02 in the 1997 Metric Edition of the Standard Specifications is amended to include the following:

Type "A" (Native Grass Seeding)	Minimum Purity (%)	Broadcast or Hydraulic Seeder Application Rate in kg of Pure Live Seed/ha	Approved Mech. Drill Application Rate in kg of Pure Live Seed/ha
Western Wheatgrass – Flintlock	85		12
Sideoats Grama – Butte	75		4.5
Little Bluestem – Blaze	60		4.5
Blue Grama – NE, KS, CO	35		2.25
Sand Lovegrass – NE – 27	90		2.25
Purple Prairie Clover – Inoculated	90		3.5
Partridge Pea – Platte	90		1
<b>Type "B" (Lawn Grass)</b>			
Turf Type Fescue – Arid 3	85		50
Turf Type Fescue – Jaguar 3	85		50
Turf Type Fescue – Masterpiece	85		50
Turf Type Fescue – Rembrant	85		50
Perennial Ryegrass – Top Gun	85		22.4

Type B shall be seeded with a brillion or a brillion type seeder.

Mulch for the Type "A" seed is restricted to prairie hay.

Paragraph 6. of Subsection 803.02 is void and superseded by the following:

Mulch for Type B seeding shall be Hydromulch. Hydromulch shall be applied at a minimum of 2,250 kg per hectare of wood fiber mulch and if a paper hydromulch is used, it shall be applied at a minimum rate of 2,700 kg per hectare. The seed shall be applied separately from the mulch and fertilizer. The mulch and fertilizer may be applied in the same operation. A non-toxic organic tackifier shall be used with the hydromulch at the manufacturer's recommendations.

Paragraph 1. of Subsection 805.05 is amended to include the following:

Pay Item	Pay Unit
Hydromulch	Megagram (Mg)

All seed shall be origin Nebraska, adjoining states, or as specified. A contractor proposing to use a substitute variety, or origin shall submit for the engineer's consideration a seed tag representing the seed which shows the variety, origin and analysis of the seed.

Rates of application of commercial inorganic fertilizer shall be:

	Rate of Application Per ha (Minimum)
Available Nitrogen (N <sub>2</sub> ) -----	35 or 40 kg
Available Phosphoric Acid (P <sub>2</sub> O <sub>5</sub> ) -----	102 or 107 kg

Rate of application of granular sulphur coated urea fertilizer shall be:

Nitrogen (total available) -----	67 kg
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The contractor may, at his option, apply granular urea formaldehyde in lieu of the sulphur coated urea fertilizer at the following rate:

Nitrogen (total available) -----	67 kg
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### **AREA INLET SEDIMENT FILTER (S8-20-0203)**

#### **Description**

This work shall consist of furnishing, installing and removing an area inlet sediment filter and the installing of a temporary silt check around the inlet if required.

#### **Material Requirements**

The area inlet sediment filter shall be selected from the Approved Products List.

#### **Construction Methods**

The area inlet sediment filter shall be installed according to the manufacturer's instructions. The Engineer shall be given a copy of the instructions before any are placed on the project.

#### **Maintenance of the Area Inlet Sediment Filter**

The area inlet sediment filter shall remain in place throughout the life of the project. Silt removal shall be performed after each storm event.

#### **Removal of the Area Inlet Sediment Filter**

The area sediment filter shall be removed at the completion of the project and shall remain the property of the Contractor.

The Engineer may determine that inlet protection is still required and order that a temporary silt check be placed around the inlet. The temporary silt check installation and the area inlet sediment filter removal shall occur in the same day.

Method of Measurement

All work and materials described herein shall be included in the item "Area Inlet Sediment Filter". The Area Inlet Sediment Filter shall be measured by the each.

**COVERCROP SEEDING  
(S8-21-0603)**

Subsection 812.02 in the Standard Specification is void and superseded by the following:

**812.02 – Material Requirements**

1. The covercrop seed shall comply with the following requirements and shall be applied at the rates shown in Table 812.01.

<b>Table 812.01</b>				
<b>Covercrop Seed Requirements</b>				
<b>Covercrop Seed and Limitations</b>	<b>Minimum Purity (%)</b>	<b>Minimum Germination (%)</b>	<b>Approved Broadcast or Hydraulic Seeder Application Rate</b>	<b>Approved Mech. Drill Application Rate</b>
Oats: Jan. 1 – Aug. 31	80	60	96 lbs/acre (107 kg/ha)	96 lbs/acre (107 kg/ha)
Pearl Millet or Foxtail Millet: May 2 – July 15	80	60	25 lbs/acre (27 kg/ha)	25 lbs/acre (27 kg/ha)
Winter Wheat: Sept. 1 – Dec. 31	80	60	120 lbs/acre (134 kg/ha)	120 lbs/acre (134 kg/ha)
Annual Ryegrass, Urban Areas: Jan. 1 – Dec. 31	80	80	50 lbs/acre (55 kg/ha)	50 lbs/acre (55 kg/ha)

2. The seed for covercrop shall be delivered in bags and tagged with the purity and germination shown on the tag. Bulk seed may be used on this project also, but it too will need a current purity and germination test.
3. Fertilizer is required for covercrop seeding. Rate of application of commercial inorganic fertilizer shall be:

**Rate of Application**

Available Nitrogen (N2)                      66 lbs./acre (73 kg/ha)

4. Subsection 812.03 2.b. in the Standard Specifications is void and superseded by the following:

The covercrop seed may be drilled or broadcast and harrowed. If the seed is broadcast and harrowed, the covercrop shall be considered "guaranteed to grow". If replanting is necessary due to failure to obtain an erosion controlling stand of covercrop, the reseeding shall be done at the Contractor's expense.

Subsection 812.03 is amended to include the following:

The fertilizer shall be applied prior to seeding and incorporated into the soil.

The Contractor shall apply the seed at the rate shown in Table 812.01.

**FABRIC SILT FENCE  
(HIGH POROSITY AND LOW POROSITY)**

Paragraph 4. of Subsection 809.03 in the Standard Specifications is amended to include the following:

At the completion of the project the silt fence shall be left in good working condition.

Paragraph 1. of Subsection 809.05 is amended to include the following:

Pay Item	Pay Unit
Rental of Crawler Mounted Hydraulic Excavator, Fully Operated	Hour (h)

**RELOCATE IMPACT ATTENUATOR**

Removing impact attenuator shall include the removal of all beam guardrail materials, cartridges, fittings, and posts from locations shown in the plans or designated by the Engineer. Concrete anchors shall be removed in their entirety and disposed of by the Contractor.

Resetting impact attenuator shall include setting impact attenuator salvaged from the project site. New concrete anchors and leveling pad shall be furnished by the Contractor. The Contractor shall furnish all new hardware and incidentals required to install the salvaged attenuator elements.

New materials, replacement materials, and concrete shall conform to the requirements of Section 902.

1. The Contractor shall remove impact attenuator so that all materials may be salvaged.
2. Salvaged materials shall be reset.

Traffic shall at no time be within 5.4 meters of an unprotected concrete barrier section. If the Contractor cannot stage his work to accommodate this requirement, then the exposed concrete barrier must be protected in a manner as directed by the Engineer at no additional cost to the Department.

The system shall be reset as specified by the manufacturer of the existing system. The manufacturer shall certify, in a letter to the Engineer, that the system was installed correctly. Along with the certification, the manufacturer shall send maintenance instructions for the installed system.

The item "Relocate Impact Attenuator" shall be measured by the each and shall include removing and resetting the impact attenuator system and any attachment materials, barrier transitions sections, the certification letter, and the maintenance instructions.

## **IMPACT ATTENUATOR SYSTEM**

The Contractor shall furnish and install an impact attenuator system at the location shown in the plans. The system shall meet NCHRP 350 standards for test-level 3 (TL-3). The system shall be a non-gating redirective crash cushion and designed to attach to the 815mm Concrete Barrier End Section shown in the plans. The end section is 815 mm high and 610 mm wide.

The following products are impact attenuator systems that may or may not meet the requirements above. QuadGuard, manufactured by Energy Absorption Systems and distributed by the John Thomas Company at 1-(888) 447-7263, TAU-II, manufactured by Barrier Systems Inc. at 1-(888) 800-3691, TRACC manufactured by Trinity Industries: at 1-(800) 644-7976.

The system shall be furnished and installed as specified by the manufacturer. The manufacturer shall certify, in a letter to the Engineer, that the system was installed correctly. Along with the certification, the manufacturer shall send maintenance instructions for the installed system.

The item "Impact Attenuator" shall be measured by the each (EA) and shall include furnishing and installing the impact attenuator system and any attachment materials, barrier transitions sections, replacement cartridge kits, the certification letter and the maintenance instructions.

## **TEMPORARY IMPACT ATTENUATOR (Group 10)**

The Contractor shall furnish, install and maintain an impact attenuator system at the following locations as shown on the traffic control plans or as designated by the Engineer.

- Sta. 74+39.8 Lt. & Rt. (Installed Phase 1)
- Sta. 74+64.5 Lt. & Rt. (Installed Phase 1)
- Sta. 75+66.5 Rt. (Installed Phase 3)
- Sta. 82+22.5 Rt. (Installed Phase 3)
- Sta. 82+90.8 Rt. (Installed Phase 3)

The Contractor shall relocate, install and maintain an impact attenuator system at the following locations as shown on the traffic control plans or as designated by the Engineer.

- Sta. 75+26.4 Lt. (Relocated Phase 4)
- Sta. 82+03.0 Lt. (Relocated Phase 6)
- Sta. 83+14.0 Rt. (Relocated Phase 6)
- Sta. 74+90.9 Rt. (Relocated Phase 8)

The systems installed in Phase 1 shall be designed for attachment to the concrete barrier curb special (610 mm wide), and all others shall be designed for attachment to the temporary concrete protection barriers (610 mm wide). The systems shall be designed for 45 mph.

The Department recommends the Contractor choose from the following systems or an approved equal: QuadGuard, Type CZ or React 350 manufactured by Energy Absorption Systems and supplied by the John Thomas Company at 1-(888) 447-7263, TRACC manufactured by Trinity Industries at 1-(800) 644-7976, TAU II, manufactured by Barrier Systems, Inc. at 1-(888)-800-3691.

If the selected system requires a replacement cartridge set or a replacement kit to restore it after an impact, the Contractor shall have available one replacement cartridge set or kit either on the project or within a reasonable distance in the event the installed system becomes damaged.

The system shall be installed and maintained as specified by the manufacturer. The Contractor shall immediately repair or replace any damaged system.

Upon completion of the work requiring the impact attenuator, the Contractor shall remove the system; clean the site of any debris and fill any holes drilled to attach the system to the obstacle or the pavement with epoxy mortar described in Section 1018 of the Standard Specifications.

The items "Temporary Impact Attenuator" and "Relocate Impact Attenuator" shall be measured by the each (EA) and shall include all the parts, attachments, pavement epoxy and replacement modules required to build, maintain and remove the required system.

### **TEMPORARY TRAIL COVERS FOR BICYCLE/PEDESTRIAN TRAIL UNDER EXPRESS AND RAMP BRIDGES**

The Papio-Missouri River NRD (P-MRNRD) has constructed a pedestrian/bicycle trail along the east bank of the Big Papillion (Papio) Creek that runs under the proposed Westbound and Eastbound Express bridges. P-MRNRD has also constructed a detour trail to allow the main trail to be closed for bridge construction activities. The detour trail extends along the north side of South Bridge Road, along the west side of 108<sup>th</sup> Street (under the West Dodge Bridge over 108<sup>th</sup> Street) and along the south side of North Bridge Road. NDOR has made a commitment to keep the trail open to the extent practical during construction, using both the main trail and detour trail as needed.

The Contractor will provide temporary trail covers to protect pedestrians at crossing under bridges at the Big Papillion Creek. The trail covers shall be placed under the South Bridge Road Bridge, Bridge 2, Bridge 2 and 5, West Dodge Bridge narrowing and Bridge 1. The trail covers shall be of varying lengths as necessary to protect the pedestrians. The Contractor shall maintain either the main trail or the detour trail open at all times during construction of the bridges over the Papio Creek.

The Contractor will provide the Engineer and the P-MRNRD with a plan of the covers and receive approval from the Engineer before mobilizing or constructing them. The Contractor shall maintain the temporary trail covers under the bridges until the Engineer authorizes their removal. The following applies to the trails and the temporary trail covers:

- The main trail and the detour trail will be a minimum 3 meters wide.
- The temporary trail covers shall have a solid roof but may be open on the sides.
- The covers shall have adequate height for bicyclists to ride through comfortably.
- The length of the covers shall at a minimum extend 3 meters beyond the outside edges of the bridge construction or narrowing.
- The City of Omaha will provide signage for the trails.
- The City of Omaha will provide snow removal maintenance for the trails during the winter months.
- Temporary hard surface that is damaged during construction will be repaired or replaced by the contractor in a timely manner.

- The contractor shall maintain either the main trail or the detour trail open at all times.
- When a trail is closed, the Contractor will be responsible for signing the closure.
- The contractor will be allowed to shift either trail as necessary for construction to provide for a safe trail system.

Building, installing, maintaining and removing the "Temporary Trail Cover" shall be measured and paid for by the each. Payment for the item "Temporary Trail Cover" shall be considered full compensation for all the materials, labor, equipment and incidentals necessary to build, install, maintain and remove the cover. This price shall also be full compensation for maintaining the trails during the construction season as described above.

### **TEMPORARY FENCE**

Where the project construction is adjacent to residences, commercial properties, and pedestrians or is considered to be a hazard to the public, the Contractor shall install and maintain a temporary fence as directed by the Engineer.

The temporary fence can be let down to allow access during a day's construction but shall be replaced if work crews are not in the area. The temporary fence must be in place at the end of each day's operation.

The Contractor shall furnish the temporary fence and fence materials. The fence material shall be a lightweight orange colored plastic and be at least 1200 mm high. The Contractor will also furnish metal "T" posts and ties. The post shall be set at approximately 3-meter intervals and the fabric tied with 3 ties per post.

The item "Temporary Fence" shall be measured and paid for by the Meter. The price bid shall be full compensation for providing, building maintaining and removing the temporary fence. All miscellaneous equipment, post materials and labor required to complete the work shall be included with the bid.

### **CONCRETE DITCH LINING**

Subsection 908.04 and 908.05 in the 1997 Metric Edition of the Standard Specifications is amended to include the following item:

Pay Item	Pay Unit
Concrete Ditch Lining	Square Meter

### **GRANULAR FILL FOR PIPE UNDERDRAIN**

Paragraph 2. of Subsection 914.02 of the 1997 English Edition of the Standard Specifications is void and superseded by the following:

Aggregate that is used in pipe underdrains shall conform to the quality requirements of Subsection 1033.02, paragraphs 3.b.(3) and 3.b.(6) and the Class E Aggregate gradation requirements of Table 1033.03A.

**EQUIPMENT RENTAL  
(Crawler Mounted Hydraulic Excavator)  
(S9-5-0604)**

Subsection 919.02 in the Standard Specifications is amended to include the following:

14. Crawler Mounted Hydraulic Excavators shall be crawler-type units capable of excavating soil in its original position and loading the excavated material into dump trucks. The minimum operating weight shall be 12 metric tons.

**47B CONCRETE PAVEMENTS AND  
47BD CONCRETE FOR BRIDGES  
(S10-4A-0304)**

General

Section 1002 in the 1997 Standard Specifications and Supplemental Specifications is amended to include the following:

For the purpose of this Special Provision, Type IPN shall mean Type IP cement made with 15 to 25 percent natural pozzolan and Type IPF shall mean Type IP cement made with 15 to 25 percent Class F fly ash. All cements must conform to the requirements of Section 1004 in the 1997 Standard Specifications and Supplemental Specifications.

47BD Concrete for Bridges and Barriers

The 47BD concrete used in bridge decks, approach slabs, bridge rails, and barriers shall be proportioned using one of the alternates shown in Table I.

TABLE I (ENGLISH)  
CLASS 47BD CONCRETE PROPORTIONS

Alt.	Cement Type	Pounds of Cement per Cu.Yd.	Pounds of Class F Fly Ash	Air Content Percent		Pounds of Total Agg. per Cu.Yd.		Ratio of Total Agg. Percent	Type of Coarse Agg.****
				Min.	Max.	Min.	Max.		
1	I or II	590	130 Min.	5.0	7.5	2530	2950	30±3	Limestone
2	IPN	658	0*	5.0	7.5	2530	2950	30±3	Limestone
3	IPF	658	0**	5.0	7.5	2530	2950	30±3	Limestone
4	I or II	658***	0***	5.0	7.5	2530	2950	30±3	Limestone

TABLE I (METRIC)  
CLASS 47BD CONCRETE PROPORTIONS

Alt.	Cement Type	Kg of Cement per Cu. Meter	Kg of Class F Fly Ash	Air Content Percent		Kg of Total Agg. per Cu.Meter		Ratio of Total Agg. Percent	Type of Coarse Agg.****
				Min.	Max.	Min.	Max.		
1	I or II	350	77 Min.	5.0	7.5	1500	1750	30±3	Limestone
2	IPN	390	0*	5.0	7.5	1500	1750	30±3	Limestone
3	IPF	390	0**	5.0	7.5	1500	1750	30±3	Limestone
4	I or II	390***	0***	5.0	7.5	1500	1750	30±3	Limestone

\* Class C or F fly ash may be substituted in the mix design provided the total pozzolan content does not exceed 25 percent. The mix may be modified by substituting an amount of fly ash equal to the weight of cement removed.

\*\* No additional fly ash substitution is allowed.

\*\*\* Total alkali content shall not exceed 3 lbs./yd.<sup>3</sup> (1.8 Kg/m<sup>3</sup>)

\*\*\*\* Alternate Aggregate from an approved source may be substituted for limestone.

Water reducing and set retarding admixtures shall be used in accordance with the manufacturer's recommendations of dosage rates.

#### 47B Concrete Pavements

The 47B concrete used in concrete pavements shall be proportioned using one of the alternates shown in Table II.

TABLE II (ENGLISH)  
CLASS 47B CONCRETE PAVEMENT PROPORTIONS

Alt.	Cement Type	Pounds of Cement per Cu.Yd.	Pounds of Class F Fly Ash	Air Content Percent		Pounds of Total Agg. per Cu.Yd.		Ratio of Total Agg. Percent	Type of Coarse Agg.***
				Min.	Max.	Min.	Max.		
1	I or II	510	110 Min.	5.0	7.5	2876	3130	30±3	Limestone
2	IPN	564*	0*	5.0	7.5	2876	3130	30±3	Limestone
3	IPF	564**	0**	5.0	7.5	2876	3130	30±3	Limestone

TABLE II (METRIC)  
CLASS 47B CONCRETE PAVEMENT PROPORTIONS

Alt.	Cement Type	Kg of Cement per Cu. Meter	Kg of Class F Fly Ash	Air Content Percent		Kg of Total Agg. per Cu.Meter		Ratio of Total Agg. Percent	Type of Coarse Agg.***
				Min.	Max.	Min.	Max.		
1	I or II	303	65 Min.	5.0	7.5	1706	1857	30±3	Limestone
2	IPN	335*	0*	5.0	7.5	1706	1857	30±3	Limestone
3	IPF	335**	0**	5.0	7.5	1706	1857	30±3	Limestone

\* Class C or F fly ash may be substituted in the mix design provided the total pozzolan content does not exceed 25 percent. The mix may be modified by substituting an amount of fly ash equal to the weight of cement removed.

\*\* No additional fly ash substitution is allowed.

\*\*\* Alternate Aggregate from an approved source may be substituted for limestone.

Water reducing admixtures shall be used in accordance with the manufacturer's recommendations of dosage rates.

### **FLY ASH (S10-5-0801)**

Subsection 1008.01 in the Standard Specifications is void and superseded by the following:

Fly ash shall be Class C or F meeting the requirements of ASTM C 618.

**STRUCTURAL STEEL  
(S10-5-0801)**

Section 1045 of the Standard Specifications is amended to include the following:

1045.03 -- Steel Plate Substitution

The Contractor may use either English or Metric steel plates in accordance with Table 1045.01.

<b>Table 1045.01</b>			
<b>English-Metric Steel Plate Substitution Table</b>			
<b>Metric (millimeters)</b>	<b>English (inches)</b>	<b>Metric (millimeters)</b>	<b>English (inches)</b>
9	3/8	32	1 1/4
10	3/8	35	1 3/8
11	7/16	38	1 1/2
12	1/2	40	1 5/8
14	9/16	45	1 3/4
16	11/16	50	2
18	3/4	55	2 1/4
20	13/16	60	2 3/8
22	7/8	70	2 3/4
25	1	80	3 1/4
28	1 1/8	90	3 1/2
30	1 1/4		

**REPAIR OF DAMAGED METALLIC COATINGS  
(S10-5-0801)**

Paragraph 2. of Subsection 1061.01 in the Standard Specifications is void and superseded by the following:

2. The material used for repair shall provide a minimum coating thickness of at least 50 µm with one application.

**CORRUGATED METAL PIPE  
(S10-5-0801)**

Table 1035.01 in Section 1035 of the Supplemental Specifications is amended by deleting the title "Steel and Aluminum Culvert Thickness".

**METAL FLARED-END SECTIONS  
(S10-5-0801)**

Table 1036.01 in Section 1036 of the Supplemental Specifications is amended by deleting the title "Steel and Aluminum Flared-End Thickness".

**REINFORCED CONCRETE PIPE, MANHOLE RISERS,  
AND FLARED-END SECTIONS  
(S10-5-0801)**

Paragraph 3.a. of Subsection 1037.02 in the Supplemental Specifications is void and superseded by the following:

3.a. Round reinforced concrete pipe shall conform to the requirements of AASHTO M 170-95 with the exception of the minimum circumferential reinforcing (in<sup>2</sup>/ft. (mm<sup>2</sup>/m) of pipe wall) for 15, 21, and 24 inch (380, 460, 600 mm) Class III pipe, as shown below:

Paragraph 3.b. of Subsection 1037.02 is void and superseded by the following:

b. AASHTO M 170-95 Specifications are modified as follows:

Paragraph 4. of Subsection 1037.02 is void and superseded by the following:

4. Reinforced concrete arch pipe shall conform to the requirements of AASHTO M 206-95.

Paragraph 5. of Subsection 1037.02 is void and superseded by the following:

5. Reinforced concrete elliptical pipe shall conform to the requirements of AASHTO M 207-95.

Paragraph 7. of Subsection 1037.02 is void and superseded by the following:

7. Concrete flared-end sections shall be of the design shown in the plans and in conformance with the applicable requirements of AASHTO M 170-95, Class II pipe, AASHTO M 206-95, Class A-II pipe, or AASHTO M 207-95, Class HE-II pipe for the diameter of pipe which it is to be installed.

**HIGH TENSILE BOLTS, NUTS, AND WASHERS  
(S10-5-1001)**

Subsection 1058.02 in the Supplemental Specifications is void.

Paragraph 4.b.(5) in the Standard Specifications is void and superseded by the following:

- (5) The bolt, nut, and washer assembly shall be assembled in a Skidmore-Wilhelm calibrator or an acceptable equivalent device. For bolts that are too short to be assembled in the calibrator, see Subsection 1058.03, Paragraph 4.b.(9).

**ELASTOMERIC BEARINGS AND LAMINATED  
BEARING PADS  
(S10-5-0903)**

Paragraph 2. of Subsection 1068.02 in the Standard Specifications is void and superseded by the following:

2. Samples and Certification shall be furnished in accordance with NDR's *Materials Sampling Guide*.

Paragraph 3. of Subsection 1068.02 is void.

**STEEL BARS FOR CONCRETE REINFORCEMENT  
(S10-5-1201)**

Section 1020 in the Standard Specifications is void and superseded by the following:

1020.01 - Description

Steel tie bars for longitudinal joint reinforcement in concrete pavements shall be epoxy coated and deformed Grade 40 or 60 billet steel as shown in the plans, specifications or Special Provisions.

1020.02 - Material Characteristics

1. Billet-steel bars shall conform to the requirements of ASTM A 615/A 615M.
2. Epoxy coatings shall conform to the requirements in Section 1021 of the Standard Specifications and Supplemental Specifications.

1020.03 - Acceptance Requirements

Acceptance shall be based on sampling, testing, and certification requirements in accordance with the NDR *Materials Sampling Guide*.

**EPOXY COATED REINFORCING STEEL  
(S10-5-0403)**

Table 1021.01 in Section 1021 of the Standard Specifications is void and superseded by the following:

<b>Table 1021.01</b>			
<b>Bend Test Requirements</b>			
<b>English</b>		<b>Metric</b>	
<b>Bar No.</b>	<b>Mandrel Diameter (inches)</b>	<b>Bar</b>	<b>Mandrel Diameter (millimeters)</b>
3	3	10	75
4	4	13	100
5	5	16	125
6	6	19	150
7	7	22	175
8	8	25	200
9	9	29	230
10	10	32	250
11	11	36	280
14	17	43	430
18	23	57	580

**TYPE IP CEMENT  
(S10-5-0104)**

Paragraph 2. of Section 1004.02, in the Standard Specifications is void and superceded by the following:

2. Type IP (Portland pozzolan) cement may be used in any application where fly ash modified concrete is allowed. Type IP cement shall conform to the requirements as prescribed in ASTM C 595 and the following requirements:

- a. The pozzolan content shall be 15 to 25 percent of the cementitious material by weight.
- b. The pozzolan shall be Class F fly ash or a Class N natural pozzolan.
- c. Additional fly ash substitution shall not be allowed with Type IP cement containing Class F fly ash. If Class N natural pozzolan is used in the cement, fly ash substitution is allowed to a maximum pozzolan content of 25 percent.
- d. A water reducing admixture shall be used in concrete produced with Type IP cement.

e. Mortar bars made and tested according to the provisions of ASTM C 1260 shall have an expansion of no more than 0.10 percent after 28 days. The mortar bars shall be composed of Type IP cement, limestone, and sand and gravel in the proportions used for 47B concrete. The limestone shall be from a Weeping Water, NE, source and the sand/gravel shall be from an eastern Platte River Valley source.

f. 47B concrete made with Type IP shall have a Durability Factor not less than 70 and a mass loss not greater than five percent after 300 freeze/thaw cycles when tested in accordance with ASTM C 666. The freeze/thaw testing shall be conducted according to Procedure A.

## **PERFORMANCE GRADED BINDER**

Section 503 in the Standard Specifications and Supplemental Specifications is amended to include Performance Graded Binders.

### **I. Description**

The performance graded binder to be used on this project shall be PG Binder 76-22 for Temporary Surfacing supplied by a Certified Supplier.

### **Certified Supplier**

A supplier must be certified by the Nebraska Department of Roads to be allowed to supply Performance Graded Binder in Nebraska. A certified supplier must be a participant in one or more of the following PG Binder groups.

1. AASHTO Materials Reference Laboratory (AMRL)
2. Western Cooperative Testing Group
3. Combined States Binder Group

The supplier must maintain and follow the requirements of the group or groups in which they participate in, to maintain certification by the Nebraska Department of Roads. In addition, active participation is required to maintain certification by the Department. Active participation will include submitting of round robin sample results, along with meeting other requirements of the group or groups. Failure to do so will result in loss of certification by the Department.

A certified supplier may be asked to supply to the Department, past round robin results, laboratory inspection reports, reasons for and investigative reports on out lying results, quality control testing, and/or technician training and proficiency testing reports.

The binder supplier agrees to inspection of their plant or terminal without notice anytime during production or supplying of material to the Department. The inspection may also include the supplier's laboratory.

## **Supplier Certification**

A supplier may request certification by contacting the Nebraska Department of Roads, Materials and Research Division, Flexible Pavement Engineer at (402) 479-4675. A temporary certification may be issued for a period of up to one year. Split sample testing will be required prior to receiving a temporary certification. Split sample testing will be done on all grades of binder that the supplier intends to supply during the temporary certification. The supplier will have up to one year to become certified by participating in and following the requirements of one or more of the approved binder groups.

A supplier may become certified through active participation in other binder certification/round robin groups that are approved by the Department. The Department may request from the supplier prior to approval, past or current round robin results, quality control testing, laboratory inspection reports, and/or technician training and proficiency testing reports.

## **II. Binder Sampling and Testing:**

1. Lots. Each 3750 tons (3400 Mg) of HMA produced will be a binder lot.
2. A binder lot will include only one PG Binder grade or a blend as allowed in paragraph 6.e.
3. A binder lot will only include one supplier of the PG Binder or a blend as allowed in paragraph 6.e.
4. Blending of different binder grades and binders from different suppliers will be allowed with restrictions as noted in paragraph 6.e. The Engineer must be notified of the intent to blend prior to actual blending.
5. All binders shall be sampled at the rate of at least one sample per lot with a minimum of three samples per project.
  - a. The sample shall consist of two one-quart (liter) cans and shall be taken by the Contractor's Certified Sampling Technician, with assistance from or under supervision of NDR personnel. The sample shall be taken at the plant from the line between the storage tank and the mixer or from the tank supplying material to the line, at a location at which material sampled is representative of the material in the line to the mixer. One can will be tested for compliance with AASHTO M320 specifications and the other can portion will be saved for dispute resolution, if needed. The sampling process shall follow procedures of the NDR Materials Sampling Guide and NDR T 40.
  - b. Testing. When the tested PG Binder is in compliance, the binder lot will be accepted and both cans of the sample can be discarded. If the tested PG Binder does not comply, then the price of the PG Binder lot represented by the sample shall be adjusted according to Tables 2, 3 and 4. Overall project average testing requirements and price adjustments will also apply, as stated in Table 5.

**6. Material Requirements**

- a. Performance graded binder, as specified in the contract items shall be in accordance with the PG+ specifications as noted, and AASHTO M320 with the exception of Direct Tension.
- b. Substitution of a PG Binder, which exceeds the upper and lower grade designations from the specified, requires advance notification of the Engineer, and be documented by a no cost change order. The bill of lading or delivery ticket shall state the binder grade and specific gravity.
- c. Material Certification - A Material Certification shall be submitted prior to construction, stating the type of modifier being used, and the recommended mixing and compaction temperatures for the Hot Mix Asphalt. The Material Certification must state that acid has not been used. The Material Certification must also state that the material has not been air blown or oxidized.
- d. The Contractor shall receive from the supplier, instructions on the proper storage and handling of each grade and shipment of PG Binder.
- e. Blending of PG Binders at the hot mix plant site will be allowed only when transitioning to an asphalt mixture requiring a different grade of binder and with the following restrictions:
  - (1) The resultant blend will meet AASHTO M320 specifications when tested as  $\pm 3^{\circ}$  C of the specified PG binder. The sample of the blended material will 1) be considered as a lot sample, 2) be taken during initial production following the blending of the binders, and 3) deductions when not meeting M320, will apply. On the blended sample's identification form will be a note explaining the blending conditions and a statement that the sample is a blend of materials. The next lot sample, following the sample representing the blend, will be tested as the specified binder grade for the asphalt mixture being produced and shall meet M320 specifications.
  - (2) Modified Binders - When a type of modification is used and stated in the Material Certification as required in paragraph 6.c., it will not be allowed to be blended with a binder containing a different type of modification. Blending of the same type of modifiers will be allowed.
- f. If the Engineer determines that there is a need for an anti-stripping additive the Contractor shall be compensated for the cost of liquid anti-strip additive needed, at \$12.00 per ton (\$13.23 per Mg) of PG Binder containing anti-stripping additive used. The PG Binder Supplier will add liquid anti-strip additives to the PG Binder when required by the Engineer.
- g. When PG 64-28 and 70-28 are specified the following PG+ specifications (Table 1) and AASHTO M320 with the exception of Direct Tension) will apply:

- (1) The performance graded binder shall be a binder, which incorporates a blend of base asphalt and elastomer modifiers of styrene-butadiene (SB), styrene-butadiene-styrene (SBS) or styrene-butadiene-rubber (SBR). Acid shall not be used. Air blown and/or oxidized asphalt will not be allowed. The supplier must certify that the binder is not acid modified, and that acid was not used. The binder supplier must also certify that air blowing or oxidization has not been done/used to modify the binder or used to change the properties of the binder. The composite material shall be thoroughly blended at the asphalt refinery or terminal prior to being loaded into the transport vehicle. The polymer modified binder shall be heat and storage stable and shall not separate when handled and stored per the suppliers storage and handling recommendations.
- (2) Samples of binder proposed for use and production lot samples shall be submitted to the Materials and Research, Bituminous Laboratory for testing to insure the binder is of a modification system in which no acid is used. ARR-MAZ AD-here LOF65-00, amine anti strip will be added at the rate of 0.5% to sample(s) that have been heated to 300 degrees F or until viscous and stirred for a minimum of 5 minutes. The resultant blend will then be tested for PG grading and compared to PG grading prior to the blending. The resultant blend shall meet M320 specifications and shall not show a drop of  $G^*/\sin(\delta)$  of more than 25% when compared to the result(s) of the sample prior to blending the anti strip. If the resultant blend does not meet M320 specification or shows a drop of greater than 25%, the material that is represented by the sample will be rejected.
- (3) Approval for initial use will be based on the sample(s) meeting the PG+ specifications as stated in Table 1 and M320 specifications. Approval for use will also be based on PG grading when comparing results after blending anti strip to PG grading prior to the addition of anti strip.
- (4) Lot samples of the binder shall meet or exceed the PG+ specifications as listed, in addition to M320 specifications. For PG+, Table 1 specification testing, material will be tested on original unaged binder for phase angle specification and RTFO aged material for elastic recovery. Anti strip will also be added to project lot samples as described in 6.g.(2).
- (5) When it is determined that material does not meet Table 1 specifications, Table 2 and 3 will apply, depending on the grade of binder. When it is determined that a single sample(s) does not meet M320 specifications, Table 4 will apply.

- (6) All project samples will be tested for PG+ specification compliance.

**Table 1**

**Additional Specifications for PG 64-28 and 70-28**

	<b>PG 64-28</b>	<b>PG 70-28</b>
Elastic Recovery; AASHTO T301 tested at 77°F (RTFO Aged AASHTO T301)	Minimum 60%	Minimum 70%
Phase Angle; degrees (Max) (Original Binder)	77.0	75.0

**Table 2**

**Single Sample Tolerance and Pay Factor Table  
PG 64-28**

	<b>(1) Pay Factor of 0.75</b>	<b>(2) Pay Factor of 0.50 or Removal</b>
Elastic Recovery Percentage (RTFO Aged AASHTO T301)	54 to 57.5%	Less than 54%
Phase Angle (degrees) (Original Binder)	78.5 – 79.0	Greater than 81.0°

**Table 3**

**Single Sample Tolerance and Pay Factor Table  
PG 70-28**

	<b>(1) Pay Factor of 0.75</b>	<b>(2) Pay Factor of 0.50 or Removal</b>
Elastic Recovery Percentage (RTFO Aged AASHTO T301)	64 to 67.5%	Less than 64%
Phase Angle (degrees) (Original Binder)	76.5 – 79.0	Greater than 79.0°

**Table 4**  
**Single Sample Tolerance and Price Factor Table**

	Pay Factor of 0.75 <sup>1</sup>	Pay Factor of 0.50 or Removal <sup>2</sup>
<u>Tests on Original Binder</u> Dynamic Shear, $G^*/\sin \delta$ , kPa	0.86-0.92	< 0.86
<u>Tests on Rolling Thin Film</u> <u>Oven Residue</u> Dynamic Shear, $G^*/\sin \delta$ , kPa	1.76-1.97	< 1.76
<u>Tests Pressure Aging Vessel</u> <u>Residue</u> Dynamic Shear, $G^*\sin \delta$ , kPa	5601-6200	> 6200
<u>Creep Stiffness</u> S, mPa	325-348	> 348
m-Value	0.270-0.284	< 0.270

**NOTE:** If more than one test fails to meet requirements, the largest individual price reduction (pay factor of 0.75 or 0.50) will be used to calculate price reduction for the asphalt binder.

<sup>1</sup> Price Reduction will be based on contract unit price of asphalt binder.

<sup>2</sup> The Engineer will determine if the non-compliant material will be removed. Removal and replacement will be at no additional cost to the Department. If the non-compliant material is accepted, a price factor of 0.50 will be applied. The price factor will be applied to the contract unit price of asphalt binder.

The pay factor will be applied to the quantity of material that the sample represents.

#### **Overall Project Average - Price Reduction Based on Complete M320 Testing**

Overall Project Averages does not apply to tested samples after the addition of anti strip. Samples not meeting PG+ specifications and the requirements after the addition of anti strip will be rejected.

PG+, Table 1 specifications do not apply to Overall Project Averages. PG+, Table 1 specification testing will be conducted on each Lot sample.

Out of specification material will be determined by the specifications outlined in AASHTO M320, excluding Direct Tension.

The Nebraska Department of Roads, Materials and Research, Bituminous Laboratory will do complete testing, per M320 specifications, on a minimum of three samples or 20% of the total samples from the project, whichever is the greatest. The Department will randomly select one sample for complete M320 testing out of every five samples received. When any test result shows sample not meeting M320 specifications, the previous and following sample received will be tested for complete M320 compliance. Testing will continue in this manner until tested samples meet all of M320 specifications, or there are no more lot samples to be tested.

Original Dynamic Shear Rheometer testing will be completed on all samples. When a sample being tested for only Original Dynamic Shear Rheometer compliance falls out of M320 specification, it will then be tested for complete M320 specification compliance. Adjacent samples will be tested when results, other than the Original Dynamic Shear Rheometer result, do not meet specification. This additional complete testing for M320 compliance is in addition to the minimum number of samples that will be tested for complete M320 compliance.

At the completion of testing, all complete M320 test results will be averaged. For averages that do not meet M320 specifications, the largest reduction shown in Table 5 will be applied to all the Performance Graded Binder used on the project.

**Table 5**  
**Overall Project Average – Pay Factor Table**

	Range of Average	Pay Factor Applied
<u>Tests on Original Binder</u>	< 1.00 – 0.98	0.98
Dynamic Shear, $G^*/\sin \delta$ , kPa	< 0.98 – 0.96	0.95
Min. 1.00 kPa	< 0.96 – 0.94	0.92
	< 0.94	0.85
<u>Tests on Rolling Thin Film</u>	< 2.20 – 2.156	0.98
<u>Oven Residue</u>	< 2.156 – 2.09	0.95
Dynamic Shear, $G^*/\sin \delta$ , kPa	< 2.09 – 2.024	0.92
Min. 2.20 kPa	< 2.024	0.85
<u>Tests Pressure Aging Vessel</u>	< 5000 – 5100	0.98
<u>Residue</u>	< 5100 – 5250	0.95
Dynamic Shear, $G^*\sin \delta$ , kPa	< 5250 – 5400	0.92
Max. 5000 kPa	< 5400	0.85
	< 0.300 – 0.298	0.98
m-Value Min. 0.300	< 0.298 – 0.293	0.95
	< 0.293 – 0.290	0.92
	< 0.290	0.85
<u>Creep Stiffness</u>	< 300 – 306	0.98
S, mPa	< 306 – 315	0.95
Max. 300 mPa	< 315 – 324	0.92
	< 324	0.85

#### Single Sample Reduction and Overall Project Average Reduction

A sample representing a lot, not meeting M320 Specification, will have a reduction for the material that the sample represents. Only the largest reduction from Table 4, will apply when more than one result of a single sample does not meet M320 specifications. Only the largest overall project average reduction from Table 5, will apply when more than one test average falls out of M320 specifications. Pay Factors based on both Table 4 and Table 5 test results are separate from each other and both will be applied.

### **Investigation of Verification Lot Samples That Do Not Meet Specifications**

When the lot sample shows test results out of specification limits, the process of resolving the sample failure will include the following actions as appropriate:

1. The Bituminous Lab may conduct retesting of the remaining portion of the original can sample as determined necessary to confirm or disaffirm the original test result(s).
2. The Flexible Pavement Engineer will notify the Contractor who will arrange to investigate all aspects of the testing, loading, handling and delivery of the material in question. The Contractor shall report findings to the Central Laboratory, Flexible Pavement Engineer.
3. The Department will collect and compile all information and prepare a report. A copy of the report will be distributed to the District and the Contractor.
4. The Bituminous Laboratory will issue the standard report of tests for all samples tested, to include any resulting pay factor deductions. A copy of the report of tests will be distributed to the District, Construction Division, and Contractor.

### **Dispute Resolution**

After testing and investigations have been completed on the one can of the sample and there is still a dispute, the Department will select an independent laboratory for referee testing to take place on the second can of the sample. If the independent lab's tests indicate failing results and pay deductions equal to or greater than the Department's, the Contractor will reimburse the Department for the cost of testing. If the independent lab's tests indicate that the material meets specification or is at a pay deduction less than the Department's, the Department will assume the cost of testing. When the independent lab's tests indicate a pay deduction, the lesser of the Department's and the independent lab's deductions will be applied.

### **Basis of Measurement**

PG Binder shall be measured in accordance with Subsection 503.05 in the Standard Specifications and Supplemental Specifications.

### **Basis of Payment**

Subsection 503.06 in the Standard Specifications and Supplemental Specifications is amended to provide that PG Binder, accepted by the Engineer for use in asphaltic concrete, will be paid for at the contract unit price per ton (Megagram) for the item "Performance Graded Binder \_\_\_\_\_", less any deductions as prescribed in the tolerance and price reduction tables.

## **SUPERPAVE ASPHALTIC CONCRETE**

Section 1028 of the Standard Specifications and Supplemental Specifications is void.

Asphaltic Concrete Type SP5 shall use the 13 mm gradation band.

Paragraph 2.b.(1) of Subsection 503.04 is void and superseded by the following:

The contractor shall take at least four (4) control strip mixture samples and record the test results for the mixture properties identified in Paragraph 4.h.(3) of Subsection 1028.03. The contractor will also record compaction density values and rolling pattern information. This data will be for information only and shared with the Engineer.

### **SECTION 1028 -- SUPERPAVE ASPHALTIC CONCRETE**

#### **1028.01 -- Description**

1. a. Superpave Asphaltic Concrete is a Contractor-designed mix.
- b. The Contractor will be required to define properties using a gyratory compactor that has met the Superpave evaluation test procedures, during mix design and production.
2. a. Before production of asphaltic concrete, the Contractor shall submit, in writing, a tentative job mix formula on the NDOR Mix Design Submittal Form for verification to the NDR Flexible Pavement Engineer at the Lincoln, Nebraska Central Laboratory.
- b. The job mix formula shall identify the virgin mineral aggregates, RAP, if used, and mineral filler, if needed, with the value of the percent passing each specified sieve for the individual and blended materials.
- c. (1) The Contractor shall submit six – 95 mm gyratory pucks compacted to 7%  $\pm 0.5\%$  air voids, and two – 75 mm gyratory pucks compacted to 4%  $\pm 0.5\%$  air voids for testing and 3 proportioned 22 lb. (10,000-gram) samples of the blended mineral aggregates and two one-quart (liter) samples of the proposed PG Binder to be used in the mixture to the NDR Materials and Research Central Laboratory at least 15 NDR working days before production of asphaltic concrete. These samples will be used to verify the Contractor's Superpave mix design test results and mix properties.
- (2) Submitted with these samples shall be a copy of the Contractor's results for all Superpave mix design tests.
- (3) This mix design shall include at a minimum:
  - (i) The bulk specific gravity of the blended aggregate. Whenever RAP is used it shall be processed through an ignition oven and then combined proportionally with the virgin aggregate. The bulk specific gravity shall be determined for the blend from an unwashed sample of the - #4 and a washed sample of + #4 material in accordance with AASHTO T 84 and AASHTO T 85 respectively.

- (ii) The target binder content.
  - (iii) The supplier and grade of PG Binder.
  - (iv) The maximum specific gravity of the combined mixture (Rice).
  - (v) The bulk specific gravity and air voids at N initial (Nini), N design (Ndes) and N maximum (Nmax) of the compacted gyratory specimens.
  - (vi) Voids in the Mineral Aggregate (VMA) and Voids Filled with Asphalt (VFA) at Ndes.
  - (vii) Fine Aggregate Angularity (FAA), Coarse Aggregate Angularity (CAA), Flat and Elongated Particles and Clay Content of the aggregate blend.
  - (viii) Location description and/or legal descriptions and producers of materials used in the mix.
  - (ix) Dust to Binder Ratio
  - (x) PG Binder recommended mixing and compaction temperatures.
  - (xi) Type of PG Binder modification, if modified
- d. Before the mix design is approved, the Materials and Research Laboratory shall test all properties. This approval is on the submitted laboratory materials, and allows the contractor to begin plant production test strip and verification testing with the QA/QC Program.
3. PG Binder in Recycled Asphalt Pavement:
- a. The Contractor may approach the State with a proposal to supplement the virgin aggregates of the asphaltic concrete mix with a Contractor's specified percentage of recycled asphalt pavement (RAP). The State may accept or reject the proposal based on whether the mix design meets the specified criteria of the asphaltic concrete proposed. The RAP may come from the project or an existing stockpile. The Contractor is responsible for investigating the quality and quantity of the RAP material.
  - b. In recycled asphaltic concrete mixtures, the allowable maximum percent of Reclaimed Asphalt Pavement (RAP) will be as shown in Table 1028.01. If the Contractor elects to exceed these values, the Contractor will be required to lower the minimum pavement design temperature of the PG Binder, one grade, according to AASHTO M320.

**Table 1028.01**

<b>Asphaltic Concrete Type</b>	<b>Percent, Maximum RAP</b>
SPS	50
SP1	35
SP2	25
SP3	25
SP4	15
SP4 Special	25
SP5	15

4. Quality Control Program:

- a. The Contractor shall establish, provide, and maintain an effective Quality Control(QC) Program. The QC Program shall detail the methods and procedures that will be taken to assure that all materials and completed construction conforms to all contract requirements.
- b. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract, the Contractor shall assume full responsibility for placing a pavement course that meets the target field values.
- c. The Contractor shall establish a necessary level of control that will:
  - (1) Adequately provide for the production of acceptable quality materials.
  - (2) Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.
  - (3) Allow the Contractor as much latitude as possible in developing control standards.
- d.
  - (1) The Contractor shall develop and keep on file with the Materials and Research Flexible Pavements Engineer a copy of their QC Program. A copy of the QC Program shall be kept on file in the QC lab trailer. This Program shall be updated as needed and submitted annually for review.
  - (2) The Contractor shall not begin any construction or production of materials without an approved QC Program.
- e. The QC Program shall address, as a minimum, the following items:
  - (1) QC organization chart.
  - (2) Submittals schedule.

- (3) Inspection requirements.
    - (i) Equipment.
    - (ii) Asphalt concrete production.
    - (iii) Asphalt concrete placement.
  - (4) QC testing plan.
  - (5) Documentation of QC activities.
  - (6) Requirements for corrective action when QC and/or acceptance criteria are not met.
  - (7) Any additional elements deemed necessary.
  - (8) A list, with the name and manufacturers model number, for all test equipment used during laboratory testing.
  - (9) A description of maintenance and calibration procedures, including the frequency that the procedures are performed.
- f. The QC organization chart shall consist of the following personnel:
- (1) A Program Administrator:
    - (i) The Program Administrator shall be a full-time employee of the Contractor or a Subcontractor (Consultant) hired by the Contractor.
    - (ii) The Program Administrator shall have a minimum of 5 years experience in highway construction.
    - (iii) The Program Administrator need not be on the job site at all times but shall have full authority to institute any and all actions necessary for the successful implementation of the QC Program.
    - (iv) The Program Administrator's qualifications and training shall be described in the QC Program.
  - (2) One or more Quality Control Technicians:
    - (i) The quality control technicians shall report directly to the Program Administrator and shall perform all sampling and quality control tests as required by the contract.
    - (ii) The QC technicians shall be certified by the NDR Materials and Research Division.
    - (iii) Certification at an equivalent level by a state or nationally recognized organization may be acceptable.

- (iv) The QC technician's credentials and NDR training records shall be submitted to the NDR Materials and Research Division.
  - (v) The Contractor may have a non-certified technician working under the direct supervision of a certified technician for no more than one construction season.
- g.(1) Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the work.
- (2) QC test results and periodic inspections shall be used to ensure the mix quality and to adjust and control mix proportioning.
- h. QC Testing Plan:
- (1) The testing plan shall include the NDR statistically based procedure of random sampling for acquiring test samples.
  - (2) The Contractor may add any tests necessary to adequately control production.
  - (3) All QC test results shall be reported on NDR software by the Contractor with a copy provided to the Engineer within 1 week after the tests are complete. Daily review by the Engineer will be allowed if requested.
- i. Corrective Action Requirements:
- (1) The Contractor shall establish and utilize QC charts for individual QC tests. The requirements for corrective action shall be linked to the control charts.
  - (2) The Contractor's QC Program shall detail how the results of QC inspections and tests will be used to determine the need for corrective action.
  - (3)
    - (i) A clear set of rules to determine when a process is out of control and the type of correction to be taken to regain process control will be provided.
    - (ii) As a minimum, the plan shall address the corrective actions that will be taken when measurements of the following items or conditions approach the specification limits:
      - (I) Plant produced mix gradations at laydown.
      - (II) Binder content.
      - (III) Air voids.
      - (IV) VMA
      - (V) VFA (mix design only)

(VI) FAA AASHTO T 304  
CAA ASTM D 5821

(VII) Dust to Binder Ratio

(iii) Corrective actions that will be taken when the following conditions occur:

(I) Rutting

(II) Segregation

(III) Surface voids

(IV) Tearing

(V) Irregular surface due to mix tenderness

#### **1028.02 -- Material Characteristics**

1. The type of PG Binder shall be shown in the plans or special provisions.
2. Aggregates:
  - a. Aggregates for use in superpave asphaltic concrete shall be tested on an individual basis.
  - b. With the exception of Asphaltic Concrete Type SPS the blended mineral aggregate shall not contain more than 60 percent limestone on the final surface lift of asphaltic concrete.
  - c. Crushed rock material for use in asphaltic concrete, 1/4 inch (6.35 mm) down, screenings and manufactured sand shall have a Sodium Sulfate loss of not more than 12 percent by mass at the end of 5 cycles. One 20-lb. (10-kg) sample shall be taken by NDR personnel at the project for every 5,000 tons (4500 Mg) of aggregate used, with a minimum of one per project for quality testing.
  - d. Quartzite, granite, and chat shall conform to the requirements of Subsection 1033.02, Paragraph 4, a. (8). One 60-lb. (30 kg) sample shall be taken by NDR personnel at the project every 3,000 tons (2700 Mg) of aggregate used, with a minimum of one per project for quality testing.
  - e. Crushed rock (Limestone) and Dolomite shall conform to the requirements of Paragraph 4.a. (4), (5) and (6). of Subsection 1033.02 of the Standard Specifications, Sampling size and frequency shall adhere to the current NDR Materials Sampling Guide. (Some aggregate can be adversely affected by ignition ovens resulting in erroneous reading for asphalt content and gradation unless corrected for.)
  - f. Amend Paragraph 4.a. (7) of Subsection 1033.02 to provide that soundness tests shall not be required for fine sand.

- g. Amend Subsection 1033.02 to provide that once the satisfactory quality of aggregates from a source has been established, sufficient additional soundness tests will be performed to insure the continued satisfactory quality of the material.
- h. The coarse aggregate angularity value of the blended aggregate material shall meet or exceed the minimum values for the appropriate asphaltic concrete type as shown in Table 1028.02

**Table 1028.02**  
**Coarse Aggregate Angularity**  
**(ASTM D 5821)**

<b>Asphaltic Concrete Type</b>	<b>CAA (minimum)</b>
SPS	35
SP1	55
SP2	65
SP3	75
SP4	85/80*
SP4 Special	85/80*
SP5	95/90*

\* Denotes two faced crushed requirements

- i. The fine aggregate angularity value of the blended aggregate material shall meet or exceed the minimum values for the appropriate asphaltic concrete type as shown in Table 1028.03.

**Note:** The specific gravity for calculation of the Fine Aggregate Angularity (FAA) shall be determined on a combined aggregate sample of the material passing the No. 8 (2.36 mm) sieve and retained on the No. 100 (150 µm) sieve. The Contractor will determine the specific gravity to be used in the calculation of FAA mixture design value(s) and, if verified by the NDOR Aggregate Laboratory, this same value can be used throughout production. The verification value determined by the NDOR Aggregate Laboratory will be on a combined aggregate sample supplied by the Contractor that is representative of the material proposed or being used during production. The specific gravity to be used throughout production to calculate FAA values will be the Contractor's verified value or the NDOR determined value (whenever verification is not made) and will be noted on the Mix Design. Changes in aggregate percentages during production may require determination of a revised specific gravity for FAA.

**Table 1028.03**  
**Fine Aggregate Angularity**  
**(AASHTO T304 Method A)**

<b>Asphaltic Concrete Type</b>	<b>FAA (minimum)</b>
SPS	--
SP1	40.0
SP2	43.0
SP3	43.0
SP4	45.0
SP4 Special	45.0
SP5	45.0

- j. The coarse aggregate shall not contain flat and elongated particles exceeding the maximum value for the appropriate asphaltic concrete type category shown in these provisions according to Table 1028.04.

**Table 1028.04**  
**Flat and Elongated Particles\***  
**(ASTM D 4791)**

<b>Asphaltic Concrete Type</b>	<b>Percent, Maximum</b>
SPS	25
SP1	10
SP2	10
SP3	10
SP4	10
SP4 Special	10
SP5	10

\*Criterion based on a 5:1 maximum to minimum ratio.

- k. The sand equivalent of the blended aggregate material from the fine and coarse aggregates shall meet or exceed the minimum values for the appropriate asphaltic concrete type shown in these provisions according to Table 1028.05.

**Table 1028.05**  
**Clay Content Criteria**  
**(AASHTO T 176)**

<b>Asphaltic Concrete Type</b>	<b>Sand Equivalent, Minimum</b>
SPS	30
SP1	40
SP2	40
SP3	45
SP4	45
SP4 Special	45
SP5	45

- I. The blended aggregate shall conform to the gradation requirements specified below for the appropriate nominal size.
  - (1) It is recommended that the selected blended aggregate gradation does not pass through the restricted zones as specified in the following control points for nominal size. The plot of the blended aggregate gradation of Superpave mix designs with FAA values of less than 43.0 will not enter the limits of the restricted zone. The plot of the blended aggregate gradation of Superpave mix designs with FAA values of 43.0 to less than 45.0 passing through the restricted zone must intersect both the upper and lower limits of the restricted zone between 1) any two consecutive sieves used to define the restricted zone limits, or 2) two vertical lines plotted between the #8 and #50 sieve a distance apart no greater than 1/3 the horizontal distance between the #8 (2.36-mm) and #50 (300- $\mu$ m) sieves. Superpave mix designs with FAA values of 45.0 or greater will not be restricted from passing through the restricted zone.

**Table 1028.06**  
**Gradation Control Points for 0.375 Inch (9.5 mm) Nominal Size**

<b>English Sieve (Metric)</b>	<b>Control Points (percent passing)</b>		<b>Restricted Zone Boundary (percent passing)</b>	
	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
1/2 inch (12.5 mm)	100.0			
3/8 inch (9.5 mm)	90.0	100.0		
No. 4 (4.75 mm)		90.0		
No. 8 (2.36 mm)	32.0	67.0	47.2	47.2
No. 16 (1.18 mm)			31.6	37.6
No. 30 (600 $\mu$ m)			23.5	27.5
No. 50 (300 $\mu$ m)			18.7	18.7
*No. 200 (75 $\mu$ m)	2.0	10.0		

\* see note following Table 1028.08

**Table 1028.07**  
**Gradation Control Points for 0.5 Inch (12.5 mm) Nominal Size**

<b>English Sieve (Metric)</b>	<b>Control Points (percent passing)</b>		<b>Restricted Zone Boundary (percent passing)</b>	
	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
3/4 inch (19 mm)	100.0			
1/2 inch (12.5 mm)	90.00	100.00		
3/8 inch (9.5 mm)		90.00		
No. 8 (2.36 mm)	28.0	58.0	39.1	39.1
No. 16 (1.18 mm)			25.6	31.6
No. 30 (600 $\mu$ m)			19.1	23.1
No. 50 (300 $\mu$ m)			15.5	15.5
* No. 200 (75 $\mu$ m)	2.0	10.0		

\* see note following Table 1028.08

**Table 1028.08**  
**Gradation Control Points for 0.75 Inch (19 mm) Nominal Size**

<b>English Sieve (Metric)</b>	<b>Control Points (percent passing)</b>		<b>Restricted Zone Boundary (percent passing)</b>	
	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
1 inch (25 mm)	100.0			
3/4 inch (19 mm)	90.0	100.0		
1/2 inch (12.5 mm)		90.0		
No. 8 (2.36 mm)	23.0	49.0	34.6	34.6
No. 16 (1.18 mm)			22.3	28.3`
No. 30 (600 $\mu$ m)			16.7	20.7
No. 50 (300 $\mu$ m)			13.7	13.7
* No. 200 (75 $\mu$ m)	2.0	8.0		

\* Dust to binder ratio is the ratio of the percentage by weight of aggregate finer than the No. 200 (75  $\mu$ m) sieve to the asphalt content expressed as a percent by weight of total mix. The dust to binder ratio shall be between 0.60 and 1.60.

m. The combined mineral aggregate for Asphaltic Concrete, Type SPS, shall be an aggregate or a combination of aggregates, and mineral filler if needed.

**Table 1028.09**  
**Gradation Control Points for Type SPS**

<b>English Sieve (Metric)</b>	<b>Control Points (percent passing)</b>	
	<b>Minimum</b>	<b>Maximum</b>
1 inch (25 mm)	100.0	
¾ inch (19 mm)	94	100.0
½ inch (12.5 mm)	81	94
No. 8 (2.36 mm)	42	70
No. 16 (1.18 mm)	29	43
No. 30 (600 µm)	19	34
No. 50 (300 µm)	11	20
* No. 200 (75 µm)	2	8

\* see note following Table 1028.08

- n. Mineral filler shall consist of pulverized soil, pulverized crushed rock, broken stone, gravel, sand-gravel, sand or a mixture of these materials that conforms to the following requirements.

**Table 1028.10**  
**Mineral Filler for Type SPS**

	<b>Min.</b>	<b>Max.</b>
Total Percent Passing the No. 50 (300 µm) Sieve	95	100
Total Percent Passing the No. 200 (75 µm) Sieve	80	100
Plasticity Index (material passing the No. 200 (75 µm) Sieve, except soil)	0	3
Plasticity Index for Soil	0	6

(i)

3. Contractor's Lab Equipment:

- a. The Contractor shall calibrate and correlate the testing equipment according to the procedures prescribed for the individual tests and conduct tests in conformance with specified testing procedures.
- b. The Contractor shall have the following equipment (or approved equal) at or near the project location:
  - (1) An AASHTO approved gyratory compactor and molds.
  - (2) An AASHTO approved Asphalt Content Ignition Oven.
  - (3) Rice equipment specified in AASHTO T 209, procedure 9.5.1, Weighing in Water. The thermometer being used to measure water temperature will be as specified in T 209.
  - (4) FAA equipment
  - (5) To test density of compacted asphaltic concrete, a minimum 6000 gm balance, 0.1 gm resolution, with under body connect and water container

large enough to conveniently place specimen in the basket and completely submerge the basket and specimen without touching the sides or bottom is required.

- (6) QC Laboratory (suggested size 8 ft. x 45 ft.) (2.4 m x 13.7 m) which contain the following:

Air conditioner.  
Dedicated phone (where available).  
FAX machine.  
Xerox type copy machine.  
Sample storage.  
Work table.  
Bulletin board.  
Running water.  
Desk and chair.  
Separate power supply.  
Incidental spoons, trowels, pans, pails.

- (7) Diamond saw for cutting cores.
- (8) Diamond core drill (6 inch (150 mm) and 4 inch (100 mm) diameter core.
- (9) Oven, 347°F (175°C) minimum, sensitive  $\pm 5^\circ\text{F}$ . ( $\pm 2^\circ\text{C}$ ).
- (10) USA Standard Series Sieves for coarse and fine aggregate with appropriate shakers (12 inch (300 mm) recommended).
- (11) Personal Computer capable of running and creating a CD copy of NDR software and Color Printer.

### **1028.03 -- Acceptance Requirements**

#### **1. Volumetric Mix Design**

- a. The job mix formula shall be determined from a mix design for each mixture. A volumetric mixture design in accordance with AASHTO PP 28 as modified within this special provision will be required. However, the mixture for the Superpave specimens and maximum specific gravity mixture shall be short-term aged for two hours.
- (1) Practice for Short and Long-Term Aging of Hot Mix Asphalt (HMA),  
AASHTO R30
- (2) Method for Preparing and Determining the Density of Hot Mix Asphalt Specimens by Means of the SHRP Gyratory Compactor,  
AASHTO T312
- b. The optimum binder content shall be the binder content that produces 4.0 percent air voids at Ndes. The design shall have at least four binder content points, with a minimum of two points above and one point below the optimum. Submitted with the design will be plots showing the values of Air Voids, VMA, VFA and Density at the four binder contents. The amount of uncompacted

mixture shall be determined in accordance with AASHTO T209. For Type SPS Asphaltic concrete the optimum binder content shall be that which produces air voids at Ndes of 1.5 percent to a maximum of 5.0 percent.

- c. The Contractor shall inform the Engineer when changes in mixture properties occur for any reason, such as, but not limited to, the result of changes in the types or sources of aggregates are made or when changes in grades, sources, properties or modification procedures (if modified) of PG Binders are made. These changes may require a new job mix formula, mix design and moisture sensitivity test. The new proposed job mix formula shall be in accordance with the requirements as stated above and submitted 5 working days prior to use for verification.
- d. Each Superpave mixture shall be tested for moisture sensitivity in accordance with AASHTO T 283. The loose mixture shall be short-term aged for two hours in accordance with AASHTO R30. The 6-inch (152-mm) specimens shall be compacted in accordance with AASHTO T 312 to seven percent air voids at 95-mm in height and evaluated to determine if the minimum Tensile Strength Ratio (TSR) of 80 percent has been met. If the mixture has not met the minimum TSR value, an anti-stripping additive shall be added at a dosage rate, such that the mix will meet the minimum TSR of 80 percent. All data shall be submitted with the mix design verification request. During production of Lot #1, the Contractor shall provide to the NDR Central laboratory properly prepared gyratory samples for AASHTO T 283 testing for all mixtures. A TSR test result of less than 80 percent will require mixture modification(s) and a sample from subsequent lots will be tested until a TSR value of at least 80 percent is achieved. Moisture sensitivity testing is not required for Asphaltic Concrete Type SPS.
  - (1) When tests indicate the need for an anti-stripping additive the Contractor shall be compensated for the liquid anti-strip additive needed, as determined during mixture design verification, at \$12.00 per ton (\$13.23 per Mg) of PG Binder containing anti-stripping additive used. The PG Binder Supplier will add liquid anti-strip additives to the PG Binder.
- e. Design Criteria:
  - (1) The target value for the air voids of the asphaltic concrete design shall be 4 percent at the Ndes number of gyrations. For Type SPS Asphaltic concrete the air voids at Ndes shall be a minimum of 1.5 percent with a maximum of 5.0 percent.

**Table 1028.11**  
**Gyratory Compaction Effort**  
**(Average Design High Air Temperature <39 degrees C)**

<b>Asphaltic Concrete Type</b>	<b>Nini</b>	<b>Ndes</b>	<b>Nmax</b>
SPS	6	40	62
SP1	7	68	104
SP2	7	76	117
SP3	7	86	134
SP4	8	96	152
SP4 Special	7	76	117
SP5	8	109	174

- (2) The design criteria for each mixture shall be determined from Tables 1028.12, 1028.13, and 1028.14.

**Table 1028.12**

<b>Mix Criteria</b>	<b>SPS, SP1</b>	<b>SP2</b>	<b>SP3, SP4, SP4 Special, SP5</b>
Voids In Mineral Aggregate	See Table 1028.13		
Voids Filled with Asphalt	See Table 1028.14		
%Gmm at Nini	91.5*	90.5	89.0
%Gmm at Nmax	98.0*	98.0	98.0

\* No specification requirement for SPS, only %Gmm at Ndes = 95 to 98.5

**Table 1028.13**  
**Voids in Mineral Aggregate**  
**Criteria at Ndes**

<b>Nominal Maximum Aggregate Size (Metric)</b>	<b>Minimum VMA, Percent*</b>
3/8 inch (9.5 mm)	15.0
1/2 inch (12.5 mm)	14.0
3/4 inch (19 mm)	13.0

\* No specification requirement for SPS

**Table 1028.14**  
**Voids Filled with Asphalt**  
**Criteria at Ndes**  
**(for mix design only)**

<b>Asphaltic Concrete Type</b>	<b>Design VFA, Percent</b>
SPS	N/A
SP1	70 – 80
SP2	65 – 78
SP3	65 – 78
SP4	65 – 75
SP4 Special	65 - 75
SP5	65 – 75

2. The Contractor shall make Mix adjustments when:
  - a. Air voids, VMA, FAA, CAA or Binder content do not meet the currently approved criteria.
  - b. Surface voids create a surface and/or texture that does not meet the criteria of Sections 502 and 503 in the 1997 English and Metric Edition of the Standard Specifications.
  - c. Pavement does not meet any other design criteria.
  - d. Rutting occurs.
3. Mix adjustments at the plant are authorized within the limits shown in Table 1028.15 as follows:
  - a. The adjustment must produce a mix with the percent air voids and all other properties as stated in these specifications.
  - b. All adjustments must be reported to the Engineer.
  - c. The adjustment values in Table 1028.15 will be the tolerances allowed for adjustments from the NDR verified mix design “Combined Gradation” target values which resulted from production or mix design adjustments, but cannot deviate from Superpave gradation criteria, or violate restricted zone criteria specified in paragraph 2. I. (1) of Subsection 1028.02. Mix adjustments for individual aggregates, including RAP, greater than 25% of the original verified mix design proportion or greater than 5% change in the original verified mix design percentage, whichever is greater, may require the Contractor to submit a new mix design, as determined by the Engineer. The contractor is responsible for requesting new mix design targets as they approach these tolerances, failure to do so may result in a suspension of operations until a new mix design is approved.

**Table 1028.15**

<b>Aggregate Adjustments</b>	
<b>Sieve Size</b>	<b>Adjustments</b>
1 inch (25 mm), 3/4 inch (19 mm), 1/2 inch (12.5 mm), 3/8 inch (9.5 mm)	± 6%
No. 8 (2.36 mm), No. 16 (1.18 mm), No. 30 (600 µm), No.50 (300 µm)	± 4%
No. 200 (75 µm)	± 2%

4. Sampling and Testing:
- a. The Contractor shall take samples at frequencies identified by the Engineer, according to the NDR statistically based procedure. The samples shall be approximately 75 pounds (34 kg) and split according to NDR T-248 either at: 1) the sampling location, with the NDR taking custody of their sample at that time or 2) after being transported to the test facility in an insulated container, as determined by the Engineer. The details of sampling, location, splitting etc. shall be determined at the pre-construction conference.
  - b. All samples transported to the test facility and companion samples within the Lot shall be identified by attaching the lab calculation sheet from the superpave 2002 software, stored, and retained by the Contractor until the NDR has completed the verification testing process.
  - c.
    - (1) The sample shall be taken from the roadway, behind the paver before compaction or from the windrow.
    - (2) At least one QC sample shall be tested for every 750 tons (680 Mg) of plant produced mix.
      - (i) If, at the completion of the project, the final lot consists of less than 3,750 tons (3,400 Mg) of asphaltic concrete, 1 sample for each 750 tons (680 Mg) or fraction thereof, shall be taken and tested.
    - (3) Additional sampling and testing for the Contractor's information may be performed at the Contractor's discretion. Any additional testing will not be used in pay factor determination.
    - (4) At least 1 sample shall be taken between the first 110 tons (100 Mg) and 300 tons (270 Mg) at the following times: 1) at the project start-up, 2) when a test result, identified in Paragraph 4,h,(3) of Subsection 1028.03, is out of specification, and 3) when a substantial aggregate proportion or other major mix change has been made. This sample, when other than at start-up, will be in lieu of the next scheduled random sample location.

- (5) The Contractor will be notified what subplot sample must be tested for FAA and CAA according to the NDR random sampling schedule. The FAA and CAA may be sampled from the blended cold feed material but in addition the Contractor will be required to test FAA and CAA from a roadway sample using an ignition oven sample for correlation. If the coarse portion of the blend is all ledge rock the CAA tests can be waived. If the samples tested with the ignition oven meet the CAA and FAA minimum requirement, then the cold feed sample does not have to be tested. When both ignition oven and cold feed samples are being tested the acquisition of the samples shall be timed such that each sample represents, as close as possible, the same aggregate being fed into the plant.
- (6) For projects using RAP material the FAA shall be established as follows:

A RAP sample will be processed through an ignition oven and then combined with the proportioned amount of virgin aggregate defined by the mix design and then proceeding with FAA and CAA testing.
- d. The sample shall be compacted immediately while still hot (additional heating may be required to raise the temperature of the sample to compaction temperature).
- e. Each production sample shall be tested as follows:
  - (1) (i) Bulk Specific Gravity (Gmb) shall be determined for each specimen in accordance with AASHTO T 166- Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens. One specimen shall be compacted for each production sample.
  - (2) One Theoretical Maximum Specific Gravity (Gmm) test for each production sample of uncompacted mixture shall be determined in accordance with AASTHO T 209 procedure 9.5.1. Weight in water - Maximum Specific Gravity of Bituminous Paving Mixtures.
  - (3) (i) The Blended Aggregate Bulk Specific Gravity (Gsb) shall be determined from a combined aggregate blend, including any RAP following ignition burn-off, on the + #4 and - #4 material. This test and recalculation will be required if the mix design changes according to the tolerances in Paragraph 3.c. of subsection 1028.03 and/or table 1028.15.
  - (ii) AASHTO T 84 - Specific Gravity and Absorption of Fine Aggregate.
  - (iii) AASHTO T 85 - Specific Gravity and Absorption of Coarse Aggregate.

- (4) The laboratory air voids shall be determined in accordance with the following:

**Table 1028.16**

$\text{Gmb}(\text{corr})@Nany = \text{Gmb}(\text{meas})@Nmax \times (\text{height}@Nmax \div \text{height}@Nany)$
$\%Gmm(\text{corr})@Nany = 100 \times (\text{Gmb}(\text{corr})@Nany \div \text{Gmm}(\text{meas}))$
$\% \text{ Air Voids}@Nany = 100 - \%Gmm(\text{corr})@Nany$
$\text{VMA}@Ndes = 100 - (\text{Gmb}(\text{corr})@Ndes \times \text{Ps} \div \text{Gsb})$
$\text{VFA}@Ndes = 100 \times ((\text{VMA}@Ndes - \% \text{ Air Voids}@Ndes) \div \text{VMA}@Ndes)$
Measured = (meas)
Corrected = (corr)

5. (i) The percent of PG Binder shall be determined for each QC test. The percent of PG Binder will be computed by ignition oven results.
- (ii) The gradations shall be determined for each QC test using AASHTO T 30.
- (6) Except as noted in this Subsection, all sampling and testing shall be done as prescribed in the *NDR Materials Sampling Guide and Standard Method of Tests*.
- f. Testing Documentation:
- (1) All test results and calculations shall be recorded and documented on data sheets using the latest version of NDOR provided "Superpave" software. A copy containing complete project documentation will be provided to the Materials and Research Division at the completion of the project.
- g. QC Charts:
- (1) QC charts shall be posted at the asphalt production site and kept current with both individual test results and moving average values for review by the Engineer.
- (2) Control charts shall include a target value and specification limits.
- (3) As a minimum, the following values shall be plotted or reported on NDR provided software:
- (i) Laboratory Gyratory density
- (ii) Ignition oven or cold feed aggregate gradations for all Superpave sieves will be reported.
- (iii) PG Binder content shall be plotted to the nearest 0.1 percent by ignition oven results in accordance with AASHTO T 308.

- (iv) The theoretical maximum specific gravity (Rice) to the nearest 0.001 percent will be reported.
  - (v) Laboratory Gyratory air voids at Ndes shall be plotted to nearest 0.1 percent. Laboratory Gyratory air voids, at Nini, Ndes and Nmax shall be reported to nearest 0.1 percent.
  - (vi) FAA and CAA of the asphaltic concrete for both cold feed and ignition oven samples will be reported to the nearest 0.1 percent.
  - (vii) VMA content shall be plotted to nearest 0.1 percent and VFA shall be reported to the nearest 0.1 percent.
  - (viii) Dust to Binder ratio to the nearest 0.01 will be reported.
- h. Independent Assurance (IA) Review of Testing:
- (1) The Contractor will allow NDR personnel access to their laboratory to conduct IA review of technician testing procedures and apparatus. Any deficiencies discovered in testing procedures will be noted and corrected.
  - (2) During IA review, NDR personnel and the Contractor will split a sample for the purpose of IA testing. The sample(s) selected will be tested in the NDR Branch Laboratory. Any IA test results found to be outside of defined testing tolerances will be noted. The Contractor must then verify the testing apparatus and make corrections if the apparatus is out of tolerance.
  - (3) Testing Tolerances
    - (i) Asphaltic Concrete and Asphaltic Concrete Aggregates.

**Table 1028.17**

Test	Tolerance
Asphalt Content by Ignition Oven	0.5%
Gyratory Density	0.020
Maximum Specific Gravity	0.015
Bulk Dry Specific Gravity (Gsb)	0.020
FAA	0.5%
CAA	10.0%
Field Core Density	0.020

(4) Aggregate Gradation (Blended Aggregate)

**Table 1028.18**

<b>Size Fraction Between Consecutive Sieves, %</b>	<b>Tolerance</b>
0.0 to 3.0	2%
3.1 to 10.0	3%
10.1 to 20.0	5%
20.1 to 30.0	6%
30.1 to 40.0	7%
40.1 to 50.0	9%

5. a. In response to tests results, the Contractor shall notify the Engineer whenever the process approaches the Specification limits.
- b. When any single test result(s), on the same mix property, from two consecutive QC samples fall outside the allowable production tolerances in Table 1028.19, the material represented by these tests will be accepted with a 20% penalty or rejected, as determined by the Engineer.

**Table 1028.19**  
**Production Tolerances\***

<b>Test</b>	<b>Allowable Single Test Deviation from Specification</b>
Voids in the Mineral Aggregate	- 0.75% to + 1.25% from Min.
Dust to Asphalt Ratio	None
Coarse Aggregate Angularity	- 5% below Min.
Fine Aggregate Angularity	- 0.50% below Min.

\* These tolerances are applied to the mix design specification values, not the submitted mix design targets.

- c. The Contractor shall assume the responsibility to cease operations when specifications other than those stated in Table 1028.19 are not being met and production shall not be started again without approval of the Engineer.
6. Verification Sampling and Testing:
- a. The NDR will select and test at random one of the subplot samples (750 tons, 680 Mg) within a Lot (3750 tons, 3400 Mg) for verification and report results in a timely manner.
- b. The results of Contractor QC testing will be verified by NDR verification tests. On any given Lot, if the results of Air Void verification testing and its companion QC testing are within 1.4 percent air voids, the Air Void verification for the entire Lot is complete and the Contractor test results will be used to determine the pay factors. If the Air Void verification test results and the companion QC test results are outside the above tolerance, the results from the verification test will be used to determine the pay factor for that subplot. Any or all of the remaining four NDR subplot samples may be

tested and the NDR subplot test results may be applied to the respective sublots and the resulting pay factors will apply.

- c. When verification test results show a consistent pattern of deviation from the QC results, the Engineer may cease production and request additional verification testing or initiate a complete IA review.
- d. If the project personnel and the Contractor cannot reach agreement on the accuracy of the test results, the Materials and Research Laboratory will be asked to resolve the dispute, which will be final.

7. Acceptance and Pay Factors

- a. Acceptance and pay factors for Asphaltic Concrete Type SPS will be based on compacted in place average density.
- b. Acceptance and pay factors for Asphaltic Concrete Type SP1, SP2, SP3, SP4, SP4 Special and SP5 will be based on single test air voids, running average air voids, compacted in place average density, and production tolerances pay factor as stated in Paragraph 5.b. subsection 1028.03
  - (1) When there is a production tolerance pay factor penalty as stated in Paragraph 5.b. subsection 1028.03 this penalty percentage will be subtracted from the percent pay for single test air voids for each subplot affected. These three individual pay factors will then be multiplied by each other to determine a total pay factor for each subplot [(750 tons) (680 Mg)].

8. Asphaltic Concrete Air Voids

- a. Normally, 1 sample for testing will be taken from each subplot [(750 tons) (680 Mg)] at locations determined by the Engineer.
- b. The pay factors for the single test air voids and moving average of four air voids pay factors will be determined in accordance with table 1028.20.
- c. If the average air voids pay factor is (50% or reject) the NDR will have the first option of accepting or rejecting the asphaltic concrete represented in this subplot. If the NDR accepts this subplot the Contractor will have the second option of replacing this asphaltic concrete for no pay on the removal and for whatever pay factor that applies to the replacement.
- d. In the case of removal, the foremost limits of the removal will be defined as the tonnage (mass) at which the production and placement was halted and a design change was made. The rear limits will be at the tonnage (mass) where linear interpolation with the previous test return to an accepted range and out of rejection limits or at the limit(s) of the defective material as determined by additional core samples taken and tested by the Contractor which show result(s) in an acceptable range and out of rejection limits to the satisfaction of the Engineer.

**Table 1028.20**

<b>Acceptance Schedule</b>		
<b>Air Voids - N<sub>des</sub></b>		
<b>Air voids test results</b>	<b>Moving average of four</b>	<b>Single test</b>
Less than 1.5%	Reject	Reject
1.5% to less than 2.0%	Reject	50%
2.0% to less than 2.5%	50% or Reject	95%
2.5% to less than 3.0%	90%	95%
3.0% to less than 3.5%	100%	100%
3.5% to 4.5%	102%	104%
Over 4.5% to 5.0%	100%	100%
Over 5.0% to 5.5%	95%	95%
Over 5.5% to 6.0%	90%	95%
Over 6.0% to 6.5%	50% or Reject	90%
Over 6.5% to 7.0%	Reject	50%
Over 7.0%	Reject	Reject

9. Asphalt Concrete Density Samples:

- a. Density tests will be performed by the Contractor under direct observation of NDR personnel. The Contractor will establish the method of testing in the preconstruction conference and shall be tested in accordance with the AASHTO T 166 or NDR T 587. The Contractor will insure that the proper adjustment bias and/or correction factors are used and accessible to NDR personnel along with all other inputs when NDR T 587 is selected. All correlation factors and test results shall be generated and reported on the NDOR Density spreadsheet. All disputed values determined using NDR T 587 shall be resolved using AASHTO T 166.
- b. Density of samples shall be determined by comparing the specific gravity of the core sample to the Maximum Specific Gravity (Rice) as follows:

$$\% \text{ Density} = \frac{\text{Specific Gravity of Core}}{\text{Maximum Mix Specific Gravity (Rice)}} \times 100$$

**where:**

$$\text{Sp. Gr. of Core} = \frac{\text{Wt. of Core in Air}}{\text{Wt. of SSD Core} - \text{Wt. of Core in Water}}$$

$$\text{Maximum Mix Specific Gravity (Rice)} = \frac{\text{Wt. of Mix in Air}}{\text{Wt. of Mix in Air} - \text{Wt. of Mix in Water}}$$

**Note: The individual QC test value of the Maximum Mix Specific Gravity (Rice) will be used to calculate the density of each corresponding core.**

- c. Either 4 inch (100 mm) or 6 inch (150 mm) diameter core samples shall be cut by the Contractor the first day of work following placement of the mixture.

- d. Normally, 1 sample for determination of density will be taken from each sublot (750 tons) (680 Mg) at locations determined by the Engineer.
- e. The theoretical maximum density for each lot (3,750 tons) (3,400 Mg) shall be calculated using AASHTO T 209.
- f. The average density of the lot shall be used to compute the pay factor for density. Exceptions to the sampling and testing of core samples for the determination of density are as follows:
  - (1) When the nominal layer thickness is 1 inch (25 mm) or less, the sampling and testing of density for this layer will be waived.
  - (2) When the average thickness of the 5 cores for a lot is 1 inch (25 mm) or less, the testing of density samples for this lot will be waived.
  - (3) When the nominal layer thickness and the average of the original 5 cores for a lot are both more than 1 inch (25 mm), but some of the cores are less than 1 inch (25 mm) thick, additional cores shall be cut at randomly selected locations to provide 5 samples of more than 1 inch (25 mm) thickness for the determination of the pay factor for density.
- g. For the first lot (3,750 tons) (3,400 Mg) of asphaltic concrete produced on a project and for asphaltic concrete used for temporary surfacing, the pay factor for density shall be computed in accordance with Table 1028.21. After the completion of the first lot, the pay factor for density shall be computed in accordance with Table 1028.22.
- h.
  - (1) If, at the completion of the project, the final lot consists of less than 3,750 tons (3400 Mg) of asphaltic concrete, a minimum of 3 samples, or 1 sample for each 750 tons (680 Mg) or fraction thereof, whichever is greater, shall be taken and tested for density.
  - (2) The test results shall be averaged and the density pay factor based on the values shown in Table 1028.22.
  - (3) Should the average of less than 5 density tests indicate a pay factor less than 1.00, additional density samples to complete the set of five shall be taken at randomly selected locations and the density pay factor based on the average of the 5 tests.

**Table 1028.21**

<b>Acceptance Schedule Density of Compacted Asphaltic Concrete (First Lot)</b>	
<b>Average Density (5 Samples, Percent of Voidless Density)</b>	<b>Pay Factor</b>
Greater than 90.0	1.00
Greater than 89.5 to 90.0	0.95
Greater than 89.0 to 89.5	0.70
89.0 or Less	0.40 or Reject

**Table 1028.22**

<b>Acceptance Schedule Density of Compacted Asphaltic Concrete (Subsequent Lots)</b>	
<b>Average Density (5 Samples, Percent of Voidless Density)</b>	<b>Pay Factor</b>
Greater than 92.4	1.00
Greater than 91.9 to 92.4	0.95
Greater than 91.4 to 91.9	0.90
Greater than 90.9 to 91.4	0.85
Greater than 90.4 to 90.9	0.80
Greater than 89.9 to 90.4	0.70
89.9 or Less	0.40 or Reject

- i. If requested by the Contractor, check tests for all density tests in the original set, taken no later than the working day following placement will be allowed in lots with a density pay factor of less than 1.00. No re-rolling will be allowed in these lots. Locations for checks tests will be determined by a new random sampling schedule provided by the Engineer. The average density obtained by the check tests shall be used to establish the density pay factor for the lot.

**10. PG Binder Sampling**

- a. At least one sample (2-1 quart cans) (2-1 liter cans) of PG Binder will be sampled by the Contractor's QC Technician for every Lot (3750 tons) (3400 Mg) of asphalt concrete mixture produced.
- b. Samples will be taken in accordance with NDR Standard Method T40.
- c. The QC Technician will include on the Sample Identification form all information required by the contract.

## ANTI-ICING SYSTEM

### I. DESCRIPTION

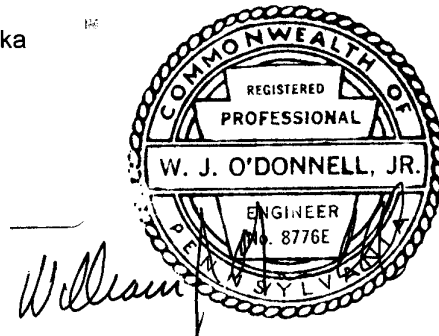
This work shall consist of providing, installing, testing, and providing warranty for a Boschung fixed automated anti-icing system for the new bridges, roadways and approaches as shown on plans. The work shall include all labor, materials, equipment, and services necessary to perform all the tasks to complete the design, installation, testing, start-up, training, and maintenance of the anti-icing system.

The anti-icing system is a fixed automated system that allows automatic treatment of the traffic lanes and other targeted areas. The anti-icing system dispenses a liquid anti-icing agent by pumping the chemical through a series of solenoid-controlled valves to nozzles mounted in the roadway and bridge deck. Upon actuation, a remote processing unit, or RPU, controller opens solenoid valves in an automated sequence to spray the anti-icing liquid over the targeted area. The anti-icing cycle shall be initiated automatically, requiring no human activation, based on information provided by active and passive sensors mounted in the bridge deck, and atmospheric sensors. The anti-icing cycle shall also be capable of initiation remotely using data or voice transmission, or by manual activation from the pumphouse. The system shall be capable of dispensing varying quantities of liquid anti-icing agent in variable spray sequences depending on road surface conditions at the site, for example, black ice, snow, or freezing rain.

The system shall operate within a fluid pressure range of 12 to 16 atmospheres, with accumulator tanks located throughout the system to supply a localized pressure boost to the spray nozzles. The liquid shall flow through a pressurized closed loop piping system that is designed to permit the isolation of individual nozzles or groups of nozzles, while continuing to supply fully-pressurized liquid to all remaining operational spray nozzles. The complete anti-icing system shall be a fully-integrated system, with individual components designed, manufactured, and tested to operate specifically as part of the anti-icing spray system. The system shall be a proven design and shall not be a prototype.

The system and its operation shall be completely independent of the Department's existing or planned road weather information system network. The system shall be connected via modem to the States computer network through a central computer located at the District Headquarters, from which the system shall be capable of remote control operation and monitoring.

Temporary Permit to Practice Engineering in Nebraska  
**William J. O'Donnell (Mechanical)**  
Permit No.: T-0285; Expiration Date: 2/6/2005  
State of Licensure: Pennsylvania; No. PE008776E  
Project: Boschung America Anti-Icing System  
Installation



## **II. PROVIDER (Boschung) & CONTRACTOR (Installer) QUALIFICATIONS**

The anti-icing system Provider is Boschung America, LLC. The Provider shall design the anti-icing system, shall provide the system materials including operating software, shall inspect and supervise the installation of the system and shall warranty the system.

The system Provider was selected prior to the contract letting. The early selection enabled the system to be integrated into the bridge design. The Provider was selected based on their systems design, materials, quality, reputation and the company's experience.

The Contractor shall provide installation services for the anti-icing System. The contractor shall provide the manpower the equipment and the miscellaneous materials to install the system. The Contractor shall have adequate experience and expertise to provide quality workmanship in the installation of the anti-icing system.

The Contractor shall provide documentation of their qualifications, experience record, prior project references, and the availability of the designated personnel. All prior project references shall be currently available to personnel who can verify the quality of the contractor's previous work, and shall include name, address, and telephone number. This documentation shall reference the experience of the Provider and Contractor in the complete installation of fixed automated anti-icing spray systems for roadways or bridges and shall be maintained by the Superintendent.

## SYSTEM COMPONENTS

The anti-icing system shall consist of the following components supplied by the Provider, installed by the Contractor unless otherwise noted:

### A. Spray Disks

The spray disks shall be mounted in the bridge deck or roadway surface, with the disk top surface at least 2 mm (+0mm/-0.2mm) below the surface of the bridge deck or roadway, and shall be capable of withstanding high-volume traffic and snow plowing procedures conducted with maintenance trucks. The height of the liquid stream from the nozzle shall not exceed 400 mm above the traveled lane when applying the liquid. The spray disks shall be made of a durable non-metallic synthetic material that remains stable under exposure to sunlight, weather, and traffic. The synthetic material shall be comparable in stiffness and rigidity to stainless steel. All metallic components of the spray disk shall be type-316 stainless steel. The spray disks mounted in the bridge deck shall have piping connections located either on the underside or side of the disk. The spray disks mounted in the roadway pavement off the bridge shall have side-mounted pipe connections. The spray disks shall be fabricated in such a manner that the nozzle directions can be adjusted while the disk is embedded in the bridge deck or roadway surface without removal of the disk assembly. The spray disks shall be capable of spraying an arc of 100 degrees, through six nozzles oriented at 20-degree angles from each other. The nozzles shall be capable of being held in reserve for future widening of the roadway. The nozzles shall be self-cleaning. The spray disk and nozzle design must have a minimum record of successful performance on highway anti-icing systems of ten years.

#### **Deck Spray Disks Installation notes (please refer to plans, Special Plan 34C; sheet 19 of 65):**

- Soft wooden block-out must be placed at every spray disk location before concrete pouring
- Block-out shall be installed AFTER rebar installation is completed
- Block-out to be located in a place with no rebars
- Block-out may be displaced up to 200 mm. in any direction if necessary to avoid rebar
- 51 mm. perforation through deck to be done after deck is cured & block-out has been removed
- Use Ferro scan device to confirm that no rebar is present before performing deck perforation

### B. Pavement Sensors

Pavement sensors are solid-state electronic devices intended to be installed in the bridge deck or roadway pavement. Sensors shall be constructed of materials that have thermal characteristics similar to the bridge deck or pavement materials into which they are installed. They shall be flush-mounted in the bridge deck with an epoxy sealer, and be capable of withstanding high-volume traffic and snow plowing procedures conducted with maintenance trucks.

Pavement sensors shall be of the active and passive type. Active pavement sensors are defined as surface sensors that measure the freeze point by artificially cooling the sensor surface below the pavement temperature. Active sensors directly detect ice formation. Active sensors shall be capable of providing accurate data when exposed to any anti-icing chemical, any mixture of anti-icing chemicals, any level of surface moisture, expected levels of traffic friction, any surface contaminants or remaining residuals on the road surface that could affect the freezing point temperature.

The provider shall be able to demonstrate a minimum of ten years proven field operation of the active pavement sensors in automated liquid anti-icing spray systems.

Passive pavement sensors are defined as surface sensors that measure the physical properties of the pavement surface, or the moisture on the pavement surface.

**A pavement sensor group** shall consist of two sensors and must have one sensor of each type:

1. Type 1 Active/Passive Pavement Sensor: This sensor must include two pavement captors; The active pavement captor shall be capable of cooling the sensor surface temperature using an electronic Peltier device to a point approximately 2 degrees Celsius below the current pavement temperature, and returning the sensor surface to an above freezing temperature, in a continuous cycle; and shall be capable of detecting ice formation on its surface.  
The passive pavement captor shall measure the pavement surface temperature. The passive pavement captor shall be capable of measuring the passive conductivity reading of the moisture/chemical mixture on the pavement surface.
2. Type 2 Active Pavement Sensor: The Type 2 active pavement sensor shall be capable of continually measuring the “freeze point temperature” of the moisture/chemical mixture on the roadway surface. This sensor shall be capable of accurately detecting freeze point temperature in the range of 0 degrees to minus 20 degrees Celsius using an electronic Peltier device.

Pavement sensors shall provide the following minimum information:

1. Pavement Surface Temperature Range: -40 degrees C to +85 degrees C;
2. Pavement Surface Temperature Accuracy:  $\pm 0.25^{\circ}$  C;
3. Presence of wet surface condition;
4. Presence of moisture on pavement;
5. Presence of frost or ice on pavement;
6. Presence of anti-icing chemical;
7. Freezing Point Temperature of Moisture Considering Concentration of Anti-icing Chemical measured directly in degrees C by active sensor, and estimated in degrees C by passive sensor. Freezing Point Temperature range:  $0^{\circ}$  C to  $-20^{\circ}$  C;
8. Presence of snow, ice, or wet surface condition when surface temperature is below  $0^{\circ}$  C.

**Pavement Sensors Quantity:** The minimum number of pavement sensors to be included in this installation is:

1. System A/B - 120th Street RWIS Station: 3 groups of Pavement Sensors (Group as described above)
2. System C – Creek RWIS Station: 1 group of Pavement Sensors (Group as described above)

### **C. Chemical Pressure Piping**

The chemical pressure pipe/tubing shall be Polyamide 11, also known as Nylon 11, tubing, with 18 mm outside diameter, and 14 mm inside diameter, or approved equal, except within the pumphouse. Polyamide 11 tube couplings are not permitted in tubing runs between junction chambers, or in remote, inaccessible locations. All pipe connections, joints, elbows, fixed points, and pipe clamps shall be type 316 stainless steel.

Chemical pressure pipe within the pump house shall be beta polypropylene or polyethylene rigid pipe with socket-fused joints, rated for the system pressure.

#### D. Conduit for Chemical Pressure Piping

Chemical pressure piping shall be routed within a protective conduit system consisting of non-metallic conduit where embedded in concrete or buried in the ground except as shown on the plans, and galvanized steel conduit where exposed except as shown on the plans.

Conduit and all fittings, connections, elbows, and mounting hardware shall be sized as shown on the plans.

Galvanized steel raceway shall include **one expansion and one deflection fitting** at every bridge joint, and each 75 meters (250 feet) in between or at every fixed pier as a minimum. To allow expansion and contraction in the run of metal conduit, Expansion Fitting O-Z Gedney Type AX-8 or equal approved shall be used, providing a minimum of 200 mm. movement. To absorb deflections and misalignments a Deflection/Expansion Fitting O-Z Gedney Type DX or equal approved shall be used. Minimum angular misalignment 30 degrees, Minimum parallel misalignment: 19 mm. At every bridge joint, where expansion up to 200 mm. must be provided, two (2x) Expansion Fittings O-Z Gedney Type AX-8 shall be installed. Galvanized raceway shall be supported every 3 meters.

#### E. Instrumentation in Pump Station

1. Pressure Gauges: Analog type, industrial grade, all Type 316 stainless steel, minimum pressure range = 0 to 2,000 kilopascals (0 to 290 psi).
2. Flowmeter Transmitter: senses flow rate in system and sends signal to RPU spray system controller. Flowmeter shall be fabricated from durable noncorrosive materials. All metallic parts shall be Type 316 stainless steel. Minimum flow rate range = 0.3 to 6 meters per second.
3. Pressure Switch Transducer: senses pressure in system and sends signal to RPU spray system controller. All metallic parts shall be Type 316 stainless steel. Pressure range = 0 to 2,000 kilopascals.
4. Ultrasonic Level Sensor: ultrasonic device to detect the level of chemical in the storage tanks. The ultrasonic level sensor shall be connected to an alarm horn mounted on the exterior of the pumphouse to alert personnel filling the tanks when the tanks are full. The ultrasonic level sensor shall also send signals to a digital level display located in the housing for the chemical fill tube on the pumphouse.

#### F. Valve Units

Valve units shall control the flow of anti-icing chemical from the main supply line to each spray disk. Valve units shall consist of electromagnetically-controlled solenoid valves and electronic solenoid control cards. Solenoid valves and control cards shall operate on a **24-volt** system. Each control card shall have the capability to independently control the operation of two solenoid valves. The system shall be capable of controlling up to 32 control cards through a single pair of conductors. The control cards shall allow each solenoid valve to be remotely activated using different spray programs from the RPU controller. Each control card shall be addressable via a signal frequency allowing individual control from the RPU. The control cards shall have remote fault testing capability.

#### G. Pressurized Accumulator Tanks

Pressurized accumulator tanks shall be provided to store liquid and to provide consistent pressurization to the liquid throughout the system during the spray sequence. A minimum of **one** accumulator tank shall be provided for every **four** spray disks, or as shown on the plans.

The accumulator tank shall be appropriately sized for a minimum liquid capacity of 1.5 liters, and shall fit within the enclosures shown on the plans. The accumulator tanks shall be made of stainless steel and all components shall be compatible with any type of anti-icing chemical in

current use. Stainless steel manual shut-off valves shall be provided at each accumulator tank location as shown on the plans.

**H. System Control Cable**

Two-conductor 14-gauge shielded cable for valve system control, 24-volt.

**I. Sensor Control Cable**

Shielded control cable for active and passive pavement sensors.

**J. Conduit for Sensor Control Cable and RPU Slave Unit Power Cable**

Sensor control cable and power cable for RPU Slave Unit MPX shall be routed within a protective conduit system consisting of non-metallic conduit where embedded in concrete or underground except as shown on the plans, and galvanized steel conduit where buried or exposed except as shown on the plans. Conduit and all fittings, connections, elbows, and mounting hardware shall be sized as shown on the plans. When the raceway is galvanized, expansion and deflection fittings must be included as explained in section D. Galvanized raceway shall be supported every 3 meters.

**K. Anti-Icing Chemical Storage Tanks**

Two storage tanks are needed for the system. Anti-icing chemical tanks shall be 30,000-liter (8,000 gal.) and 11,300-liter (3,000 gal.) minimum capacity, double wall fiber glass underground tanks as shown on the plans. Each tank shall have an entry port through the top. The tank shall be vented at the top. Vent openings shall be covered with type 304 stainless steel wire cloth with mesh opening size 1.2 mm by 1.6 mm, using 0.23 mm diameter wire. The tank shall be made from an approved glass fiber-reinforced epoxy material. Any metal components of the tank shall be type 316 stainless steel. Galvanized steel shall not be permitted.

**L. Anti-Icing Chemical (supplied by the State)**

The anti-icing chemical shall be a 50 percent aqueous potassium acetate solution by weight, with corrosion inhibitors, and shall be produced specifically for highway and bridge deck anti-icing. It shall be a clear, colorless, mobile liquid, free from matter in suspension, with a density of 1.28 grams per cubic centimeter at 20 degrees Celsius, and pH in the range 10.5 to 11.5, to which blue food-grade dye has been added. The specific gravity shall be in the range 1.25 to 1.30 at 20 degrees Celsius. The maximum viscosity shall be 10 centipoise at 20 degrees Celsius, and 20 centipoise at 0 degrees Celsius. The freezing point shall be -60 degrees Celsius or lower as determined in accordance with ASTM D-1177. The anti-icing chemical shall be completely miscible with water, and shall be nonflammable. The chemical shall be stable and shall not separate in storage.

**M. Water Service**

Every Pump Station shall have water service connection as shown on the plans, for summer system flushing. This water connection shall comply with city regulations and has to be equipped with safety reverse flow valves, as shown on plans.

**N. Pump and Motor**

Provide a pump of appropriate size to assure proper operation of the anti-icing system. Pump shall be a vertical multistage centrifugal type. Pump and housing shall be type 316 stainless steel with seals and bearings appropriate for exposure to chloride-based chemicals, potassium acetate,

calcium magnesium acetate or CMA, CMA with potassium or CMAK, and other anti-icing chemicals. Electric motor to be 1.5 kW, single-phase, 220 volt, 60 Hz, appropriate for use in corrosive environments. Pump shall be capable of refilling any individual accumulator within the finished system within 10 seconds.

**O. Remote Processing Unit Spray System Controller**

The anti-icing system shall be controlled by a microprocessor-based RPU controller with capacity for 256 spray disks and the ability to monitor pump functions, system pressure and flow characteristics, and tank fluid levels. The RPU spray system controller shall be able to interpret between various signals from sensors to initiate different spray programs to apply measured amounts of liquid anti-icing chemical to the roadway surface. The control of the application of anti-icing chemical shall be fully automated, with provisions for operator intervention and notification. The automated control system shall include atmospheric sensor capabilities and active and passive pavement sensor technology. The RPU spray system controller shall be capable of storing and running 16 different software programs for automatic spray activation sequences. The RPU spray system controller shall have the capability to vary the length of time each solenoid valve is opened, thus varying the quantity of liquid anti-icing agent that is applied to the roadway surface, and shall be capable of changing the length of time for pauses between sprays, according to different conditions on the roadway surface. Fully automatic operation shall have manual override capability, with the options for manual pushbutton operation from the pumphouse, operation via telephone call with password, and computer activation from a Windows-based PC software. The system shall provide surge protection for the incoming telephone line. The RPU shall have the capability of detecting failures of system components and initiating automatic system shutdown in the event of a failure.

The RPU spray system controller shall be contained within a waterproof stainless steel or aluminum housing with lockable lid. The provider shall be able to demonstrate a minimum of ten years of proven field operation of the RPU spray system controller software in automated liquid anti-icing spray systems.

**B. Road Weather Information System – RWIS**

The RWIS system and associated Remote Processing Units shall allow for total flexibility in the selection of meteorological sensors and the system adaptability. The system shall include the integration of active and passive pavement sensors.

1. Air Temperature & Relative Humidity Sensor: temperature measurement range = -40° C to +70° C, temperature sensing accuracy throughout range =  $\pm 0.2^\circ$  C, relative humidity measurement range = 0 percent to 100 percent, with an accuracy of less than 3 percent in the range from 0 percent to 95 percent RH, and less than 5 percent in the range from 95 percent to 100 percent RH. Sensor shall have a wind and solar radiation shielded housing. Sensor shall be mounted approximately 2.4 meters above ground level.
2. Optical Precipitation Sensor: the optical precipitation sensor shall be able to detect the rate and type of precipitation by sensing falling particles, and shall be capable of distinguishing between rain, freezing rain, hail, and snow. The sensor shall be capable of detecting minimum precipitation particle sizes of 0.6 mm diameter. Operating temperature range shall be -50° C to +70° C. False alarm error rate for precipitation shall be less than 0.2 percent. Precipitation intensity error rate shall be less than 5 percent for the range 10 mm/hour to 100 mm/hour, and less than 10 percent for the range 3 mm/hour to 500 mm/hour. The sensor shall be mounted approximately 3.0 meters above ground level.
3. Wind Speed and Direction Sensors: the sensors shall be able to detect the speed and the direction of the wind at every moment. Sensors shall be mounted approximately 10.0 meters above ground level. (Wind sensors provision only for Anti-icing System A/B, 120<sup>th</sup> St. station)

4. RWIS Remote Processing Unit: A remote processing unit, or RPU, shall be provided to collect and store data from the various sensors. The RPU supplied shall be part of a standard product line and not custom or specially produced for this project. The RWIS RPU shall transmit data to the RPU spray system controller in the required formats when polled. The RWIS RPU shall consist of a microprocessor of current manufacture that is capable of performing all of the required functions. A card cage or other modular layout shall provide the data bus for the microprocessor, and individual components shall be replaceable to perform maintenance and repairs. The RPU shall include serial ports, analog and digital drivers, and inputs to fully support and correctly interpret the pavement and meteorological sensors. The RPU shall be supplied with a host serial port for interfacing to a laptop computer to perform diagnostic and calibration functions. The RPU shall have the capability for future expansion of the number of serial ports, and shall be capable of adding digital outputs. Where pavement or meteorological sensors are located more than 100 meters from the main RPU, additional "slave" RPU units shall be provided within 100 meters from the subject sensors, to collect and store analog data from the sensors, and to transmit the data in digital form to the main RPU. The "slave" RPU units shall be fully compatible with, and meet the same requirements as the main RPU. RWIS RPU and slave RPU units shall be contained within heavy-duty durable non-metallic enclosures with lockable lids that are sealed against moisture when closed.

5. RWIS Mounting Pole:

Where wind speed and direction sensors are present, the RWIS mounting pole shall be a 10 meters (30 feet) fold over aluminum tower and shall be mounted on four anchor bolts embedded in a concrete foundation. The atmospheric sensors and RWIS RPU enclosure shall be mounted on an aluminum tower. The tower with mounted equipment shall be capable of withstanding a wind load of 160 kilometers per hour. It shall be grounded with three ground rods, each 3.0 meters in length and connected with ground cable, as shown on the plans. RWIS mounting tower and foundation drawings shall be submitted for approval.

Where wind sensors are not included, the atmospheric sensors and RWIS RPU enclosure shall be mounted on an aluminum pole. The pole shall have a minimum height of 2.44 meters (8') above ground level, and shall be mounted on four anchor bolts embedded in a concrete foundation. The pole with mounted equipment shall be capable of withstanding a wind load of 160 kilometers per hour. It shall be grounded with three ground rods, each 3.0 meters in length and connected with ground cable. RWIS mounting pole and foundation drawings shall be submitted for approval.

**Q. Central Computer**

The system shall be supplied with a "major manufacturer" central computer capable of effectively running the supplied client software for remote operation of the anti-icing system, which shall be approved by the Engineer at the time of installation. Effectively running is defined as incurring no server slowdown or server resource depletion while operating client software. The central computer shall include a tape back up capable of performing system back up, and supporting disaster recovery of the central computer. The central computer hard drive shall be configured fault tolerant.

The central computer operating system shall be the latest version of Microsoft Business OS and minimum true 32-bit operating system or approved equivalent. Operating system to be approved by the Engineer at the time of installation.

**R. Modem**

The system shall be supplied with the necessary modems to provide communications between the RPU spray system controller, RWIS RPU, and central computer over standard telephone lines. The modems shall be industrial grade, intended for exterior installation, capable of operating in a

temperature range from -15 degrees Celsius to 80 degrees Celsius, and a humidity range from 0 percent RH to 100 percent RH. The system shall be compatible with existing Department servers. The RPU shall be able to support communications with the central computer utilizing telephone line autodial/answer modem. Communications between the RPU and central computer shall be verified via user name and password method. A minimum of two separate, user-configurable and encrypted accounts/access codes shall access the RPU, one for contractor access, and one for administrative access. All modems shall be supplied by the Provider.

## **S. Pumphouse Building**

1. **120th Street Station:** The pump house shall consist of a pre-cast concrete underground vault to be installed on a concrete foundation. The dimensions and configuration of the pump house are as shown on the plans. Installation of electrical components within the pump house shall be in accordance with the requirements of the National Electrical Code, dated 2002, including clearances. Interior surfaces of pre-cast roof and wall panels shall have a smooth steel form finish.

Underground vault shall comply with OSHA standards for confine places, and must be equipped with an automatic sump pump, fan with working volume greater than volume of vault, emergency lights and fire extinguisher.. The interior surfaces, including the inside face of walls and all points of entry of service lines and utilities shall be watertight and rodent proofed.

The contractor shall submit for review and approval structural engineering design calculations and working drawings for the pump house pre-cast concrete building that have been prepared and sealed by a Professional Engineer registered in Nebraska. The design calculations and working drawings shall be submitted for review and approval.

Pre-cast concrete shall have a minimum strength of 25 Mpa and shall be low permeability concrete, in accordance with the Special Provision for Low Permeability Concrete, and shall be air-entrained.

2. **Old Mill Station:** The pump house shall consist of a pre-cast concrete panelized building system to be field-erected on a cast-in-place, or CIP, concrete foundation. The dimensions and configuration of the pumphouse are as shown on the plans. Installation of electrical components within the pumphouse shall be in accordance with the requirements of the National Electrical Code, dated 2002, including clearances.

Deformed steel reinforcing bars shall conform to ASTM A615/A615M and shall have a yield strength of 420 MPa. All reinforcing steel in the foundation shall be epoxy-coated.

Pre-cast and CIP concrete shall have a minimum strength of 25 Mpa and be a low permeability concrete, in accordance with the Special Provision for Low Permeability Concrete, and shall be air-entrained.

The pre-cast roof and wall panels shall be produced as single component monolithic panels, and no intermediate roof or wall joints are allowed, except at corners. The pre-cast roof panel shall have a peak in the center of the short direction, and shall have a minimum slope of 1 percent to each side. The roof panel shall extend a minimum of 60 mm beyond the wall panel on each side, and shall have a turn-down design that extends at least 12 mm below the top edge of the wall panels to prevent migration of moisture into the building along the top of the wall panels.

The pre-cast wall panels shall have an exposed aggregate architectural finish on all exterior surfaces. Clean brown river stone aggregate shall be "seeded" into the concrete panel top surface while in the form, chemically retarded, and washed with high pressure water jet to expose the aggregate to a depth of 3 mm.

Interior surfaces of pre-cast roof and wall panels shall have a smooth steel form finish.

The pumphouse building shall be designed in accordance with the Nebraska Uniform Building Code, and the BOCA National Building Code, 1996, for Use Group "U". Structural Design Loads shall be: roof live load = 2.8 kPa; floor live load = 12.0 kPa; wind load = 200 km/hour; seismic performance category "C", exposure group I, with  $A_v = 0.10$ .

The contractor shall submit for review and approval structural engineering design calculations and working drawings for the pumphouse pre-cast concrete building that have been prepared and sealed by a Professional Engineer registered in Nebraska. The design calculations and working drawings shall be submitted for review and approval.

All joints between panels shall be caulked on the exterior and interior surface of the joints using an approved sealant. The back of the joints shall be taped with Type N bond breaking tape to ensure adhesion of caulk to parallel sides of joint and not the back.

Pre-cast panel units shall be securely fastened together with Type 304 stainless steel brackets with a minimum thickness of 6 mm. All threaded fasteners shall be 12.7-mm minimum diameter Type 304 stainless steel bolts. Cast-in threaded anchors used for panel connections shall be compatible with stainless steel bolts, and shall be directly connected to panel forms before casting. No floating-in of connection inserts is permitted.

#### **T. Ventilator Fan**

A ventilator fan shall be provided in the pumphouse where shown on the Plans. The ventilator fan shall consist of an electric motor driven propeller fan. The ventilator fan unit shall be complete with statically and dynamically balanced heavy gauge aluminum blades. Fan shall be direct drive. Electric motor shall be permanently lubricated and shall be resiliently mounted. Motor shall be suitable for variable speed operation. Fan shall be provided with a wire guard located on the motor side. Propeller fan shall have a minimum capacity of 12.7 cubic meters per minute under 3 mm standard pressure. Fan housing and supports shall be fabricated from durable noncorrosive materials.

#### **U. Doors and Louvers**

Doors, louvers, frames, and transoms shall be constructed in a manner and of material that prevents trespassers from entering the pump houses. Product data and working drawings for doors, louvers, frames, and all accessories and hardware shall be submitted for review and approval. Doors, louvers, frames, and all accessories and hardware shall be obtained from a single source and by a single manufacturer. Doors, louvers, and frames shall include manufacturer's unconditional warranty for a minimum of ten years against failures due to corrosion for the specific environment into which they are installed.

Glass fiber mat unit mass shall be 460 grams/sq. meter minimum. Glass fiber reinforced polyester shall be formulated from chemically proven resins to achieve the highest performance in any specified environment, and shall be resistant to UV radiation. All resins shall be premium grade iso polyester, USDA and FDA approved. Minimum glass fiber-to-resin ratio shall be 30 percent. All steel components shall be stainless steel.

Doors shall be of heavy-duty industrial grade construction. The door shall be equipped with a heavy duty deadbolt lock. Keys to the pump house doors shall be supplied to the State. . Door thickness shall be a minimum 45 mm, and door shall have an insulating value of R factor 11. Doors shall have a smooth gloss surface with a minimum value of 88 in accordance with ASTM D 523 – "Standard Test Method for Specular Gloss". Color shall be a gray permanent pigment that runs throughout the entire material thickness.

Louvers shall be of solid pultruded glass fiber reinforced polyester resin construction with stainless steel fasteners and sealed in such a way as to prevent moisture penetration. Louver finish and color shall match doors, and color shall be consistent throughout material thickness.

Door frames and transoms shall conform with Steel Door Institute, or SDI, Specifications and shall be comparable in size and strength to 1.5-mm thick, or 16 gauge, hollow metal door frame. Door frames shall be assembled using one-piece glass fiber reinforced polyester pultruded construction with a minimum material thickness of 6 mm. Frame profile shall be an industry standard 146-mm deep, with 51-mm wide face, double rabbeted with 16-mm high stop. Header to jamb joints shall be miter cut and assembled with glass fiber reinforced polyester clips and stainless steel fasteners. Frame and transom finish and color shall match doors, and color shall be consistent throughout the entire frame thickness. Frames shall be one-piece upon assembly and shall be rigid in construction.

Thresholds shall be standard saddle-type design 140-mm wide by 13-mm high, made from pultruded glass fiber reinforced polymer resin, with anti-slip grooves in the top surface. Thresholds shall be secured with stainless steel anchors.

Astragals for double doors shall be standard angle type made from pultruded glass fiber reinforced polymer resin.

Weather stripping and sweeps shall be provided by the door manufacturer, and shall have aluminum mill finish with neoprene seals.

Door hinges shall be stainless steel full mortise, ball bearing type with 114 by 114-mm template, applied with stainless steel fasteners. Closers shall be for severe service application. Kick plates shall be 1.2 mm thick, or 18 gauge, stainless steel with a brushed finish and beveled edges. Locksets and latchsets shall be heavy-duty stainless steel ball type, grade 1 severe service. Exit device shall be stainless steel RIM 19-R series with keyed dogging device to keep the latch bolt retracted when engaged. Hardware shall be furnished by the door manufacturer. Manufacturer's installation instructions shall be enclosed with hardware in the original box. The Contractor shall be ultimately responsible for proper installation of all hardware once received on the job site.

Install door opening assemblies in accordance with approved working drawings, SDI-100 – "Recommended Specifications for Steel Doors and Frames", and manufacturer's printed installation instructions. Maintain plumb and level tolerances specified in manufacturer's printed installation instructions. Adjust doors to swing open and shut without binding, and to remain in place at any angle without being moved by gravitational influence. Adjust door hardware to operate correctly. Clean surfaces of door opening assemblies and sight-exposed door hardware in accordance with manufacturer's maintenance instructions. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

### III. SUBMITTALS

The Contractor and the Provider shall submit to the Department Engineer for review and approval the following items:

- A. The Contractor shall submit detailed installation working drawings for the complete anti-icing spray system with sufficient detail to allow review of all power and communications for compliance with the Specifications. Working drawings shall clearly indicate any and all deviations from the contract documents. The working drawings shall include specific details and exact locations of all system components including proprietary equipment.
- B. The Contractor shall submit compliance Traceability Matrix for computer and electronic device hardware and software that gives evidence of the compliance of each component with the requirements in the Specifications.
- C. The Contractor shall submit installation schedule, with 60 days in advance, that shall outline the steps the Contractor intends to make to complete the contract. (A copy must be sent to the Provider) The installation schedule shall be revised and resubmitted if there is a significant change to the schedule.
- D. The Contractor shall submit Contractor qualifications and resumes in accordance with Section II – Provider and Contractor Qualifications.
- E. The Provider shall submit structural engineering design calculations and working drawings for the pumphouse pre-cast concrete building and the pumphouse underground vault prepared and sealed by a Professional Engineer registered in Nebraska. Provider will submit to contractor.
- F. The Provider shall submit working drawings and product data for doors, louvers, frames and all accessories and hardware for the pumphouse.
- G. The Contractor shall submit working drawings for Buildings and RWIS foundation and mounting Pole/Tower.
- H. As part of the Operations Manual, the Provider shall submit product data sheets or certificates of conformance with the Specifications for the following system components:
  - 1. Spray disks;
  - 2. Pavement sensors;
  - 3. Chemical pressure piping;
  - 4. Conduit for chemical pressure piping;
  - 5. Valve units;
  - 6. Pressurized accumulator tanks;
  - 7. System control cable;
  - 8. Sensor control cable;
  - 9. Conduit for sensor control cable and RPU slave unit power cable;
  - 10. Anti-icing chemical storage tanks;

11. Pump and motor;
  12. RPU spray system controller;
  13. RWIS RPU and all meteorological sensors;
  14. Modems;
  15. Concrete, class 30, low-permeability, for cast-in-place foundation;
  16. Concrete, class 35, for pre-cast building;
  17. Epoxy resin waterproofing for concrete surfaces;
  18. Silicone sealant and bond breaking tape for building joints.
- I. Operations and Maintenance Manual – The Provider shall furnish an Operations and Maintenance Manual, or O&M Manual, for the anti-icing system. The O&M Manual shall include operation and maintenance instructions for all systems and items of equipment provided under the contract. The O&M Manual shall be in the form of neatly formatted bound ring binders and electronic format in the form of CD-ROM disks. Prior to completion of the work, and at least 90 days prior to final payment, the Provider shall furnish for the Engineer's review three O&M Manual draft copies. Prior to completion of the work, and at least 30 day prior to final payment, the Contractor shall furnish for the Engineer's review three copies of the final O&M Manual. The final O&M Manual shall be approved by the Engineer before a final acceptance of the work.

The O&M Manual shall consist of product data sheets, brochures, bulletins, charts, schedules, approved working drawings corrected to as-built conditions, assembly drawings, wiring diagrams, operation and maintenance information for equipment, and other information necessary for the Department to establish an effective operating maintenance program. Oversized sheets and working drawings larger than 216 mm by 280 mm shall be neatly folded to that size with title block exposed along one edge, and bound or placed in pockets within the Manual. The O&M Manual shall include:

1. Title page giving the name and location of the facility, bridge plan numbers, and Project Numbers;
2. Performance curves for all pumps and equipment;
3. Approved working drawings of each component;
4. Approved product data sheets and dimensioned drawings of each piece of equipment, and details of all replacement parts;
5. Manufacturer's installation, operation, and maintenance instructions for each piece of equipment and complete listing of nameplate data;
6. Complete wiring diagrams of all individual pieces of equipment and systems including one line diagrams, schematic or elementary diagrams, and interconnection diagrams;
7. Complete piping and interconnection drawings;
8. Complete parts list with parts assembly drawing, names and addresses of spare parts suppliers, recommended list of spare parts to be kept on hand by the Department, and sample order forms for ordering spare parts. Lead time required for ordering spare parts shall be estimated;

9. Instructions with easily understood schematics or diagrams for disassembling and assembling the equipment for overhaul or repair;

Delivery of O&M Manual satisfactory to the Engineer is an essential part of project delivery. Incomplete or inadequate manuals will be returned to the Provider for correction and resubmission.

The Contractor shall not start construction or installation of any part of the anti-icing system until the complete design and installation working drawings and installation schedule have been received and reviewed, and written approval to begin construction has been issued by the Engineer. Such approval shall not relieve the Contractor of responsibility for results obtained by the use of these designs and drawings or any of the Contractor's other responsibilities under the contract.

## **V. SYSTEM OPERATIONS**

### **A. System Requirements - General**

Ambient Environment – The System shall be able to withstand temperatures in the range of  $-40^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$  with no permanent loss of function or component failure. The pavement sensors and nozzles shall withstand temperatures up to  $+85^{\circ}\text{C}$ .

Operating Environment – The System shall accurately apply liquid anti-icing chemicals to a pavement surface in the temperature range of  $-30^{\circ}\text{C}$  to  $+5^{\circ}\text{C}$ .

Chemical Environment – The System shall be able to safely store and apply the commonly encountered liquid anti-icing chemicals. Those liquid chemicals include but are not limited to: Calcium Chloride - CaCl, Magnesium Chloride - MgCl, Potassium Acetate - KAc, Sodium Chloride - NaCl, Calcium Magnesium Acetate - CMA, and CMA/KAc blend - CMAK.

The entire permanent anti-icing spray system component shall consist of materials that are resistant to corrosion from whatever chemical is selected by the Department for use in the system. All metallic valves shall be electrically polished stainless steel, as well as the stainless steel accumulator tanks, joints, connections, elbows, fixed points, and pipe clamps.

Communications and Software – The System communication software shall be delivered that meets standard communication protocol specifications. The System shall communicate functions such as automatic system operation and display, the system software programs in the controller, tank level, pressure and fluid flow control along with manual operation of the system. The system data collection software shall run as a background service on the central computer. The central computer need not be logged on to the Department's network to continue to log data from the anti-icing system.

Operating System – Latest Microsoft Business OS and minimum true 32-bit operating system or approved equivalent. Operating system shall be approved by the Engineer at the time of installation.

Software/Firmware – Client software shall not require OS administrative privilege to operate. Software/Firmware manufacturer shall support bug fixes and maintenance upgrades for a minimum of one year after system acceptance.

Software Licensing – Contractor shall provide a minimum of one remote access licenses and one license for the software on the central computer.

Users – The system shall permit a minimum of five simultaneous users with user-configurable and changeable web access.

Security – All communication to and from the RPU shall be verified by user name and password. The system shall provide two levels of password security, one with administrative configuration abilities, and the other user as read-only access.

1. All passwords shall be stored in an encrypted format with no clear text.
2. User accounts names and passwords shall be user definable and changeable.
3. The system shall support a minimum of two user accounts within the RPU.

Regulatory Requirements – The System shall comply with all applicable national, state, and local construction and safety codes.

The System provided shall be capable of two-way communication with the user using any or all of the following methods:

1. **Computer Network:** The System provided shall be capable of networking with wide area networks. The System provided shall utilize a Windows 2000 Server. The server provided shall network with standard computers via modem, network router, and frame relay, etc.
2. **Telephone Modem:** The System provided shall be capable of supporting conventional telephone modem operation. This capability shall include the ability to originate, or receive, calls to remote control sites.
3. **Onsite Hook-up:** The System provided shall provide the capability for local on-site connection of a portable computer to the RPU spray controller and RWIS RPU using RS-232C serial interface protocol.

#### **B. User Control Options**

The System provided shall provide for the control of the liquid chemical application with full automation. The system provided shall be capable of the following control modes:

1. **Fully Automated:** The System operation shall be automatic utilizing user-defined parameters and the pavement and weather conditions sensed by the RWIS.
2. **Manual Override:** The System provided shall allow for manual override of the automated mode. The system shall make this available locally at the site or remotely.
3. **Fully Manual:** The System provided shall respond only to a user – generated command. Manual control options shall include the override ability by networked computers, modem, manual on-site locking pushbutton, or telephone.

#### **C. Spray Control Ranges**

The System provided is capable of controlled applications of liquids in the range of 28 to 110 liters per lane-kilometer, or 0.0077 to 0.031 liters per square meter.

#### **D. Fault Detection and Remediation**

The System provided is able to detect problems and compensate for these problems and notify the user of the problems by the following methods:

1. **Self Check:** The System provided shall be able to detect chemical leakage and restrictions within the spray system. This includes the main feed lines as well as laterals feeding individual nozzles. Additionally, the System provided shall be capable of detecting hardware failures in all other connecting systems including pavement sensors and alerting the system user of the problem.
2. **Remediation:** The System provided shall provide for a single push button reset of normal functions upon completed system repairs or inspections. The system shall automatically detect system defects and take action without operator intervention to prevent system damage or environmental damage.
3. **User Notification:** The System shall automatically notify system user through the central computer of detected problems including location of abnormalities and actions taken. The notification system shall include user-definable and configurable alarms/notifications.

#### **E. Inventory Tracking and Control**

The System shall automatically provide tracking of material used by the anti-icing system. The system shall have the ability to detect and report liquid levels in the tank throughout the range from full tank to empty tank. The status of the tank level shall be reported to the user using the communications system. The system also shall have alarms for full tank, low level requiring refilling, and low level - not sufficient chemical to operate the system, providing an alarm to the operator and system shut-off to prevent system damage. All level alarms shall be settable by system user.

#### **F. Basic Operating Capabilities**

The system shall have the following basic operating capabilities as a minimum:

1. Automatic system tests on a preprogrammed and/or timed basis. The system shall measure system pressure and quantity of liquid flow and prevent system operation if parameters exist outside of acceptable operating conditions.
2. The system shall monitor and alarm for tank levels of low and or empty.
3. Capability to activate a warning device before the spraying operation commences.
4. The system shall be capable of going through a system evaluation before activating the spraying operation. This system evaluation shall check for system leaks, low chemical reservoir levels, and other system defects and shall not activate the system if any of these conditions exist. During system activation, the system shall evaluate if individual spray valves do not activate and shall document in system log and alert the operator of these conditions.
5. Autonomous operations based on various weather parameters in the RWIS.
6. The RWIS and pavement sensor technology shall include the following:
  - a. The sensor technology must insure that the sensor shall work with any anti-icing chemical, multiple chemicals, varying water depths, oils, dirt, and other remaining residuals on the road surface that can change the freezing point temperature. This includes any potential chemical applied on the surface by maintenance trucks.
  - b. The sensor technology must allow the system to have total user flexibility in system operation. The pavement and atmospheric sensors shall allow the following detection of the system:
    - i. Comparison of active and passive pavement sensors utilizing the advantages of each;
    - ii. Detection of accurate Freeze Point Pavement Temperature on the pavement which does not require re-calibration with each chemical used; can work with multiple chemicals, for example when exposed to various combinations of truck-applied chemicals; allows for system activation at different thresholds before freezing, for example, 1, 2, or 3 degrees before freezing, and provides accurate detection of freeze point temperature to (-) 20 degrees Celsius.
  - c. The System provided shall allow for software logic programs that utilize all of the capabilities of the RWIS remote processor to properly interface with the anti-icing

spray system controller. The System provided shall have user settable thresholds for adjusting automatic operation of the system:

- i. System activation when road moisture is at or near freezing via user settable thresholds;
  - ii. System activation when freeze point temperature sensors detect when pavement surface moisture is near freezing via user settable thresholds;
  - iii. System activation when chemical dilution is occurring via user settable thresholds;
  - iv. System activation and accurate freeze point temperature measurements even when multiple chemicals are used via user settable thresholds;
  - v. Accurate system activation without calibration of pavement sensors with changing chemicals;
  - vi. Immediate system activation when falling snow or freezing precipitation is detected via user settable thresholds;
  - vii. The ability to include other weather parameters in the system logic such as low pavement temperature lockout according to different anti-icing chemicals for minimum temperature, relative humidity, etc. via user settable thresholds.
7. The system shall have a minimum of 7 and up to 16 different spray programs available for activation of the various nozzles, separate timed sequences or separate circuits. A circuit is defined as a pump, supply lines, valve units and controlling device. These programs can be defined for up to 256 valves as a minimum. The capability shall be available for each nozzle's electromagnetic valve spray to be programmed to spray for a specific length of time, selectable to be open between 1 and 10,000 milli-seconds. The capability shall be available to change the length of pauses between "nozzle spraying", selectable from 1 to 10,000 seconds.
8. Manual override of system operation from any of the manual options.
9. Manual operation either locally or remotely; system options:
- a. Manual pushbutton at the site;
  - b. Remote Activation from data transmission;
  - c. Computer activation from a Windows 2000 based PC software.

#### **G. Commissioning, Testing, and Training**

A qualified representative of the Provider shall supervise the installation of the automatic anti-icing system including the start up, alignment, and testing of the entire system. The chemical storage tanks and the entire system shall be filled to capacity with anti-icing chemical at commissioning of the system (Chemical provided by the Department of Roads).

Testing Requirements:

1. Installation Testing: An installation test of the system shall be conducted at the conclusion of installation in the presence of the Engineer. The installation test shall simulate the full range of functions the anti-icing system is intended to provide. A successful installation test is required before the system may be accepted.

Training:

A minimum of one eight hour day of on-site and office training shall be provided by a qualified representative. This training shall cover operation, commissioning, seasonal commissioning/decommissioning and maintenance of the permanent automatic anti-icing system.

## VI. PROVIDER'S SCOPE OF WORK

Boschung America is the selected provider for the automated anti-icing system.

Boschung Contact information is as follows:

Contact Name: William Gorse, Operation Manager  
Address: 930 Cass Street New Castle PA 16101  
Phone: 724.658.3300 X 506  
Fax: 724.658.2300  
E-mail: [wrg@boschungamerica.com](mailto:wrg@boschungamerica.com)

The provider shall supply to the Contractor all materials and services specified herein. The Contractor must submit with 60 days minimum in advance to the Provider an installation schedule that shall outline the steps the Contractor intends to make to complete the contract.

If further coordination is needed, both Provider and Contractor shall be available to discuss and plan the installation.

The provider scope of work includes the following:

### A. Services

Pre-Installation: Provider must be available to support anti-icing project set-up and to answer Contractor questions. A responsible contact name and a phone number must be given to the Contractor and to NDOR Project Engineer.

Installation: The Provider shall supply an anti-icing supervisor to monitor the installation operations to supervise the integration of crucial components and participate in the system commissioning, testing and training. The installation work shall be performed under the supervision of the system provider's designated supervisor, who shall be fully knowledgeable and experienced, as defined herein, in the installation, and maintenance of similar fixed automated anti-icing spray systems. Provider's supervisor must be present at the site when crucial system components are going to be installed. It is anticipated a minimum of three visits during construction. When not at the site, the provider's supervisor must be completely available for installation support through phone or e-mail.

As the system is installed, the contractor shall prepare and submit to the Project Engineer percent complete reports for the computation of payment estimates. As part of the report the Provider and the Contractor shall certify that the completed portion of the anti-icing system is installed correctly and in strict accordance with the Boschung plan and meets Boschung's standards.

The Provider's designated supervisor performing the work shall have at least five years of experience in this work. Contractor can not install any crucial component without the prior inspection and written approval of the provider supervisor. Crucial components are: **spray disks, pavement sensors, valve units, pressurized accumulators tanks and pump station equipment.**

Commissioning and Testing: The Supervisor or a qualified representative of the system Provider shall supervise and manage the system commissioning including the start up, alignment, and testing of the entire Anti-Icing system.

Warranty: In a separate Agreement between the State and Boschung America, LLC, the Anti Icing system shall be warranted, by the Provider for defects in the systems operation and design including the Systems

equipment, materials and logic. The warranty shall be for a period of **one** year starting on the last day of the installation testing or through one uninterrupted winter season (October 1 to April 1) of Anti Icing System use including the system startup in the fall and the system decommissioning in the spring, whichever is longer. Both the system and the installation shall be covered by this warranty. A certificate of warranty from the Contractor and the Provider shall be provided to NDOR. Nebraska State Maintenance forces will provide any necessary traffic control for the Provider during the warranty period and the extended warranty if applicable".

As part of the warranty, the provider shall make one site visit during the winter season to provide additional training and support to the State. The site visit shall be planned at least 2 weeks in advance and be arranged at the discretion of the State.

If the system is not performing to the satisfaction of the State, the warranty period will be extended up to an extra full winter season to adequately ascertain the anti-icing system functioning properly and as described by the Provider.

## **B. Materials**

Provider shall supply to the Contractor the following parts in sufficient quantity to furnish the anti-icing system according to plans and these specifications:

1. Spray Disks
2. Deck Spray Disk Installation Kit containing: Block-out, Epoxy, foam ring, stainless steel pipe and custom plastic sleeve polyurethane Hard. 75D according to plans and specs.
3. Pavement Sensors
4. Pavement Sensors Epoxy for installation
5. Pressure Pipe Nylon 11 / 18 mm. O.D. in sufficient quantity to connect the entire system
6. Instruments in Pump Station
7. Pressure Pipe in Pump Station
8. Pumps and Motors in Pump Station
9. RPU Controllers in Pump Station
10. Master Power Cabinets in Pump Station
11. Valve units (Stainless Steel NEMA 4X enclosure shall be included when required)
12. Pressurized Accumulator Tanks (Stainless Steel NEMA 4X enclosure shall be included when required)
13. Electronic drive board Control Cable according to specs, in sufficient quantity to connect the entire system
14. Underground fiberglass double wall tanks (31,000 liters & 11,000 liters), including accessories as dead mans, collars, turnbuckles, etc. according to plans)
15. Two RWISs including: Tower (10 m.) and pole (2.4 m.), Environmental Sensors and Controllers
16. Graphical User Interface BORRMA for Remote monitoring of the system
17. Desktop Computer and modem according to specs
18. Pump House Buildings (Above and Under Ground according to specs)

## **VII. CONTRACTOR'S SCOPE OF WORK**

The Contractor shall provide installation services for all materials specified herein, and in general, supply miscellaneous materials and services not include in the Provider's scope of work (Section VI)

### **A. Installation Services**

Pre-installation: The Contractor is responsible for project set-up and project administration. The Contractor is also responsible for submitting the items identified in Section IV.

Installation: The Contractor is responsible for project installation, including: labor, equipment, materials shown below in Section VII. B., general costs, insurances (If any), performance bond (if any), and every cost directly involved with the installation of the anti-icing system.

The installation work shall be performed under the supervision the Provider's representative, who shall be fully knowledgeable and experienced, as defined herein, in the installation, and maintenance of similar fixed automated anti-icing spray systems.

The Contractor shall provide installation services for all materials specified herein, and in general, supply miscellaneous materials and services not include in the Provider's scope of work (Section VI).

As the system is installed, the contractor shall prepare and submit to the Project Engineer percent complete reports for the computation of payment estimates. As part of the report the Provider and the Contractor shall certify that the completed portion of the anti-icing system is installed correctly and in strict accordance with the Boschung plans and as directed by the inspector or anti-icing Superintendent.

Commissioning and Testing: Contractor is responsible for supporting the automatic anti-icing system commissioning including the start up, alignment, and testing of the entire system. The Supervisor or a qualified representative of the system Provider shall supervise and manage the system commissioning.

Warranty: The Contractor shall warranty the anti-icing system installation and miscellaneous materials supplied as described below. The Contractor shall warranty the part of the anti-icing system installed integral to the bridge and wall structures. Any problem with the anti-icing system caused as a result of installation workmanship or negligence in the integration of the anti-icing system with the structural elements of the project will be the responsibility of the Contractor.

The warranty shall be for a period of **one** year starting on the last day of the installation testing or through one uninterrupted winter season (October 1 to April 1) of anti-icing system use including the system startup in the fall and the system decommissioning in the spring, whichever is longer.

As part of the warranty, the Contractor shall make one site visit, with the Provider, during the winter season to provide additional training and support to the State. The site visit shall be planned at least 2 weeks in advance and be arranged at the discretion of the State.

If the system is not performing to the satisfaction of the State, the warranty period will be extended up to an extra full winter season to adequately ascertain the anti-icing system functioning properly as designed.

**B. Materials**

The Contractor shall supply the following parts in sufficient quantity to furnish the anti-icing system according to plans and these specifications:

1. Temporary Facilities and covered Storage Warehouse.
2. Installation of parts and equipment provided by Boschung
3. Maintenance and Protection of Traffic when required for installation
4. Polymer Concrete Underground Valve Boxes according to plans
5. PVC Underground raceway including polymer concrete pull boxes as needed
6. Galvanized Steel Raceway and Support as needed according to plans (H.D. Galvanized conduit, S.S. Dampening U-bolt, male adaptors in every box connection, anchors, capsules, concrete inserts, flexible conduit, anchors, etc according to plans)
7. Expansion & Deflection devices as shown on plans
8. S.S. Nema 4X Pull boxes on galvanized raceway as needed for the installation (Turns, direction changes, connections, girder offsets and other points)
9. Galvanized Conduit Bodies Type C as needed on galvanized raceway for pulling purposes
10. RWIS Tower/Pole Foundation and Grounding
11. Pump Station Buildings Foundations (Final design, materials and construction)
12. Unloading and installation of pre-cast buildings provided by Boschung
13. Underground Tanks Foundations and Tanks Installation according to plans
14. Systems connection to services: Power, Water and Phone according to city regulations.  
(All labor, materials, meters and permits if any)
15. Phone cable & Electric wire to fully connect the system and services hook up.
16. Electric Installation Materials in Pump House including Breaker Panel & Lighting.
17. Support and installation of Pressure Pipe & Pumps inside Pump Station Buildings.
18. PVC sleeves through concrete bridge members to accommodate rigid raceway for chemical pressure pipe or sensor control cables.
19. In general any installation material necessary to furnish the anti-icing system and not specified as the Provider scope.

#### **VIII. MEASUREMENT AND BASIS OF PAYMENT**

The item "Anti-Icing System" shall be an established amount shown in the contract and paid for on an each basis. The item "Anti-Icing System" shall be considered full compensation to the anti-icing system provider for the materials and services described above in this provision. The agreed compensation to "Anti-Icing System" shall include the services, labor, materials, installation inspection, installation supervision and management, and the warranty described above.

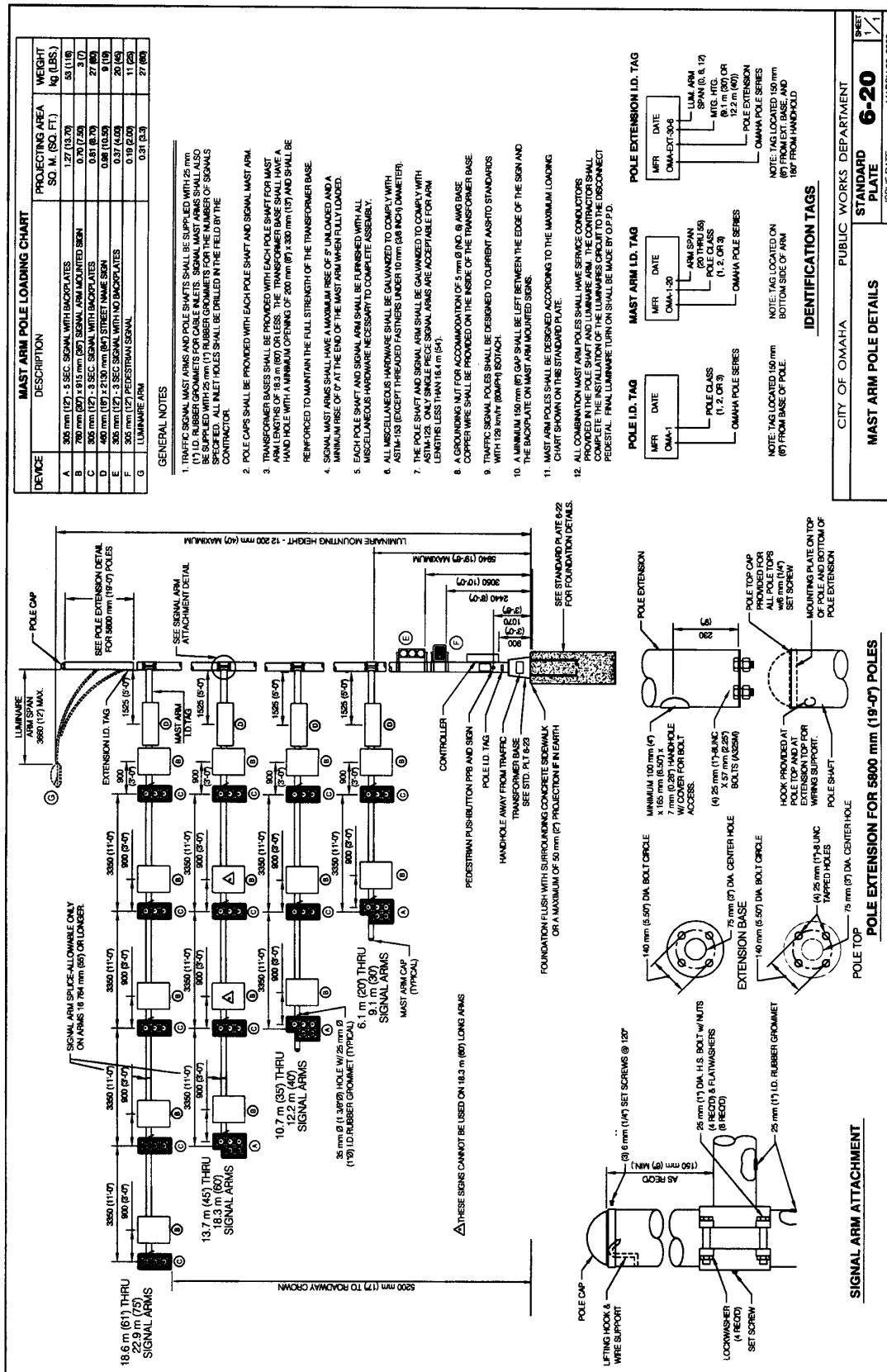
The item "Anti-Icing System" shall be broken down as follows in consideration of the percent of work complete for partial payment during installation.

- Material supplies – 65% of the item. The Provider must request payment and provide invoices or certificates to certify that system materials are purchased and in the Omaha area available for use on the project.
- Installation Inspection - 30% of the item. This work will parallel the percent complete for the item Install Anti-Icing System.
- Warranty – 5% of the item. Payment for the warranty will be made at the end of the warranty period.

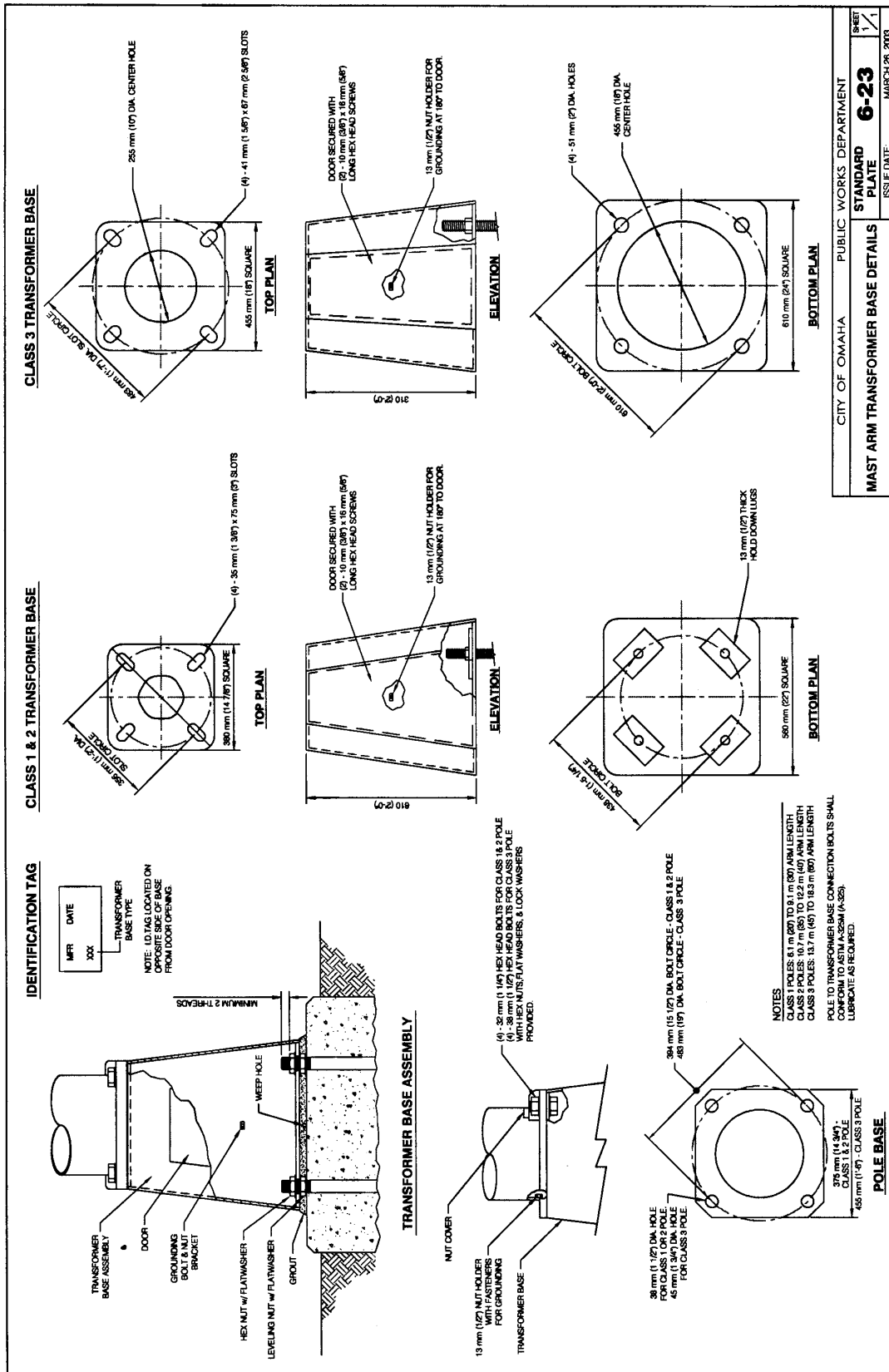
The item "Install Anti-Icing System" shall be bid and paid as part of this contract as an each item for the installation services, labor and materials described above. The item "Install Anti-Icing System" shall be broken down as follows in consideration of the percent of work complete for partial payment during installation.

- The Contractor shall provide monthly estimates of the percent complete for the work item "Install Anti-Icing System". The Engineer will base the percent complete payment for the item on the Contractor's estimate and on visual inspection.
- Materials must be permanently installed and considered accepted work to be considered for payment.









CITY OF OMAHA	PUBLIC WORKS DEPARTMENT
STANDARD PLATE	6-23
MAST ARM TRANSFORMER BASE DETAILS	SHEET 1
ISSUE DATE:	MARCH 26, 2003

**T11**

**T12**

**T21**

**T22**

**T31**

**T32** **TS-1L**

**T33** **TS-1R**

**T34L**

**T34S**

**T34R**

**T23**

**PS-1**

**T41** **TS-1LB**

**T42** **TS-1RB**

**T51** **TS-1LL**

**T51A** **TS-1LL**

**T52** **TS-1RR**

**T52A** **TS-1RR**

**SIGNAL FACE NOTATION KEY**

T - ALL 300 mm (12") SIGNAL LENSES

NUMBER OF LENSES IN SIGNAL FACE

SIGNAL FACE ARRANGEMENT

**BID ITEMS**

X3-0 1/2" LENS ARRANGEMENT

X3-0 1/2" NUMBER OF LENSES

X3-0 1/2" T-DENOTES TRAFFIC SIGNAL

X3-0 1/2" P-DENOTES PEDESTRIAN SIGNAL

CITY OF OMAHA PUBLIC WORKS DEPARTMENT

STANDARD SIGNAL FACE ARRANGEMENTS

STANDARD PLATE **6-60**

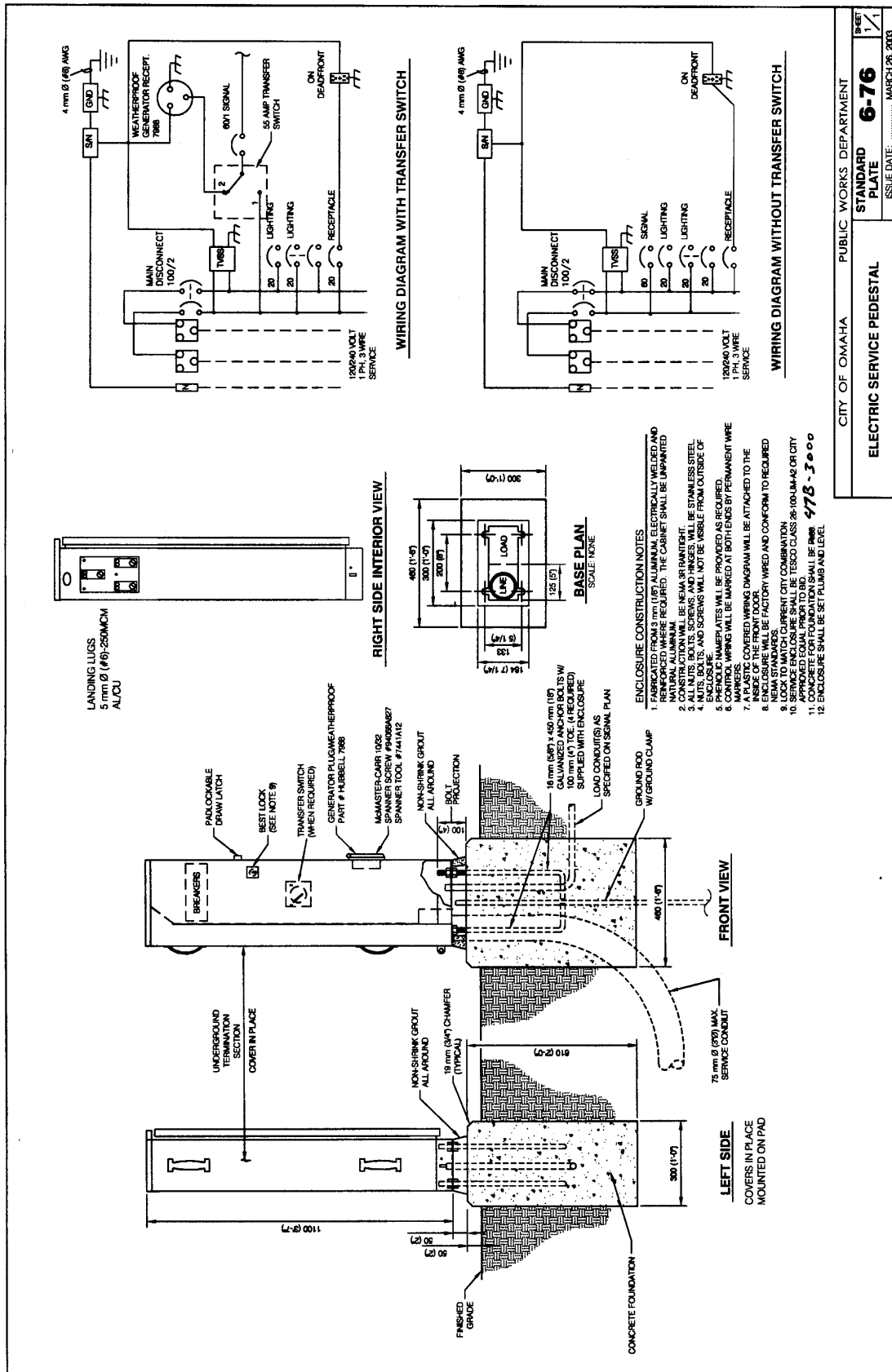
ISSUE DATE: MARCH 28, 2003

SHEET 1/1

TWO-PHASE INSTALLATIONS

MAST ARM POLES ON THE NE & SW CORNERS

WIRE COLOR	TRACER	SIGNAL NO.	FUNCTION
GREEN	1	1	GREEN
ORANGE	1	1	YELLOW
RED	1	1	RED
GREEN	2	2	GREEN
ORANGE	2	2	YELLOW
RED	2	2	RED
GREEN	3	3	GREEN
ORANGE	3	3	YELLOW
RED	3	3	RED
GREEN	4	4	GREEN
ORANGE	4	4	YELLOW
RED	4	4	RED
GREEN	5	5	GREEN
ORANGE	5	5	YELLOW
RED	5	5	RED
GREEN	6	6	GREEN
ORANGE	6	6	YELLOW
RED	6	6	RED
GREEN	7	7	GREEN
ORANGE	7	7	YELLOW
RED	7	7	RED
GREEN	8	8	GREEN
ORANGE	8	8	YELLOW
RED	8	8	RED
GREEN	9	9	GREEN
ORANGE	9	9	YELLOW
RED	9	9	RED
GREEN	10	10	GREEN
ORANGE	10	10	YELLOW
RED	10	10	RED
GREEN	11	11	GREEN
ORANGE	11	11	YELLOW
RED	11	11	RED
GREEN	12	12	GREEN
ORANGE	12	12	YELLOW
RED	12	12	RED
GREEN	13	13	GREEN
ORANGE	13	13	YELLOW
RED	13	13	RED
GREEN	14	14	GREEN
ORANGE	14	14	YELLOW
RED	14	14	RED
GREEN	15	15	GREEN
ORANGE	15	15	YELLOW
RED	15	15	RED
GREEN	16	16	GREEN
ORANGE	16	16	YELLOW
RED	16	16	RED
GREEN	17	17	GREEN
ORANGE	17	17	YELLOW
RED	17	17	RED
GREEN	18	18	GREEN
ORANGE	18	18	YELLOW
RED	18	18	RED
GREEN	19	19	GREEN
ORANGE	19	19	YELLOW
RED	19	19	RED
GREEN	20	20	GREEN
ORANGE	20	20	YELLOW
RED	20	20	RED
GREEN	21	21	GREEN
ORANGE	21	21	YELLOW
RED	21	21	RED
GREEN	22	22	GREEN
ORANGE	22	22	YELLOW
RED	22	22	RED
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ORANGE	27	27	YELLOW
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GREEN	28	28	GREEN
ORANGE	28	28	YELLOW
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GREEN	29	29	GREEN
ORANGE	29	29	YELLOW
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GREEN	30	30	GREEN
ORANGE	30	30	YELLOW
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GREEN	31	31	GREEN
ORANGE	31	31	YELLOW
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GREEN	32	32	GREEN
ORANGE	32	32	YELLOW
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GREEN	33	33	GREEN
ORANGE	33	33	YELLOW
RED	33	33	RED
GREEN	34	34	GREEN
ORANGE	34	34	YELLOW
RED	34	34	RED
GREEN	35	35	GREEN
ORANGE	35	35	YELLOW
RED	35	35	RED
GREEN	36	36	GREEN
ORANGE	36	36	YELLOW
RED	36	36	RED
GREEN	37	37	GREEN
ORANGE	37	37	YELLOW
RED	37	37	RED
GREEN	38	38	GREEN
ORANGE	38	38	YELLOW
RED	38	38	RED
GREEN	39	39	GREEN
ORANGE	39	39	YELLOW
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GREEN	40	40	GREEN
ORANGE	40	40	YELLOW
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ORANGE	41	41	YELLOW
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ORANGE	42	42	YELLOW
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GREEN	43	43	GREEN
ORANGE	43	43	YELLOW
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GREEN	44	44	GREEN
ORANGE	44	44	YELLOW
RED	44	44	RED
GREEN	45	45	GREEN
ORANGE	45	45	YELLOW
RED	45	45	RED
GREEN	46	46	GREEN
ORANGE	46	46	YELLOW
RED	46	46	RED
GREEN	47	47	GREEN
ORANGE	47	47	YELLOW
RED	47	47	RED
GREEN	48	48	GREEN
ORANGE	48	48	YELLOW
RED	48	48	RED
GREEN	49	49	GREEN
ORANGE	49	49	YELLOW
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ORANGE	50	50	YELLOW
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GREEN	51	51	GREEN
ORANGE	51	51	YELLOW
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ORANGE	52	52	YELLOW
RED	52	52	RED
GREEN	53	53	GREEN
ORANGE	53	53	YELLOW
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GREEN	54	54	GREEN
ORANGE	54	54	YELLOW
RED	54	54	RED
GREEN	55	55	GREEN
ORANGE	55	55	YELLOW
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GREEN	56	56	GREEN
ORANGE	56	56	YELLOW
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GREEN	57	57	GREEN
ORANGE	57	57	YELLOW
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ORANGE	61	61	YELLOW
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GREEN	62	62	GREEN
ORANGE	62	62	YELLOW
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ORANGE	63	63	YELLOW
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GREEN	64	64	GREEN
ORANGE	64	64	YELLOW
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GREEN	65	65	GREEN
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ORANGE	66	66	YELLOW
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ORANGE	67	67	YELLOW
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GREEN	68	68	GREEN
ORANGE	68	68	YELLOW
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GREEN	69	69	GREEN
ORANGE	69	69	YELLOW
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GREEN	70	70	GREEN
ORANGE	70	70	YELLOW
RED	70	70	RED
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ORANGE	71	71	YELLOW
RED	71	71	RED
GREEN	72	72	GREEN
ORANGE	72	72	YELLOW
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GREEN	73	73	GREEN
ORANGE	73	73	YELLOW
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ORANGE	74	74	YELLOW
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ORANGE	78	78	YELLOW
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ORANGE	79	79	YELLOW
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ORANGE	80	80	YELLOW
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ORANGE	81	81	YELLOW
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GREEN	82	82	GREEN
ORANGE	82	82	YELLOW
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ORANGE	85	85	YELLOW
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ORANGE	86	86	YELLOW
RED	86	86	RED
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ORANGE	87	87	YELLOW
RED	87	87	RED
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ORANGE	88	88	YELLOW
RED	88	88	RED
GREEN	89	89	GREEN
ORANGE	89	89	YELLOW
RED	89	89	RED
GREEN	90	90	GREEN
ORANGE	90	90	YELLOW
RED	90	90	RED
GREEN	91	91	GREEN
ORANGE	91	91	YELLOW
RED	91	91	RED
GREEN	92	92	GREEN
ORANGE	92	92	YELLOW
RED	92	92	RED
GREEN	93	93	GREEN
ORANGE	93	93	YELLOW
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GREEN	94	94	GREEN
ORANGE	94	94	YELLOW
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GREEN	109	109	GREEN
ORANGE	109	109	YELLOW
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GREEN	110	110	GREEN
ORANGE	110	110	YELLOW
RED	110	110	RED
GREEN	111	111	GREEN
ORANGE	111	111	YELLOW
RED	111	111	RED
GREEN	112	112	GREEN
ORANGE	112	112	YELLOW
RED	112	112	RED
GREEN	113	113	GREEN
ORANGE	113	113	YELLOW
RED	113	113	RED
GREEN	114	114	GREEN
ORANGE	114	114	YELLOW
RED	114	114	RED
GREEN	115	115	GREEN
ORANGE	115	115	YELLOW





## **SECTION 901 – POLES, MAST ARMS, AND CANTILEVER STRUCTURES**

### **901.01 Description.**

This work includes furnishing and installing of span wire poles, mast arm poles, combination mast arm and lighting poles, cantilever sign structures, street light poles, and pedestal poles including all materials, equipment, labor, tools, transportation, permits, licenses, and all other miscellaneous items as required by the Contract Documents.

### **901.02 Material Requirements.**

#### **(A) General.**

Metal span wire poles, mast arm poles, combination mast arm and lighting poles, cantilever sign structures, street light poles, and pedestal poles shall be galvanized steel or aluminum structures designed in accordance with AASHTO Specifications for the Design and Construction of Structural Supports for Highway Signs. The maximum design wind velocity shall be 160.9 kilometers per hour (100 miles per hour) with a one and three-tenths (1.3) gust factor after installation. A Structural Engineer currently licensed to practice in the State of Nebraska shall seal all designs.

Design structures to support the required signal heads, lighting systems, signal and lighting cables, signage, other required items, and 14.9 kilograms of ice per linear meter (10 pounds per linear foot) per tube for the location and span indicated in the Contract Documents. Use the area of the signs shown plus thirty (30) percent or as noted on the Contract Documents for design calculations. Once selected, use the same design patterns, materials, and basic member shape throughout the project unless otherwise indicated in the Contract Documents.

When indicated in the Contract Documents, design cantilever sign structures to include lighting and a walkway. Design the walkway to be continuous over the roadway and shoulder on and in front of the lower chord. Design railing along the front side that folds down when not in use. No part of the walkway or railing in the folded position shall obstruct normal viewing of the sign(s).

Fabricate poles and arms in a plant owned and operated by a fabricator having sufficient experience to manufacture the structures in accordance with the Contract Documents. Provide the name and address of the fabricator and evidence of the fabricator's qualifications and experience upon request by the Engineer. Aluminum or steel galvanize structural components after fabrication unless otherwise indicated in the Contract Documents or directed by the Engineer.

#### **(B) Metal Poles.**

Metal poles shall consist of a round, tapered pole shaft of galvanized steel fabricated to the dimensions and details required in the Contract Documents. Metal poles shall have one (1) longitudinal automatic electric weld. After forming, flatten the weld. Steel shall meet the requirements of ASTM A595, Standard Specification for Steel Tubes, Low Carbon, Tapered for Structural Use. Incorporate a lifting U-hook at the top of the shaft. The U-hook shall be capable of supporting the weight of the entire pole.

For mast arm installations, design metal poles to support the required mast arms, signal heads, signal and lighting cables, signage and up to 14.9 kilograms of ice per linear meter (10 pounds per linear foot). For span wire installations, design metal poles to support the required signal heads, signal and lighting cables, and signage for the span length required with a worst angle of seventy (70) degrees. For all other installations, design metal poles to support the required signal heads, signal and lighting cables, signage and up to 14.9 kilograms of ice per linear meter (10 pounds per linear foot). The maximum design wind velocity for all installations shall be 160.9 kilometers per hour (100 miles per hour) after installation. Design all metal poles to support a 6.1 meter (20 foot) luminaire extension with a 4.57 meter (15 foot) luminaire arm and 34 kilogram (75 pound) luminaire.

The pole manufacturer shall state the amount of pole rake necessary for the pole to set plumb under the required loading after installation. The pole manufacturer shall certify that the signal poles and related hardware will not fail under the loading requirements indicated in the Contract Documents.

Secure a one (1) piece galvanized steel anchor base of adequate strength, shape, and size to the lower end of the shaft using two (2) continuous electric arc welds. The base shall telescope the shaft of the pole. Locate one (1) weld inside the base at the end of the shaft. Locate one (1) weld outside the base at the joint between the base top and the pole shaft.

Furnish all hardware necessary to complete the metal pole assembly in accordance with the pole manufacturer's instructions. Hardware shall include but not be limited to bolts, nuts, washers, removable pole tops, anchor bolts, anchor bolt covers, and transformer bases. Galvanize all exposed metal hardware. Removable pole tops shall consist of a galvanized positioning cap screw and galvanized pole cap. Furnish one (1) rubber grommet of one (1) inch inside diameter for each signal arm mounting location. Furnish transformer bases for all installations at signalized intersections. Furnish transformer bases for all installations between signalized intersections as directed by the Contract Documents.

Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

**(C) Wood Poles.**

Wood poles shall be southern pine, douglas fir, western red cedar, or northern white cedar conforming to ASTM D25, Standard Specification for Round Timber Piles, and ANSI 05.1, Wood Poles, Specifications and Dimensions. Treat poles using the Rueping Process with a minimum of 160.4 kilograms of five (5) percent pentachlorophenol solution per cubic meter (10 pounds per cubic foot) of timber in accordance with AASHTO M133, Preservatives and Pressure Treatment Process for Timber. Roof, gain, and bore poles before full-length preservation treatment. Locate markings 3.05 meters (10 feet) above the butt of the pole. Cut gains on the concave side or side having the greatest curvature in poles having a reverse or double sweep. Gained surfaces shall be in parallel planes.

Poles in line shall not have sweeps or short crooks exceeding fifty (50) percent of the maximum allowed. Less than twenty (20) percent of the poles shall contain the maximum allowable sweeps and short crooks.

Store poles by stacking on creosote-treated or decay-resisting skids at least 0.305 meters (1 foot) above the ground. Arrange skids to avoid distortion of the poles. Stack poles to permit free circulation of air. Remove any decaying wood from beneath stored poles immediately.

**(D) Pedestal Traffic Signal Poles.**

Pedestal traffic signal poles shall consist of a spun, seamless aluminum-alloy 6063-T6 shaft meeting the requirements of ASTM B429, Standard Specification for Aluminum-alloy Extruded Structural Pipe and Tube. The minimum wall thickness of the pole shall be 6.35 millimeters (¼ inch). The minimum inside diameter shall be 101.6 millimeters (4 inches). The minimum outside diameter shall be 114.3 millimeters (4½ inches).

Support the pole using a breakaway base comprised of cast aluminum meeting the requirements of ASTM B179, Standard Specification for Aluminum-alloys in Ingot and Molten Forms for Castings. The breakaway base shall have an approximate height of 381 millimeters (15 inches) with a diameter of 431.8 millimeters (17 inches) or less.

Design the pedestal traffic signal pole and breakaway base to support the pole, signal load, signal and lighting cables, and ice loading of 14.9 kilograms of ice per linear meter (10 pounds per linear foot). The maximum design wind velocity shall be 160.9 kilometers per hour (100 miles per hour) after installation. The manufacturer shall design and test the breakaway base in accordance with all applicable AASHTO requirements.

Furnish all hardware necessary to complete the pedestal traffic signal pole assembly in accordance with the pole manufacturer's instructions. Hardware shall include but not be limited to bolts, nuts, washers, anchor bolts, anchor bolt covers, and pole bases. Galvanize all exposed metal hardware. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. Furnish one (1) rubber grommet of one (1) inch inside diameter for each signal or luminaire mounting location.

**(E) Anchor Bolts.**

Anchor bolts shall conform to the requirements of ASTM A307, Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, and the Contract Documents. The pole manufacturer shall certify that the strength of the anchor bolts is sufficient for the loading requirements of the pole. The minimum yield strength shall be 4227 kilograms per square centimeter (60,000 psi). Thread the bolts a sufficient length to allow for proper installation. Threads shall be full and sound. Galvanize all exposed portions of the anchor bolt. Supply two (2) galvanized hexagon nuts and two (2) galvanized flat washers with each anchor bolt. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

**(F) Transformer Bases.**

Transformer bases shall be galvanized steel meeting the requirements of ASTM A27, Standard Specification for Steel Castings, Carbon, for General Application. The transformer base shall be of adequate size and shape for the pole anchor base and pole foundation. The manufacturer shall certify that the transformer base meets the strength requirements for the anticipated loading. The transformer base shall have a weather-tight hand hole reinforced to

maintain the full strength of the transformer base. The minimum opening size shall be 203 millimeters (8 inches) by 330 millimeters (13 inches). Furnish a grounding nut that accommodates a No. 6 AWG copper grounding wire on the inside of the transformer base.

**(G) Signal Mast Arms.**

Signal mast arms shall consist of a galvanized steel shaft with a clamp-on mounting device suitable for attaching the arm at the height specified in the Contract Documents. Signal mast arms less than 16.8 meters (55 feet) shall be one (1) piece arms. Signal mast arms 16.8 meters (55 feet) or longer may be one (1) or two (2) piece arms. Steel shall meet the requirements of ASTM A595, Standard Specification for Steel Tubes, Low Carbon, Tapered for Structural Use. The clamp-on mounting shall be structurally sound and neat in appearance. The signal mast arm shall be field adjustable or provide a minimum of two (2) and a maximum of four (4) degree rise. Supply a mast arm cap for the free end of the mast arm. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. Furnish one (1) rubber grommet of 25.4 millimeters (1 inch) inside diameter for each signal mounting location. Design signal mast arms to support the required signal or luminaire load and the required signal and lighting cables. The maximum design wind velocity shall be 160.9 kilometers per hour (100 miles per hour) after installation.

**(H) Luminaire Arms and Extensions.**

Luminaire arms and extensions shall consist of a galvanized steel shaft with a mounting device suitable for attaching the arm and/or extension at the height specified in the Contract Documents. Steel shall meet the requirements for 50.8 millimeter (2 inch) Grade A or Schedule 40 pipe as defined by ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless. The mounting shall be structurally sound and neat in appearance. The mating arm and pole steel simplex attachments shall meet the requirements for Grade 65-35 steel castings as defined by ASTM A27, Standard Specification for Steel Castings, Carbon, for General Applications. Channel scrolls shall be 38.1 millimeters (1½ inch) by 38.1 millimeters (1½ inch) by 3.175 millimeters (1/8 inch) commercial grade steel.

**(I) Sealing Compound.**

Aluminum-filled, resilient sealing compound shall be Minnesota Mining and Manufacturing Company (3M) Sealant Number 1168 or approved equal.

**(J) Pipe Handrails.**

Pipe handrails shall be of Aluminum-alloy 6061-T6 or Alloy 6063-T6 and shall conform to the requirements of ASTM B221, Standard Specification for Aluminum-alloy Extruded Bars, Rods, Shapes and Tubes; or ASTM B241 Standard Specification for Aluminum and Aluminum-alloy Seamless Pipe and Seamless Extruded Tube.

**(K) Copper Grounding Wire, Grounding Rods, and Test Stakes.**

Copper grounding wire shall be No. 6 AWG stranded copper wire as defined by ASTM B3, Standard Specification for Soft or Annealed Copper Wire. Copper grounding wire installed in conduit shall be No. 6 AWG green insulated stranded copper wire as defined by ASTM B3, Standard Specification for Soft or Annealed Copper Wire. Grounding rods and test stakes shall comply with IMSA Specification Number 62-1956 excluding length and diameter requirements. Ground rods and test stakes shall have a minimum diameter of 15.875 millimeters (5/8 inch). Supply ground rods and test stakes with a ground rod clamp.

**(L) Grout.**

Grout shall be non-shrinking and non-rusting and comply with the requirements for Grade A Pre-Hardening Volume-Adjusting Grout as defined by ASTM C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout.

**(M) Anchors and Anchor Rods.**

Anchors shall be three-way (3-way) expanding malleable iron anchors having a minimum diameter of 203 millimeters (8 inches). Malleable iron shall conform to the requirements of ASTM A47, Standard Specification for Ferritic Malleable Iron Castings. Anchor rods shall be 2.44 meter (8 foot) long, 15.875 millimeter (5/8 inch) diameter galvanized steel rods with a thimble end. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

**(N) Guy Wire and Guy Guards.**

Guy wire shall be 9.525 millimeter (3/8 inch) diameter, seven (7) wire, high-strength grade cable with Class A zinc coating meeting the requirements of ASTM A475, Standard Specification for Zinc-Coated Steel Wire Strand. Guy guards shall be 2.44 meter (8 foot) long, half-round, galvanized metal guards. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

**(O) Bonding Clamps.**

Bonding clamps shall be galvanized metal clamps that expand by tightening a set screw. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

**(P) Span Wire Cable.**

Span wire cable shall be 9.525 millimeter ( $\frac{3}{8}$  inch) diameter, seven (7) wire, high-strength grade cable with Class A zinc coating meeting the requirements of ASTM A475, Standard Specification for Zinc-Coated Steel Wire Strand.

**(Q) Traffic Signal Tie Wire.**

Traffic signal tie wire shall be 6.35 millimeter ( $\frac{1}{4}$  inch) diameter, seven (7) wire, Siemens-Martin or equal grade cable with Class A zinc coating meeting the requirements of ASTM A475, Standard Specification for Zinc-Coated Steel Wire Strand.

**(R) Conduit and Conduit Fittings.**

Conduit and conduit fittings for direct bury applications shall be galvanized rigid steel conforming to UL-6, UL Standard for Safety for Electrical Rigid Metal Conduit – Steel; high-density polyethylene conforming to ASTM F2160, Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); or rigid polyvinyl chloride conforming to UL-651, UL Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit. Conduit and conduit fittings for boring applications shall be high density polyethylene conforming to ASTM D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter. Furnish in standard lengths with UL label. Rigid steel conduit fittings shall be galvanized steel or galvanized malleable iron. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. PVC conduit fittings and cement shall be compatible with the PVC conduit. Transitions between HDPE and PVC conduits shall conform to the manufacturer's recommendations. Conduit size shall be the minimum trade size permitted for the application. Conduit installed for above ground risers shall be galvanized rigid steel conduit.

**(S) Portland Cement.**

Portland cement shall conform to the requirements for Cement Type I or Cement Type II as defined by ASTM C150, Specification for Portland Cement including Table 1, Table 2 (Maximum Equivalent Alkalies requirements only), and Table 3.

**(T) Water.**

All water used in PCC shall meet the requirements of AASHTO T26, Quality of Water to be used in Concrete. Obtain such water from a source approved by the Engineer.

**(U) Aggregate.**

Coarse aggregate shall conform to all requirements for Size D57, Class 4S aggregate as defined by ASTM C33, Specification for Concrete Aggregates. Coarse aggregate shall consist of a minimum of seventy-five (75) percent by weight of limestone, quartzite, dolomite, or crushed gravel materials. Fine aggregate shall conform to all requirements for fine aggregate as defined by ASTM C33, Specification for Concrete.

**(V) Admixtures.**

Admixtures shall conform to the requirements of ASTM C494, Standard Specification for Chemical Admixtures for Concrete; ASTM C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete; or ASTM C260, Standard Specification of Air-Entraining Admixtures for Concrete. Dosages shall be as directed by the manufacturer.

Calcium chloride shall meet the requirements of ASTM D98, Specifications for Calcium Chloride. The maximum amount of calcium chloride added shall not exceed two (2) percent by weight of the total amount of cement in the mixture. Do not use calcium chloride without prior written approval by the Engineer. Add calcium chloride on the project site in a manner acceptable to the Engineer. Mix calcium chloride flake in a minimal amount of water before adding to the PCC. Mix the calcium chloride solution with the concrete for a minimum of thirty (30) revolutions before commencing placement of the PCC.

Do not use any admixtures that retard the initial set of the PCC without prior approval by the Engineer. Add water-reducing admixtures at the mixer separately from air-entraining admixtures in accordance with the manufacturer's printed instructions. The air entrainment agent and the water-reducing admixture shall be compatible.

**(W) PCC Mix Proportioning.**

Proportion PCC mixtures to meet the requirements of Table 901.01.

**Table 901.01**  
**PCC Properties**  
**Metric Units**

Mix Type	L6
Portland Cement Content, kgs. per cubic meter	335
Coarse Aggregate, % of Total Aggregate	30±3
Fine Aggregate, % of Total Aggregate	70±3
Maximum Water Cement Ratio	0.45
Minimum 28-Day Compressive Strength, kg per square centimeter	247
Air Content, %	6.5±1.0
Slump, millimeters	101.6-mm Max.
Concrete Temperature during placement, °C	21.1±3.89

**English Units**

Mix Type	L6
Portland Cement Content, lbs. per cubic yard	564
Coarse Aggregate, % of Total Aggregate	30±3
Fine Aggregate, % of Total Aggregate	70±3
Maximum Water Cement Ratio	0.45
Minimum 28-Day Compressive Strength, psi	3500
Air Content, %	6.5±1.0
Slump, inches	4-inch Max.
Concrete Temperature during placement, °F	70±25

**Referenced Test Procedures.**

- ASTM C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C173, Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- ASTM C143, Test Method for Slump of Hydraulic Cement Concrete
- ASTM C1064, Test Method for Temperature of Freshly Mixed Portland Cement Concrete

**(X) Reinforcing Steel.**

Reinforcing steel shall be deformed steel bars conforming to the requirements of ASTM A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, or ASTM A996, Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement. Do not use Grade 50 or Grade 60 rail steel bars for tie bars that are bent or straightened during construction. For construction requiring bent bars, use Grade 40 tie bars meeting the requirements of ASTM A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

**(Y) Pre-molded Joint Filler.**

Pre-molded joint filler for expansion joints shall conform to the requirements of ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types). Neatly punch holes to admit the dowels where indicated in the Contract Documents. The diameter of the holes shall not exceed 12.7 millimeter (½ inch) greater than the bar diameter. When more than one piece is required for a joint, securely fasten the abutting ends by stapling or other positive fastening means satisfactory to the Engineer.

**(Z) Curing Materials.**

Curing materials shall be membrane-forming compounds or polyethylene film. Liquid, membrane-forming compounds for curing PCC shall conform to the requirements for Type 1, 1-D, or 2, Class B as defined by ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete. Polyethylene film for curing PCC shall conform to the requirements of ASTM C171, Standard Specification for Sheet Materials for Curing Concrete

**901.03 Construction Requirements.**

**(A) General.**

Before ordering materials and within fifteen (15) calendar days after the award date, submit the information required by Table 901.02 for all materials. The Contractor is liable for any materials purchased before receiving written approval from the Engineer. Use new, unused, and in first class condition materials for the construction of the traffic signal system unless specifically stated otherwise in the Contract Documents. At the time of each submittal, identify in writing any deviations that the shop drawings or samples may have from the requirements of the Contract Documents.

**Table 901.02**  
**Materials Information Requirements**

<b>Item</b>	<b>Required Information</b>
Metal Poles	Manufacturer's Model or Catalog Number, Working Drawing*, Certificate of Compliance, Mill Test**, Design Calculation**
Mast Arms	Manufacturer's Model or Catalog Number, Certificate of Compliance, Mill Test**, Design Calculation**
Pedestal Poles	Manufacturer's Model or Catalog Number, Working Drawing*, Certificate of Compliance, Mill Test**, Design Calculation**
Anchor Bolts	Manufacturer's Model or Catalog Number, Certificate of Compliance
Breakaway Devices	Manufacturer's Model or Catalog Number, Working Drawing*, Certificate of Compliance, Mill Test**, Design Calculation**
Wire and Cable	Manufacturer's Model or Catalog Number, Certificate of Compliance
Conduit	Manufacturer's Model or Catalog Number
Wood Poles	Manufacturer's Model or Catalog Number, Manufacturer's Data identifying Species, Size, Class, and Treatment
Wood Pole Fittings	Manufacturer's Model or Catalog Number
Pole Guys and Hardware	Manufacturer's Model or Catalog Number, Certificate of Compliance
Guy Anchors	Manufacturer's Model or Catalog Number, Certificate of Compliance

\* As required by the Engineer

\*\* May substitute catalog number or model number for shop drawing as permitted by the Engineer

Before ordering structural steel, locate overhead or underground utilities to verify that they do not interfere with the work outlined in the Contract Documents. Order all poles, mast arms, span wires, anchors, and related materials necessary to complete the work no later than ten (10) calendar days after receiving approval of the submitted materials information. Submit proof of the orders and estimated delivery time to the Engineer within fifteen (15) calendar days after receiving approval of the submitted materials information. Identify any materials already in possession. Do not substitute items without written permission from the Engineer. Do not construe Engineer's acceptance of a submittal as relieving the Contractor of the responsibility to comply with the Contract Documents.

Obtain all licenses and permits before commencing the work.

A competent worker experienced in the required work shall perform all work under the supervision of a licensed journeyman electrician or lineman. A qualified journeyman electrician or lineman shall directly supervise any work involving the installation of cable, foundations, structural steel, and traffic control equipment. Installations shall comply with all applicable sections of the National Electrical Code, National Electrical Safety Code, Manual on Uniform Traffic Control Devices, all governing local ordinances and regulations, and the Contract Documents. The Engineer shall resolve any conflicts.

Inform the Engineer of the work scheduled each day. Schedule work to minimize the time any signal is inoperable. During this time, provide, place, and maintain temporary traffic control devices. Maintain a minimum of two (2) lanes of traffic on one-way streets and one (1) lane of traffic in each direction on two-way streets open to traffic during the work. Open all lanes to traffic during peak hours as directed by the Engineer or Contract Documents. Maintain traffic through open intersections at all times.

Coordinate work with all other phases of the project to minimize conflict between combined operations. Schedule work and materials deliveries to meet the project schedule. Provide the utility company supplying the electrical service adequate notice regarding the scope and nature of the power requirement. Arrange for all necessary electrical services at locations indicated in the Contract Documents. The utility company or Engineer may alter the service location in the field to adapt to certain field requirements. Cooperate with the utility company providing electrical service in locating the service lines and conduit bends.

Trim trees or shrubs using proper tree surgery practices to trim tree branches as necessary to install the poles, mast arms, span wires, or pole. Use an asphaltum-based paint manufactured for tree surgery to treat the cut or scarred branches.

Do not disconnect or damage an operational communication cable while performing work around traffic signal systems without written permission from the Engineer. Reconnect, repair, or establish a temporary connection within eight (8) hours of disconnecting or damaging a communication cable.

Size conduit bends installed in existing foundations to be equivalent to the connecting conduit in the ground. Do not cut or damage the reinforcing steel or anchor bolts in the foundation. Install the conduit a minimum depth of 305 millimeters (12 inches) below the top of the foundation or 762 millimeters (30 inches) below the depth of the surrounding ground surface, whichever is greater. Remove a sufficient amount of concrete to place the conduit inside the anchor bolts of the foundation. Position the conduit and place concrete or grout. Finish to match the existing foundation.

Replace or restore in kind equal to or exceeding any surface materials disturbed by trenching, excavating, or backfilling operations. Accomplish restoration in accordance with the Contract Documents. Dispose of all excess materials as directed by the Engineer.

Transfer any guarantees or warranties on materials purchased to the City upon acceptance of the work. Purchase materials with transferable guarantees or warranties.

**(B) Metal Pole and Pedestal pole Installation.**

Metal pole foundations for use with mast arm lengths less than or equal to 18.6 meters (61 feet) shall comply with the Contract Documents. Provide a structural engineering design on all metal pole foundations where the mast arm length exceeds 18.6 meters (61 feet). A Structural Engineer currently licensed to practice in the State of Nebraska shall seal the design.

Dig or bore holes to the lines and depth specified in the Contract Documents for the construction of the metal pole foundation. Metal pole foundations shall be round. Pedestal pole foundations shall be round or square. Construct forms for the upper 610 millimeters (2 feet) of the metal pole foundation. The minimum dimension for the mounting surface shall be 63.5 millimeters (2½ inches) greater than the pole base or transformer base on all sides. The excavation shall be dry and free of any loose materials before placing PCC. Level and secure all forms to the satisfaction of the Engineer before commencing PCC placement.

Forms shall be wood, metal, or seamless laminated fiber tubes acceptable to the Engineer. Construct forms to be mortar-tight and rigid to prevent distortion due to pressure created by the PCC construction. Do not use aluminum forms.

Supply and install a driven ground rod(s) at the base of each pole as indicated in the Contract Documents before commencing PCC placement. The ground rod shall extend a minimum of 203 millimeters (8 inches) above the finished foundation and a minimum of 2.44 meters (8 feet) beneath the bottom of the foundation. Install the ground rod in accordance with NEC Article 250.

Install and secure all reinforcing steel and conduit in a manner acceptable to the Engineer. Center the bolt circle in the middle of the foundation and set the anchor bolts plumb in the foundation at a projection distance in accordance with the pole manufacturer's instructions. Conduit bends shall be ninety (90) degrees and shall exit the foundation a minimum of 762 millimeters (30 inches) below the level of the surrounding ground. Plug the ends of the conduit before commencing PCC placement. Install pre-formed expansion joint material between the pole foundation and any abutting PCC structure.

Provide all equipment, labor, and tools necessary to perform the work to the satisfaction of the Engineer. The National Ready Mixed Concrete Association shall certify that the production facilities and delivery fleet meet the requirements of Section 3, Certification of Ready Mixed Concrete Production Facilities, of the National Ready Mixed Concrete Association Quality Control Manual. Maintain the production facility to comply with the requirements of such certification. The Engineer reserves the right to verify that the production facility complies with the certification requirements. Only central mixing production facilities are acceptable.

Accomplish concrete placement using buckets, hoppers, buggies, chutes, drop pipes, conveyor belts, and/or other necessary placement equipment acceptable to the Engineer. Use clean equipment having proper capacity and in proper working order. The maximum allowable free-fall drop for PCC material shall be 1.52 meters (5 feet). When desirable, place PCC using clean pumping equipment or conveyors in proper working condition.

Pumping equipment shall use uniformly sized pipes and hoses having a minimum diameter equal to three (3) times the maximum aggregate size. Use conveyor belts that are concave and sized to accommodate the required weight of PCC. Pumping and conveyor equipment shall permit PCC placement at any location within the placement area without significant interruption or delay. Conveyor equipment shall be capable of stopping, holding, and restarting when fully loaded. Locate the pump or conveyor equipment as near as practical to the final PCC destination. Configure pipes and conveyors to minimize bends or turns.

Before commencing PCC placement, verify that all reinforcement and embedded items are properly prepared and free of mud, oils, or other coatings that may affect bonding unless otherwise indicated in the Contract Documents. Remove any loose rust or mill scale present on reinforcing steel. Place reinforcement in the proper position in a manner acceptable to the Engineer. Secure all reinforcement or embedded items, positioned before PCC placement, using supports and ties. Do not walk or stand on positioned reinforcement or embedded items during PCC placement.

Place the PCC continuously in horizontal layers not exceeding 457 millimeters (18 inches). Provide concrete in a manner that provides constant, continuous supply of the PCC mixture. Deliver PCC at a uniform rate compatible with the available labor and equipment that allows placement operations to continue as uninterrupted as possible. Place PCC in a manner that minimizes disturbance to the forms, reinforcement, and underlying materials. Place a sufficient quantity to allow for proper consolidation and strike-off to the required elevation and thickness. Do not allow the PCC to drop more than 1.52 meters (5 feet) from the end of the discharge chute. Use a metal pipe or channel to deliver PCC at depths greater than 1.52 meters (5 feet). Handle the PCC in a manner that minimizes segregation.

Position equipment to allow an unrestricted vertical drop to the point of placement or into the conveyor vehicle. Accomplish PCC placement using the lowest practical slump that allows for proper consolidation. Deposit fresh PCC at or near its final position in the placement. Maintain the slope of chutes and drop chutes to facilitate continuous, controlled, and non-segregated PCC supply. Use chutes or drop chutes having a minimum diameter of 229 millimeters (9 inches). Place PCC in a manner that minimizes lateral movement of the deposited material.

Prime pumping equipment and pre-wet conveyors before commencing placement. Discard materials used to prime pumping equipment before commencing placement operations. Operate pumping and conveyor equipment to supply PCC as continuous as possible. Maintain the slope of conveyors to prevent loss or segregation of the PCC material during conveyance. PCC shall conform to the requirements of the Contract Documents after pumping or conveying. Minimize PCC exposure to ambient conditions during conveying.

During cold weather periods, place PCC only when the ambient air temperature is 1.67 degrees Celsius (35 degrees Fahrenheit) and rising. Cease placement operations when the ambient air temperature falls below 4.44 degrees Celsius (40 degrees Fahrenheit). Do not place PCC on frozen materials.

Use sufficient labor and equipment to permit proper placement, consolidation, and finishing of the PCC. Provide sufficient lighting acceptable to the Engineer for night or low-light placements. Do not place PCC at night without the Engineer's permission. The Contractor is responsible for any damage to the PCC due to weather conditions or other factors.

Add water or admixtures to PCC to increase workability or correct deviations from the requirements of the Contract Documents. Add water to individual loads on-site before commencing discharge. Add admixtures at the plant. Do not add any admixtures on-site without the approval of the Engineer. Do not exceed the maximum allowable water-cement ratio. If the amount of mixing water added at the plant is not available, do not add any water on-site. Mix PCC for a minimum of one (1) minute after adding water on-site at a mixer speed of thirty (30) revolutions per minute or greater. Do not add any water after commencing PCC discharge.

Consolidate the PCC throughout the length of the foundation by inserting and withdrawing a vibrator(s) at a minimum of four (4) locations within the foundation. Do not use vibration to move PCC laterally. Insert and withdraw tube vibrators vertically at close intervals in a systematic pattern. Allow running vibrators to sink into the PCC under their own weight. Do not force vibrators into semi-hardened PCC. Do not drag the vibrator through the PCC. Vibrators shall be internal tube vibrators acceptable to the Engineer. Vibrators shall operate at the manufacturer's recommended frequency and be capable of consolidating the full depth and width of the PCC without causing segregation. Keep a tachometer for measuring vibratory frequency available on the jobsite at all times.

Finish the top of the foundation to be approximately 25.4 millimeters (1 inch) above the adjacent ground or structure unless otherwise indicated in the Contract Documents. Finish the top of the foundation to be equal with the surrounding sidewalk elevation when constructing a foundation within the limits of a sidewalk.

Protect the exposed, finished PCC surface from high or low temperature extremes, low humidity, and drying winds for a minimum of three (3) days. Use protection measures that inhibit moisture loss and maintain the PCC temperature at or above 10 degrees Celsius (50 degrees Fahrenheit) for a minimum of three (3) days unless otherwise directed by Contract Documents or the Engineer. Apply liquid membrane-forming curing compounds at the concentration and application rate recommended by the manufacturer.

Remove forms as soon as practicable after the PCC has hardened without damaging the PCC. Remove any PCC surface irregularities exposed by the removal of the forms by sanding or filling with mortar in a manner acceptable to the Engineer.

Backfill the excavation and restore any areas disturbed by the foundation construction. Backfill the foundation with lean clay or silty clay materials compacted to ninety-five (95) percent of the maximum density determined in accordance with ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

Dress the top of the PCC foundation to provide for proper seating of the pole base. Heavily coat all areas that contact the PCC foundation on all aluminum bases with an aluminum-filled, resilient sealing compound. Install the poles in accordance with the manufacturer's recommendations and the Contract Documents. Position the pole with the hand hole facing away from vehicular traffic wherever possible. Install leveling nuts as directed by the pole manufacturer regardless of the need for adjustment. Install a 25.4 millimeter (1 inch) inside diameter rubber grommet below the mast arm installation location. Plumb pedestal poles using shims supplied by the pole base manufacturer. After plumbing the metal pole, fill any void between the pole base and the pole foundation with grout. Install a 12.7 millimeter (½ inch) conduit in the grout for drainage as directed by the Engineer.

Install a No. 6 AWG stranded green insulated copper conductor attached to the ground rod using an approved clamp and connected to the grounding lug on the pole shaft. Grounding shall be in accordance with the NEC, local ordinances, all applicable codes, and the requirements of the local utility company supplying electrical power. The Engineer shall resolve any discrepancies. Do not connect any grounding connections to a breakaway device. The maximum measurable resistance between the ground rod and a test stake driven 610 millimeters (2 feet) into the ground adjacent to the PCC pole foundation shall not exceed twenty-five (25) ohms. If the resistance exceeds twenty-five (25) ohms, install additional ground rods, greater than 1.83 meters (6 feet) apart and connected using a No. 4 AWG bare copper wire. The number of additional ground rods shall be as needed to produce a measurable resistance of less than twenty-five (25) ohms.

**(C) Wood Pole Installation.**

Install wood poles at locations that do not detract from the general appearance of a line of poles and are acceptable to the Engineer. Dig or bore holes to the lines and depth specified in the Contract Documents for the construction of the wood pole foundation and anchors. Holes shall be round. Minimize the diameter of all holes.

Do not drag treated poles along the ground. Do not handle poles using pole tongs, cant hooks, or other tools that produce indentations greater than 25.4 millimeters (1 inch). Do not apply tools to the section of the pole located 305 millimeters (1 foot) above and 610 millimeters (2 feet) below the foundation surface. Install the wood pole such that the pole is plumb after installation. Install a 203 millimeter (8 inch), three-way (3-way) anchor a minimum of 2.29 meters (7½ feet) into the ground. Attach a 2.13 meter (7 foot) anchor rod to the anchor in accordance with the manufacturer's instructions.

Verify that the wood pole is plumb before backfilling commences. Backfill the excavation and restore any areas disturbed by the wood pole installation. Backfill the foundation with lean clay or silty clay materials compacted to ninety-five (95) percent of the maximum density determined in accordance with ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort. Place backfill materials in uniform horizontal layers not exceeding 203 millimeters (8 inches) loose lift thickness.

Attach the guy wire(s) to pole using a 19 millimeter (¾ inch) thimble eye bolt mounted at an angle approximately equal to the angle of the guy wire(s) to the pole. Attach an insulator approximately 5.49 meters (18 feet) above the pole foundation to the guy wire(s) using preformed wire deadends or strandvises. Install a half-round guy guard on the lower 2.13 meters (7 feet) of the guy wire(s). Attach the guy wire(s) to an anchor rod using a preformed wire deadend or strandvise.

Supply and install a driven ground rod(s) at the base of each pole as indicated in the Contract Documents. The ground rod shall extend a minimum of 203 millimeters (8 inches) above and a minimum of 2.44 meters (8 feet) beneath the surface of the adjacent ground. Install the ground rod in accordance with NEC Article 250. Install a No. 6 AWG stranded copper wire attached to the ground rod using an approved clamp and connected to the splice box on the pole shaft. Use No. 6 AWG green insulated stranded copper wire for conduit installations. Grounding shall be in accordance with the NEC, local ordinances, all applicable codes, and the requirements of the local utility company supplying electrical power. The Engineer shall resolve any discrepancies. Do not connect any grounding connections to a breakaway device. The maximum measurable resistance between the ground rod and a test stake driven 610 millimeters (2 feet) into the ground adjacent to the pole foundation shall not exceed twenty-five (25) ohms. If the resistance exceeds twenty-five (25) ohms, install additional ground rods greater than 1.83 meters (6 feet) apart and connected using a No. 4 AWG bare copper wire. The number of additional ground rods shall be as needed to produce a measurable resistance of less than twenty-five (25) ohms.

**(D) Mast Arm Installation.**

Install mast arms in accordance with the manufacturer's instructions such that the loaded arm has a minimum clearance of 5.18 meters (17 feet) from bottom of all signals to the crown of the roadway. The minimum rise of the end of the loaded arm shall be zero (0) degrees. Install a 25.4 millimeter (1 inch) or greater inside diameter rubber grommet on the bottom of the mast arm near the connection to the pole as indicated in the Contract Documents or as directed by the Engineer. Rake the pole back more than the calculated deflection, load the pole, and plumb the pole by adjusting the leveling nuts.

**(E) Span Wire and Tie Wire Installation.**

Install span wires such that the loaded span wires have a minimum clearance of 6.4 meters (21 feet) above the crown of the roadway and sag of three (3) to five (5) percent of the span length. Bond the span wire to the grounding system. Install tie wire(s) when required by the Contract Documents. Attach tie wire(s) to the pole approximately 203 millimeters (8 inches) below the base of the signal head. Attach the span wire(s) and tie wire(s) to the wood pole using a 19 millimeter (¾ inch) thimbleye bolt mounted perpendicular to the centerline of the pole. Install a 63.5 millimeter (2½ inch) by 184.2 millimeter (7¼ inch) lift plate directly across from the thimbleye bolt in accordance with the manufacturer's instructions using 12.7 millimeter (½ inch) by 101.6 millimeter (4 inch) lag screws. Attach the thimbleye bolt to the lift plate.

**(F) Luminaire Installation.**

If required, remove the pole cap and bolt the luminaire extension to the pole. Attach the luminaire arm in accordance with the Contract Documents and the manufacturer's instructions. Provide and install conductors in the pole shaft and luminaire arm. Hook up the luminaire head. Connect the conductors in the pole shaft to the 3/C street lighting cable as shown on the plans. Connect the 3/C street lighting cable to the proper circuit breaker at the service disconnect pedestal unless otherwise indicated in the Contract Documents or directed by the Engineer.

**901.04 Measurement and Payment.**

The Engineer shall measure installation of furnished materials for payment as single units for each item. When materials are furnished, accept delivery of the specific items furnished at the location outlined in the Contract Documents.

The Engineer shall measure mast arm signal poles for payment by the number of mast arm signal poles supplied and accepted.

The Engineer shall measure combination mast arm signal and lighting poles for payment by the number of combination mast arm signal and lighting poles supplied and accepted.

The Engineer shall measure pedestal pole installation for payment by the number of pedestal poles installed and accepted.

The Engineer shall measure metal poles for payment by the number of metal poles supplied and accepted.

The Engineer shall measure wood poles for payment by the number of wood poles supplied and accepted.

The Engineer shall measure span wire installation for payment by the linear meter of span wire installed between poles and accepted. Do not include sag in the measurement of the span wire.

The Engineer shall measure tie cable installation for payment by the linear meter of tie cable installed between poles and accepted. Do not include sag in the measurement of the tie cable.

The cost of any design, licenses, or permits associated with the work is subsidiary to items for which the Contract provides direct payment. The cost of any foundation design associated with the work is subsidiary to items for which the Contract provides direct payment. The cost of the tree or shrub trimming is subsidiary to items for which the Contract provides direct payment. Loading, hauling, construction of all materials, mounting hardware, additional grounding rods, and all miscellaneous hardware is subsidiary to the installation of the specific item unless otherwise indicated in the Contract Documents. Any costs associated with installing wire/conduit into an existing base/foundation/pad are subsidiary to items for which the Contract provides direct payment. Mast arms and luminaire arms are subsidiary to mast arm signal poles and combination mast arm signal and lighting poles. Costs associated with restoration of the surface are subsidiary to items for which the Contract provides direct payment.

Payment will be made under the following unless otherwise indicated in the Contract Documents. The contract price shall be full compensation for furnishing all labor, materials, equipment, tools, and incidentals necessary to complete the work.

<u>Description</u>	<u>Unit</u>
Mast Arm Signal Pole, Type MP-__	Each
Combination Mast Arm Signal & Lighting Pole, Type CMP-__-__	Each
Install Mast Arm Pole	Each
Pedestal Pole, Type PP-__	Each
Install Pedestal Pole, Type PP-__	Each
__ - meter Wood Pole	Each
Install Wood Pole	Each
Street Light Pole – 1.83 m Luminaire Arm	Each
Street Light Pole – 3.7 m Luminaire Arm	Each
Install __W Street Light Luminaire	Each
Span Wire	Linear Meter
Tie Cable	Linear Meter

## **SECTION 902 – TRUSS STRUCTURES**

### **902.01 Description**

This work includes supplying and construction of steel or aluminum single panel or box truss structures for erecting traffic signals or signs as indicated in the Contract Documents. Steel or aluminum box trusses with single pole or vertical end frames shall span multi-lane roadways and shall include a sign lighting system as required by the Contract Documents.

### **902.02 Material Requirements**

#### **(A) General.**

Truss structures shall be box or single panel trusses designed in accordance with AASHTO Specifications for the Design and Construction of Structural Supports for Highway Signs. The maximum design wind velocity shall be 160.9 kilometers per hour (100 miles per hour) with a one and three-tenths (1.3) gust factor after installation. A Structural Engineer currently licensed to practice in the State of Nebraska shall seal all designs.

Design structures to support the required signal heads, lighting systems, signal and lighting cables, signage, other required items, and 14.9 kilograms of ice per linear meter (10 pounds per linear foot) per tube for the location and span indicated in the Contract Documents. Use the area of the signs shown plus thirty (30) percent or as noted on the Contract Documents for design calculations. Once selected, use the same design patterns, materials, and basic member shape throughout the project unless otherwise indicated in the Contract Documents. Design truss structures to be supported by single poles or end frames having no more than two (2) vertical main members of a closed cross section.

When indicated in the Contract Documents, truss structures intended to support signs only shall include lighting and a walkway. Design the walkway to be continuous over the roadway and shoulder on and in front of the lower chord. Design railing along the front side that folds down when not in use. No part of the walkway or railing in the folded position shall obstruct normal viewing of the sign(s).

Fabricate truss structures in a plant owned and operated by a fabricator having sufficient experience to manufacture the structures in accordance with the Contract Documents. Provide the name and address of the fabricator and evidence of the fabricator's qualifications and experience upon request by the Engineer. Aluminum or steel galvanize truss structure after fabrication unless otherwise indicated in the Contract Documents or directed by the Engineer.

#### **(B) Extruded Tubes.**

Extruded tubes for chord and column members shall be of Aluminum-alloy 60610-T6 and shall conform to the requirements of ASTM B221, Standard Specification for Aluminum-alloy Extruded Bars, Rods, Shapes, and Tubes. Extruded tubes for bracing members shall conform to the requirements of Aluminum-alloy 6063-T6, or ASTM B429 Standard Specification for Aluminum-alloy Extruded Structural Pipe and Tube.

#### **(C) Extruded Shapes.**

Extruded shapes shall be of Aluminum-alloy 6061-T6 and shall conform to the requirements of ASTM B221, Standard Specification for Aluminum-alloy Extruded Bars, Rods, Shapes, and Tubes; or ASTM B308, Standard Specification for Aluminum-alloy Standard Structural Shapes Rolled or Extruded.

#### **(D) Aluminum Plates.**

Plates shall be of Aluminum-alloy 6061-T6 and shall conform to the requirements of ASTM B209, Standard Specification for Aluminum and Aluminum-alloy Sheet and Plate.

#### **(E) Aluminum Castings.**

Castings for post bases and chord flanges shall be Alloy SG70A-T6 or Alloy SG70B-T61 and shall conform to the requirements of ASTM B26, Standard Specification for Aluminum-alloy Sand Castings; or ASTM B108, Standard Specification for Aluminum-alloy Permanent Mold Castings.

#### **(F) Aluminum Gratings.**

Material for grating shall be Aluminum-alloy 6061-T6 for bearing bars and Alloy 6063-T5 for cross or crimp bars and shall conform to the requirements of ASTM B211, Standard Specification for Aluminum and Aluminum-alloy Bars, Rods and Wire; or ASTM B221, Standard Specification for Aluminum-alloy Extruded Bars, Rods Shapes and Tubes.

**(G) Pipe Handrails.**

Pipe handrails shall be of Aluminum-alloy 6061-T6 or Alloy 6063-T6 and shall conform to the requirements of ASTM B221, Standard Specification for Aluminum-alloy Extruded Bars, Rods, Shapes and Tubes; or ASTM B241 Standard Specification for Aluminum and Aluminum-alloy Seamless Pipe and Seamless Extruded Tube.

**(H) Post and Chord Caps.**

Post and chord caps shall be Alloy SG70A-F as defined by ASTM B26, Standard Specification for Aluminum-alloy Sand Castings.

**(I) Hardware.**

Anchor bolts, flange bolts, and nuts shall conform to the requirements of ASTM A307, Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners. All other hardware shall be of good commercial quality. Galvanizing as required on plans shall be in accordance with ASTM A153, Standard Specification for Zinc Coating on Iron and Steel Hardware.

**(J) Welding Materials and Welded Materials.**

Welding materials and Welded materials shall conform to the requirements of AWS D2.0, Specifications for Welded Highway and Railway Bridges

**(K) Structural Steel.**

Structural steel shall be Grade D or E as defined by ASTM A588, Standard Specification for High-Strength Low-Alloy Structural Steel with 3523 kilograms per square centimeter (50 ksi) Minimum Yield Point to 101.6 millimeters (4 inch) Thick. Perform weldability tests on plates as defined by AWS D2.0, Specifications for Welded Highway and Railway Bridges. Submit proof of weldability to the Engineer before obtaining the structural steel. Use electrodes E 7016, E 7018, or E 7028. Do not stress-relieve test specimens.

**(L) Sealing Compound.**

Aluminum-filled, resilient sealing compound shall be Minnesota Mining and Manufacturing Company (3M) Sealant Number 1168 or approved equal.

**(M) Copper Grounding Wire, Grounding Rods, and Test Stakes.**

Copper grounding wire shall be No. 6 AWG stranded copper wire as defined by ASTM B3, Standard Specification for Soft or Annealed Copper Wire. Copper grounding wire installed in conduit shall be No. 6 AWG green insulated stranded copper wire as defined by ASTM B3, Standard Specification for Soft or Annealed Copper Wire. Grounding rods and test stakes shall comply with IMSA Specification Number 62-1956 excluding length and diameter requirements. Ground rods and test stakes shall have a minimum diameter of 15.875 millimeters ( $\frac{5}{8}$  inch). Supply ground rods and test stakes with a ground rod clamp.

**(N) Conduit and Conduit Fittings.**

Conduit and conduit fittings for direct bury applications shall be galvanized rigid steel conforming to UL-6, UL Standard for Safety for Electrical Rigid Metal Conduit – Steel; high-density polyethylene conforming to ASTM F2160, Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); or rigid polyvinyl chloride conforming to UL-651, UL Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit. Conduit and conduit fittings for boring applications shall be high density polyethylene conforming to ASTM D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter. Furnish in standard lengths with UL label. Rigid steel conduit fittings shall be galvanized steel or galvanized malleable iron. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. PVC conduit fittings and cement shall be compatible with the PVC conduit. Transitions between HDPE and PVC conduits shall conform to the manufacturer's recommendations. Conduit size shall be the minimum trade size permitted for the application. Conduit installed for above ground risers shall be galvanized rigid steel conduit.

**(O) Portland Cement.**

Portland cement shall conform to the requirements for Cement Type I or Cement Type II as defined by ASTM C150, Specification for Portland Cement including Table 1, Table 2 (Maximum Equivalent Alkalies requirements only), and Table 3.

**(P) Water.**

All water used in PCC shall meet the requirements of AASHTO T26, Quality of Water to be used in Concrete. Obtain such water from a source approved by the Engineer.

**(Q) Aggregate.**

Coarse aggregate shall conform to all requirements for Size D57, Class 4S aggregate as defined by ASTM C33, Specification for Concrete Aggregates. Coarse aggregate shall consist of a minimum of seventy-five (75) percent by weight of limestone, quartzite, dolomite, or crushed gravel materials. Fine aggregate shall conform to all requirements for fine aggregate as defined by ASTM C33, Specification for Concrete.

**(R) Admixtures.**

Admixtures shall conform to the requirements of ASTM C494, Standard Specification for Chemical Admixtures for Concrete; ASTM C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete; or ASTM C260, Standard Specification of Air-Entraining Admixtures for Concrete. Dosages shall be as directed by the manufacturer.

Calcium chloride shall meet the requirements of ASTM D98, Specifications for Calcium Chloride. The maximum amount of calcium chloride added shall not exceed two (2) percent by weight of the total amount of cement in the mixture. Do not use calcium chloride without prior written approval by the Engineer. Add calcium chloride on the project site in a manner acceptable to the Engineer. Mix calcium chloride in a minimal amount of water before adding to the PCC. Mix the calcium chloride solution with the concrete for a minimum of thirty (30) revolutions before commencing placement of the PCC.

Do not use any admixtures that retard the initial set of the PCC without prior approval by the Engineer. Add water-reducing admixtures at the mixer separately from air-entraining admixtures in accordance with the manufacturer's printed instructions. The air entrainment agent and the water-reducing admixture shall be compatible.

**(S) PCC Mix Proportioning.**

Proportion PCC mixtures to meet the requirements of Table 902.02.

**Table 902.02**  
**PCC Properties**  
**Metric Units**

Mix Type	L6
Portland Cement Content, kgs. per cubic meter	335
Coarse Aggregate, % of Total Aggregate	30±3
Fine Aggregate, % of Total Aggregate	70±3
Maximum Water Cement Ratio	0.45
Minimum 28-Day Compressive Strength, kg per square centimeter	247
Air Content, %	6.5±1.0
Slump, millimeters	101.6-mm Max.
Concrete Temperature during placement, °C	21.1±3.89

**English Units**

Mix Type	L6
Portland Cement Content, lbs. per cubic yard	564
Coarse Aggregate, % of Total Aggregate	30±3
Fine Aggregate, % of Total Aggregate	70±3
Maximum Water Cement Ratio	0.45
Minimum 28-Day Compressive Strength, psi	3500
Air Content, %	6.5±1.0
Slump, inches	4-inch Max.
Concrete Temperature during placement, °F	70±25

**Referenced Test Procedures.**

- ASTM C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C173, Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- ASTM C143, Test Method for Slump of Hydraulic Cement Concrete
- ASTM C1064, Test Method for Temperature of Freshly Mixed Portland Cement Concrete

**(T) Reinforcing Steel.**

Reinforcing steel shall be deformed steel bars conforming to the requirements of ASTM A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; or ASTM A996, Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement. Do not use Grade 50 or Grade 60 rail steel bars for tie bars that are bent or straightened during construction. For construction requiring bent

bars, use Grade 40 tie bars meeting the requirements of ASTM A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

**(U) Pre-molded Joint Filler.**

Pre-molded joint filler for expansion joints shall conform to the requirements of ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types). Neatly punch holes to admit the dowels where indicated in the Contract Documents. The diameter of the holes shall not exceed 12.7 millimeter (½ inch) greater than the bar diameter. When more than one piece is required for a joint, securely fasten the abutting ends by stapling or other positive fastening means satisfactory to the Engineer.

**(V) Curing Materials.**

Curing materials shall be membrane-forming compounds or polyethylene film. Liquid, membrane-forming compounds for curing PCC shall conform to the requirements for Type 1, 1-D, or 2, Class B as defined by ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete. Polyethylene film for curing PCC shall conform to the requirements of ASTM C171, Standard Specification for Sheet Materials for Curing Concrete

**902.03 Construction Requirements.**

**(A) General.**

Before ordering materials and within fifteen (15) calendar days after the award date, submit the information required by Table 902.03 for all materials. The Contractor is liable for any materials purchased before receiving written approval from the Engineer. Use new, unused, and in first class condition materials for the construction of the traffic signal system unless specifically stated otherwise in the Contract Documents. At the time of each submittal, identify in writing any deviations that the shop drawings or samples may have from the requirements of the Contract Documents.

**Table 902.03**  
**Materials Information Requirements**

Item	Required Information
Truss Structure	Stamped Working Drawing, Certificate of Compliance, Mill Test*, Design Calculations
Extruded Tubes and Shapes	Manufacturer's Model or Catalog Number, Working Drawing*, Certificate of Compliance, Mill Test**, Design Calculation**
Aluminum Plates	Manufacturer's Model or Catalog Number, Certificate of Compliance, Mill Test**, Design Calculation**
Aluminum Castings	Manufacturer's Model or Catalog Number, Working Drawing*, Certificate of Compliance, Mill Test**, Design Calculation**
Aluminum Grating	Manufacturer's Model or Catalog Number, Certificate of Compliance
Pipe Handrails	Manufacturer's Model or Catalog Number
Hardware	Manufacturer's Model or Catalog Number
Cantilever Sign Supports	Manufacturer's Model or Catalog Number
Steel Sign Brackets	Manufacturer's Model or Catalog Number
Welding Electrodes	Manufacturer's Model or Catalog Number
Conduit	Manufacturer's Model or Catalog Number

\* As required by the Engineer

\*\* May substitute catalog number or model number for shop drawing as permitted by the Engineer

Before ordering structural components, locate overhead or underground utilities to verify that they do not interfere with the work outlined in the Contract Documents. Order all structural components and related materials necessary to complete the work no later than ten (10) calendar days after receiving approval of the submitted materials information. Submit proof of the orders and estimated delivery time to the Engineer within fifteen (15) calendar days after receiving approval of the submitted materials information. Identify any materials already in possession. Do not substitute items without written permission from the Engineer. Do not construe Engineer's acceptance of a submittal as relieving the Contractor of the responsibility to comply with the Contract Documents.

Obtain all licenses and permits before commencing the work.

A competent worker experienced in the required work shall perform all work under the supervision of a licensed journeyman electrician or lineman. A qualified journeyman electrician or lineman shall directly supervise any work involving the installation of cable, foundations, structural steel, and traffic control equipment. Installations shall comply with all applicable sections of the National Electrical Code, National Electrical Safety Code, Manual on

Uniform Traffic Control Devices, AWS specifications, all governing local ordinances and regulations, and the Contract Documents. The Engineer shall resolve any conflicts.

Inform the Engineer of the work scheduled each day. Schedule work to minimize the time any signal is inoperable. During this time, provide, place, and maintain temporary traffic control devices. Maintain a minimum of two (2) lanes of traffic on one-way streets and one (1) lane of traffic in each direction on two-way streets open to traffic during the work. Open all lanes to traffic during peak hours as directed by the Engineer or Contract Documents. Maintain traffic through open intersections at all times.

Coordinate work with all other phases of the project to minimize conflict between combined operations. Schedule work and materials deliveries to meet the project schedule. Provide the utility company supplying the electrical service adequate notice regarding the scope and nature of the power requirement. Arrange for all necessary electrical services at locations indicated in the Contract Documents. The utility company or Engineer may alter the service location in the field to adapt to certain field requirements. Cooperate with the utility company providing electrical service in locating the service lines and conduit bends.

Trim trees or shrubs using proper tree surgery practices to trim tree branches as necessary to install the poles, mast arms, span wires, or pole. Use an asphaltum-based paint manufactured for tree surgery to treat the cut or scarred branches.

Do not disconnect or damage an operational communication cable while performing work around traffic signal systems without written permission from the Engineer. Reconnect, repair, or establish a temporary connection within eight (8) hours of disconnecting or damaging a communication cable.

Size conduit bends installed in existing foundations to be equivalent to the connecting conduit in the ground. Do not cut or damage the reinforcing steel or anchor bolts in the foundation. Install the conduit a minimum depth of 305 millimeters (12 inches) below the top of the foundation or 762 millimeters (30 inches) below the depth of the surrounding ground surface, whichever is greater. Remove a sufficient amount of concrete to place the conduit inside the anchor bolts of the foundation. Position the conduit and place concrete or grout. Finish to match the existing foundation.

Replace or restore in kind equal to or exceeding any surface materials disturbed by trenching, excavating, or backfilling operations. Accomplish restoration in accordance with the Contract Documents. Dispose of all excess materials as directed by the Engineer.

Transfer any guarantees or warranties on materials purchased to the City upon acceptance of the work. Purchase materials with transferable guarantees or warranties.

**(B) Material Handling.**

Use handling techniques that avoid scarring or marring the galvanized surface. The Engineer reserves the right to reject any such damage that, in the judgment of the Engineer, results in an objectionable appearance or a weakened structure. Remove all irregularities from cast parts. Tubing shall be seamless and exterior and interior surfaces shall be clean, smooth, and free from slivers, lamination, grooves, cracks, or other defects. The Engineer reserve the right to reject any work containing poor welding workmanship, as noted by visual or other inspection.

**(C) Fabrication of Structures.**

Fabrication of structures shall conform to AWS recommendations and the following specific requirements. The Engineer shall resolve any conflicts.

- Do not flame cut aluminum-alloy materials.
- Shear, saw, or mill material having a thickness less than or equal to 12.7 millimeters ( $\frac{1}{2}$  inch).
- Saw or mill material having a thickness greater than 12.7 millimeters ( $\frac{1}{2}$  inch). Sawed or milled edges shall be true and free of burrs or ragged breaks.
- Heating materials to a temperature exceeding 204.4 degrees Celsius (400 degrees Fahrenheit) is acceptable for a period not exceeding fifteen (15) minutes to facilitate bending.
- Bolt holes shall be drilled full size, or sub-punched 3.175 millimeters ( $\frac{1}{8}$  inch) smaller than the nominal diameter of the fastener and reamed to size. Unless otherwise indicated on the plans, the finished diameter of the holes shall be not more than seven (7) percent greater than the nominal diameter of the fastener.
- The length of the vertical end frames for structures shall be field checked before fabrication.

**(D) Aluminum Welding.**

Pre-qualify all proposed joint welding procedures using tests prescribed in Part B, Section IV, of the ASME Boiler and Pressure Vessel Code. The Engineer reserves the right to accept evidence of previous qualifications of the proposed joint welding procedures.

Pre-qualify all welders or welding operators engaged in the work using tests prescribed in Part V, Section IX, of the ASME Boiler and Pressure Vessel Code. The Engineer reserves the right to accept evidence of previous qualification of the welders or welding operators. Use the same processes and type of equipment required for the work when pre-qualifying welders or welding operators.

Accomplish welding in accordance with AWS D2.0, Specifications for Welded Highway and Railway Bridges. Joint details shall be in accordance with design requirements and detail drawings. Do not alter the joint locations without written approval from the Engineer. Prepare the joint edges by sawing, machining, clipping, shearing, or gas tungsten-arc or gas metal-arc cutting. Cut surfaces shall meet the American Standards Association surface roughness rating value of one thousand (1,000). Oxygen fins, tears, and other defects which would adversely affect the quality of the weld will not be permitted. Remove dirt, grease, forming or machining lubricants, or any organic materials from the welding areas by cleaning with a suitable solvent or by vapor degreasing.

Remove the oxide on all welding edges and surfaces immediately before welding using mechanical methods such as stainless steel wire brushing, rubbing with steel wool or abrasive cloth, scraping, filing, rotary planing, or sanding. For aluminum applications, do not use wire brushes previously used on materials other than aluminum. When mechanical methods of oxide removal on aluminum materials are unsuccessful, accomplish removal of aluminum oxide using a chemical treatment detailed in Table 69.32 of the AWS and Aluminum Association Welding Aluminum Pamphlet. Perform welding within twenty-four (24) hours after chemical treatment. Use a chemical oxide remover on all welded edges and surfaces before using gas tungsten-arc welding with direct current, straight polarity. Do not weld anodically treated aluminum without removing the anodic coating from the welded joint area.

Chip or machine out the initial weld root on all butt welds requiring one hundred (100) percent penetration, except those constructed using backing, before starting welding from the second side. Thoroughly fuse the backing to the weld metal on all butt welds constructed using backing. Where accessible, backing for welds that are subject to computed stress or which are exposed to view on the completed structure and which are not otherwise parts of the structure shall be removed and the joints ground or machined smooth. In tubular members, construct butt welds subject to computed stresses using permanent backing rings or strips. Use the same procedure for production welding of any particular joint as was used in the procedure qualification for that joint.

Prepare a sample joint and macro-etched cross section of the weld when the welded joint requires a specific root penetration to demonstrate that the proposed joint welding procedure will achieve the required root penetration. The minimum length of the sample joint shall be 305 millimeters (1 foot). Weld the sample joint using the electrode, polarity, amperage, voltage, speed, gas mixture, and gas flow rate proposed for production welding. The allowable variation of amperage and voltage shall be ten (10) percent for amperage and minus seven (7) percent for voltage during fabrication. The Engineer reserves the right to accept evidence on record in lieu of providing a sample weld.

Limit undercutting depths to less than or equal to 0.254 millimeters (0.01 inch) when the undercutting direction is transverse to the primary stress in the undercut part. Limit undercutting depths to less than or equal to 0.794 millimeters ( $\frac{1}{32}$  inch) when the undercutting direction is parallel to the primary stress in the undercut part. Do not overlap welds. Fill all craters to the full cross section of the welds.

Protect all shop or field welding operations from air currents or drafts to prevent any loss of gas shielding during welding. Provide adequate gas shielding to protect the molten metal during solidification. Position the work for flat position welding whenever practicable. Weld only dry joints. Use a suitable electrode size, voltage, amperage, welding speed, gas, or gas mixture, and gas flow rate for the material thickness, joint design, welding position, and other circumstances affecting the work. Gas metal-arc welding shall be done with direct current, reverse polarity. Gas tungsten-arc welding shall be done with alternating current or with direct current straight polarity.

Where preheat is needed, the temperature of preheat shall not exceed 176.67 degrees Celsius (350 degrees Fahrenheit) for heat-treated alloys and 315.56 degrees Celsius (600 degrees Fahrenheit) for non-heat-treated alloys. Measure the temperature of the preheat using temperature-indicating crayons or pyrometric equipment. Do not hold heat-treated alloys at the maximum preheat temperature or at temperatures near the maximum for more than thirty (30) minutes.

The Engineer reserves the right to inspect the weld by any standard method. Cracks in welds or adjacent base metal and copper inclusions are unacceptable. Limit porosity to the maximum limit specified in Appendix IV, Section

VIII of the ASME Boiler and Pressure Vessel Code. The Engineer may accept small and well-dispersed occurrences of lack of fusion, incomplete penetration, or tungsten or oxide inclusions only at the discretion of the Engineer.

For truss structures, use the dye penetrant test method on the following welds:

- Butt welds in columns and main chord members
- Fillet welds connecting column to bases and main chord members, including the associated flanges, gussets, or main load carrying brackets or members
- Fillet welds connecting flanges to the main truss chord members.

Perform dye penetrant tests in accordance using Method B, Procedure B-2 or B-3 as defined by ASTM E165, Standard Methods for Liquid Penetrant Inspection, in the presence of the Engineer and at no additional cost to the project.

Repair defective welds in a manner acceptable to the Engineer. Remove cracks in welds or the base metal throughout the entire length and depth and reconstruct the weld. Remove sections of the weld demonstrating excessive porosity, lack of fusion, or copper or tungsten inclusions and reconstruct the weld. Clean the weld and deposit additional weld metal when an excessive concavity of crater, undercut, or undersized weld occurs. Reduce overlapping by removing the excess weld metal. Remove defective areas by chipping or machining. Do not use oxygen-cutting. Inspect the chipped or machined area to verify that the entire defective weld has been removed before reconstructing the weld. Remove any traces of dye penetrant using solvent, water, heat, or other means acceptable to the Engineer before welding.

**(E) Steel Welding.**

Pre-qualify all proposed joint welding procedures. Submit the joint description or preparation, welding process, preheat and other heating requirements, welding position, amperage, voltage, polarity, welding speed, wire and flux or electrode type, type of welder, and any other related information to the Engineer for pre-qualification. Pre-qualification does not waive any requirements for producing welds that conform to the Contract Documents.

All welders, operators, and tackers shall be competent, properly trained, experienced, and capable of producing reliable welds. Certify all welders, welding operators, and tackers engaged in the work in accordance with AWS D2.0, Specifications for Welded Highway and Railway Bridges. Submit a certificate for each welder, operator, or tacker. The certificate shall state the following:

- Name of the welder, operator, or tacker
- Name and title of the individual issuing the certification
- Arc welding process, the welding position
- Qualification positions
- Groove or fillet weld
- Limited or unlimited plate thickness
- AWS electrode and flux or electrode classification
- Date and results of the test
- Evidence that the welder, operator or tacker has repeatedly performed satisfactory welding using the required process within three (3) months of starting the work
- Any other pertinent information

A private laboratory or state highway department recognized and accepted by the Engineer shall perform all testing. Perform testing on the weld metal deposited by each automatic welding machine in accordance with the procedure qualification for fillet weld soundness, AWS D2.0, Specifications for Welded Highway and Railway Bridges. Notify the Engineer of the time and location of the testing a minimum of forty-eight (48) hours before commencing testing. The Engineer reserves the right to observe the qualification testing. The Engineer reserves the right to accept evidence of previous qualification of the welders, welding operators, or tackers.

Accomplish welding by the shielded metal-arc, submerged arc, gas metal-arc, or flux cored arc process. All welding shall conform to the requirements set forth in AWS D2.0, Specifications for Welded Highway and Railway Bridges.

The minimum preheat and interpass temperature shall be 10 degrees Celsius (50 degrees Fahrenheit) for all steels with a maximum thickness of 19 millimeters ( $\frac{3}{4}$  inch) and welded using low hydrogen electrodes, or with submerged arc, gas metal arc, or flux cored arc welding.

Welding of steel to remedy other than minor defects shall be permitted only with the written approval of the Engineer.

**(F) Foundation Construction.**

Construct reinforced PCC foundations to the sizes and dimensions indicated in the Contract Documents. Dig or bore holes to the lines and depth specified in the Contract Documents for the construction of the foundation. Construct forms for the upper 610 millimeters (2 feet) of the metal pole foundation. The excavation shall be dry and free of any loose materials before placing PCC. Level and secure all forms to the satisfaction of the Engineer before commencing PCC placement.

Forms shall be wood, metal, or seamless laminated fiber tubes acceptable to the Engineer. Construct forms to be mortar-tight and rigid to prevent distortion due to pressure created by PCC construction. Do not use aluminum forms.

Supply and install a driven ground rod(s) with each foundation as indicated in the Contract Documents before commencing PCC placement. The ground rod shall extend a minimum of 203 millimeters (8 inches) above the finished foundation and a minimum of 2.44 meters (8 feet) beneath the bottom of the foundation. Install the ground rod in accordance with NEC Article 250.

Install and secure all reinforcing steel and conduit in a manner acceptable to the Engineer. Conduit bends shall be ninety (90) degrees and shall exit the foundation a minimum of 762 millimeters (30 inches) below the level of the surrounding ground. Plug the ends of the conduit before commencing PCC placement. Install pre-formed expansion joint material between the pole foundation and any abutting PCC structure.

Provide all equipment, labor, and tools necessary to perform the work to the satisfaction of the Engineer. The National Ready Mixed Concrete Association shall certify that the production facilities and delivery fleet meet the requirements of Section 3, Certification of Ready Mixed Concrete Production Facilities, of the National Ready Mixed Concrete Association Quality Control Manual. Maintain the production facility to comply with the requirements of such certification. The Engineer reserves the right to verify that the production facility complies with the certification requirements. Only central mixing production facilities are acceptable.

Accomplish concrete placement using buckets, hoppers, buggies, chutes, drop pipes, conveyor belts, and/or other necessary placement equipment acceptable to the Engineer. Use clean equipment having proper capacity and in proper working order. The maximum allowable free-fall drop for PCC material shall be 1.52 meters (5 feet). When desirable, place PCC using clean pumping equipment or conveyors in proper working condition.

Pumping equipment shall use uniformly sized pipes and hoses having a minimum diameter equal to three (3) times the maximum aggregate size. Use conveyor belts that are concave and sized to accommodate the required weight of PCC. Pumping and conveyor equipment shall permit PCC placement at any location within the placement area without significant interruption or delay. Conveyor equipment shall be capable of stopping, holding, and restarting when fully loaded. Locate the pump or conveyor equipment as near as practical to the final PCC destination. Configure pipes and conveyors to minimize bends or turns.

Before commencing PCC placement, verify that all reinforcement and embedded items are properly prepared and free of mud, oils, or other coatings that may affect bonding unless otherwise indicated in the Contract Documents. Remove any loose rust or mill scale present on reinforcing steel. Place reinforcement in the proper position in a manner acceptable to the Engineer. Secure all reinforcement or embedded items, positioned before PCC placement, using supports and ties. Do not walk or stand on positioned reinforcement or embedded items during PCC placement.

Place the PCC continuously in horizontal layers not exceeding 457 millimeters (18 inches). Provide concrete in a manner that provides constant, continuous supply of the PCC mixture. Deliver PCC at a uniform rate compatible with the available labor and equipment that allows placement operations to continue as uninterrupted as possible. Place PCC in a manner that minimizes disturbance to the forms, reinforcement, and underlying materials. Place a sufficient quantity to allow for proper consolidation and strike-off to the required elevation and thickness. Do not allow the PCC to drop more than 1.52 meters (5 feet) from the end of the discharge chute. Use a metal pipe or channel to deliver PCC at depths greater than 1.52 meters (5 feet). Handle the PCC in a manner that minimizes segregation.

Position equipment to allow an unrestricted vertical drop to the point of placement or into the conveyor vehicle. Accomplish PCC placement using the lowest practical slump that allows for proper consolidation. Deposit fresh PCC at or near its final position in the placement. Maintain the slope of chutes and drop chutes to facilitate

continuous, controlled, and non-segregated PCC supply. Use chutes or drop chutes having a minimum diameter of 229 millimeters (9 inches). Place PCC in a manner that minimizes lateral movement of the deposited material.

Prime pumping equipment and pre-wet conveyors before commencing placement. Discard materials used to prime pumping equipment before commencing placement operations. Operate pumping and conveyor equipment to supply PCC as continuous as possible. Maintain the slope of conveyors to prevent loss or segregation of the PCC material during conveyance. PCC shall conform to the requirements of the Contract Documents after pumping or conveying. Minimize PCC exposure to ambient conditions during conveying.

During cold weather periods, place PCC only when the ambient air temperature is 1.67 degrees Celsius (35 degrees Fahrenheit) and rising. Cease placement operations when the ambient air temperature falls below 4.44 degrees Celsius (40 degrees Fahrenheit). Do not place PCC on frozen materials.

Use sufficient labor and equipment to permit proper placement, consolidation, and finishing of the PCC. Provide sufficient lighting acceptable to the Engineer for night or low-light placements. Do not place PCC at night without the Engineer's permission. The Contractor is responsible for any damage to the PCC due to weather conditions or other factors.

Add water or admixtures to PCC to increase workability or correct deviations from the requirements of the Contract Documents. Add water to individual loads on-site before commencing discharge. Add admixtures at the plant. Do not add any admixtures on-site without the approval of the Engineer. Do not exceed the maximum allowable water-cement ratio. If the amount of mixing water added at the plant is not available, do not add any water on-site. Mix PCC for a minimum of one (1) minute after adding water on-site at a mixer speed of thirty (30) revolutions per minute or greater. Do not add any water after commencing PCC discharge.

Consolidate the PCC throughout the length of the foundation by inserting and withdrawing a vibrator(s) at a minimum of four (4) locations within the foundation. Do not use vibration to move PCC laterally. Insert and withdraw tube vibrators vertically at close intervals in a systematic pattern. Allow running vibrators to sink into the PCC under their own weight. Do not force vibrators into semi-hardened PCC. Do not drag the vibrator through the PCC. Vibrators shall be internal tube vibrators acceptable to the Engineer. Vibrators shall operate at the manufacturer's recommended frequency and be capable of consolidating the full depth and width of the PCC without causing segregation. Keep a tachometer for measuring vibratory frequency available on the jobsite at all times.

Finish the top of the foundation to be approximately 25.4 millimeters (1 inch) above the adjacent ground or structure unless otherwise indicated in the Contract Documents. Finish the top of the foundation to be equal with the surrounding sidewalk elevation when constructing a foundation within the limits of a sidewalk.

Protect the exposed, finished PCC surface from high or low temperature extremes, low humidity, and drying winds for a minimum of three (3) days. Use protection measures that inhibit moisture loss and maintain the PCC temperature at or above 10 degrees Celsius (50 degrees Fahrenheit) for a minimum of three (3) days unless otherwise directed by Contract Documents or the Engineer. Apply liquid membrane-forming curing compounds at the concentration and application rate recommended by the manufacturer.

Remove forms as soon as practicable after the PCC has hardened without damaging the PCC. Remove any PCC surface irregularities exposed by the removal of the forms by sanding or filling with mortar in a manner acceptable to the Engineer.

Backfill the excavation and restore any areas disturbed by the foundation construction. Backfill the foundation with lean clay or silty clay materials compacted to ninety-five (95) percent of the maximum density determined in accordance with ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

**(G) Structure Installation.**

Dress the PCC foundation to provide for proper seating of the bases before the erection of the vertical end frames. For aluminum structures, use an aluminum-filled, resilient sealing compound that completely covers all areas of aluminum that may contact the concrete. Do not erect the end frames more than twenty-four (24) hours in advance of installing the truss. Erect the end frames and plumb using leveling nuts. Securely tighten the top nuts to the base plate. Install the end frames in a manner that allows placement of approximately 38.1 millimeters (1½ inches) of grout under the base plate.

Assemble the truss sections in the field. Adjust the truss sections using shims to provide the camber required by the Contract Documents. Install the truss on the end frames as a single piece.

Place grout between the vertical end frame base plates and the PCC foundation after completing erection of the structure. The grouting material shall be a non-shrinking grout comprised of a mixture of cement, sand, and a non-shrinking, non-ferrous additive. Rod the grout into place to eliminate voids. Do not place the grout until completion of the truss installation in its final position.

Install a No. 6 AWG stranded green insulated copper conductor attached to the ground rod using an approved clamp and connected to the grounding lug on the vertical end frame when required by the Contract Documents. Ground the structure in accordance with the NEC, local ordinances, all applicable codes, and the requirements of the local utility company supplying electrical power. The Engineer shall resolve any discrepancies. The maximum measurable resistance between the ground rod and a test stake driven 610 millimeters (2 feet) into the ground adjacent to the PCC foundation shall not exceed twenty-five (25) ohms. If the resistance exceeds twenty-five (25) ohms, install additional ground rods greater than 1.83 meters (6 feet) apart and connected using a No. 4 AWG bare copper wire. The number of additional ground rods shall be as needed to produce a measurable resistance of less than twenty-five (25) ohms.

#### 902.04 Method of Measurement and Basis of Payment

The Engineer shall measure truss structures for payment as a single unit furnished, installed, and accepted.

The cost of any design, licenses, or permits associated with the work is subsidiary to items for which the Contract provides direct payment. The cost of any foundation design associated with the work is subsidiary to items for which the Contract provides direct payment. The cost of the tree or shrub trimming is subsidiary to items for which the Contract provides direct payment. Loading, hauling, construction of all materials, mounting hardware and sign brackets, junction boxes, additional grounding rods, horizontal and vertical wiring for the structure, and all miscellaneous hardware is subsidiary to the installation of the specific item unless otherwise indicated in the Contract Documents. Any costs associated with installing wire/conduit into an existing base/foundation/pad, joint welding procedure pre-qualification, or welders, welding operators, or tackers certification are subsidiary to items for which the Contract provides direct payment. Costs associated with surface restoration are subsidiary to items for which the Contract provides direct payment. Replace any damaged signs at no additional cost to the project.

Payment will be made under the following unless otherwise indicated in the Contract Documents. This contract price shall include furnishing, fabricating, welding, delivery and erection of the box truss, center mount supports, cantilever sign supports or sign brackets attached to an existing bridge, PCC foundations, reinforcing steel, anchor bolts, electrical conduit, concrete, PCC forms, PCC placement and curing, grout and grouting, vertical end frames, catwalks and handrails, aluminum beams for vertical sign supports, hardware for attaching beams to the box trusses, for all welder qualifications testing connected with the work; for furnishing and installing the sign illumination system; for convenience outlet and other electrical equipment; for all equipment, materials, tools, labor and incidentals necessary to complete the work; but this shall not include the material and labor required for the laying of the closed conduit electrical system feeding the system.

<u>Description</u>	<u>Unit</u>
Signal Structure, ( <i>location</i> )	Each

**PROPOSAL GUARANTY  
(S1-38-0801)**

As an evidence of good faith in submitting a proposal for this work or for any portion thereof as provided in the proposal form, the bidder must file with his proposal a bid bond, which must be executed on the Department of Roads' Bid Bond form, in the amount of 5 percent of the amount bid for any group of items or collection of groups for which the bid is submitted. Any alterations, conditions or limitations added to the Department of Roads' Bid Bond form will be unacceptable and cause the bid not to be opened and read.

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and EACNH-6-7(168), and BH-5164(1)

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