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100-C-147 PAYMENT OF PREDETERMINED MINIMUM WAGE DETERMINATION
(DAVIS-BACON ACT)
General Decision Number IN100006

(Revised 03-16-10)

General Decision Number IN100006 shall apply to this contract.

The above referenced wage determination is available at the Department's Contract Administration Division website location: <http://www.in.gov/dot/div/contracts/letting/index.html>.

The modification number and publication date for the General Decision effective for the bid opening is posted on the Contract Administration website ten days prior to the bid opening. The bidder shall enter the appropriate modification number, General Decision Number, and publication date in the proposal form.

100-C-151a FHWA-1273

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

(Revised 03-10-94)

- I. General.....
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Payment of Predetermined Minimum Wage
- V. Statements and Payrolls.....
- VI. Record of Materials, Supplies, and Labor.....
- VII. Subletting or Assigning the Contract
- VIII. Safety: Accident Prevention.....
- IX. False Statements Concerning Highway Projects.....
- X. Implementation of Clean Air Act and Federal Water Pollution Control Act.....
- XI. Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
- XII. Certification Regarding Use of Contract Funds for Lobbying

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 piecework, station work, or by subcontract.

2. Except as otherwise provided for 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.

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 Executive 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 26, 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 work 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 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 knowingly 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.

* * * * *

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 judgment 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.

* * * * *

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.

* * * * *

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.

* * * * *

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.

ATTACHMENT A - EMPLOYMENT PREFERENCE FOR APPALACHIAN CONTRACTS

(Applicable to Appalachian contracts only.)

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph 1c shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph 4 below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which he estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, he shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within 1 week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph 1c above.

5. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

100-C-151b DISADVANTAGED BUSINESS ENTERPRISE PROCEDURE AND GOOD FAITH EFFORTS

(Revised 04-09-07)

The Standard Specifications are revised as follows:

SECTION 103, AFTER LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 103 – AWARD AND EXECUTION OF CONTRACT

103.01 Disadvantaged Business Enterprise Program

This requirement will apply only to a federal aid contract.

(a) General Requirements

Failure to carry out the requirements set forth in 49 CFR 23.43(a) 26, as outlined in the Department's DBE Program Manual, shall constitute a breach of contract and, after notification may result in termination of the contract or such remedy as the State deems appropriate.

The above referenced CFR section requires the following policy and disadvantaged business enterprise obligation to be included in all subsequent agreements between the Contractor and all subcontractors as follows:

1. It will be the policy of the Department ~~that disadvantaged business enterprises, as defined in 49 CFR Part 23, shall have the maximum opportunity to participate in the performance of contract work financed in whole or in part with Federal funds provided under this contract to create a level playing field on which DBE's can compete fairly for federally funded contracts.~~ Consequently, the disadvantaged business enterprise requirements of 49 CFR Part 23 26, as outlined in the Department's DBE Program Manual, apply to this contract.
2. ~~The Contractor agrees to ensure that disadvantaged business enterprises certified by the State shall have the maximum opportunity to participate in the performance of contract work or subcontract work financed in whole or in part with Federal funds provided under this contract. In this regard, the Contractor shall take all necessary and reasonable steps, in accordance with 49CFR Part 23, to ensure that disadvantaged business enterprises have the maximum opportunity to compete for and perform work in this contract.~~ The Contractor shall not discriminate on the basis of race, color, national origin, or sex, in the award and performance of this contract.

The Contractor shall carry out the applicable DBE requirements in the award and administration of federally funded contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or such other remedy as the Department deems appropriate. The Contractor shall include language prohibiting discrimination on the basis of race, color, national origin, or sex in the performance of this contract in all subcontracts.

SECTION 103, BEGIN LINE 59, DELETE AND INSERT AS FOLLOWS:

4. Certified DBE

A business enterprise which has completed and filed a request for certification with the ~~Indiana~~ Department of Administration, and that the business enterprise has been reviewed and determined to comply with the guidelines established in 49 CFR Part 23 26. Business enterprises which are determined to be eligible will be certified as DBEs *to perform specific types of work.*

(c) Goal

A contract provision *DBE* goal may be shown on the Proposal sheet. Such goal, if required, has been established as the *desired minimum* amount to be contracted to DBEs. The Contractor shall meet or exceed the goal, or demonstrate that it could not be met despite ~~best~~ *good faith* efforts. Achievement of the ~~contract provision~~ goal does not relieve the Contractor of the requirement for affirmative action on subsequent subcontracting on this contract. Only work with listed DBEs ~~which~~ *that* are certified prior to the date of the letting will count toward the goal. *Credit towards contract goals will be given only for work performed by certified DBEs in the work areas for which they have been certified. The same requirements with respect to obtaining the goal apply for a Contractor that is certified as a DBE. A DBE Contractor must either achieve the goal utilizing other DBE firms or demonstrate that the goal could not be met despite good faith efforts.*

Contracting may be in the form of a subcontract, lease agreement, or material supply agreement. Full credit will be given for subcontracts and lease agreements. Credit for utilization of a DBE material supplier will be limited to those DBEs certified as suppliers prior to the letting at the rate of 60% of the expenditure to the supplier unless the supplier is also the manufacturer. Suppliers that do not manufacture the items shall also perform a commercially useful function in order for credit to be received.

A written request for changes in utilization of race/gender conscious DBE firms listed in the Affirmative Action Certification shall be approved prior to start of listed services or purchase of listed materials. Requests to reduce or eliminate the services or material provided by a listed race/gender conscious DBE that include written approval by the DBE will be considered sufficient justification if the committed DBE utilization after the requested change will meet or exceed the contract goal or a lesser percentage approved prior to execution of the contract. If the committed DBE utilization after the change does not meet or exceed the contract goal or a lesser percentage approved prior to execution of the contract, or the listed race/gender conscious DBE does not approve the change, the Contractor shall submit documented evidence that the DBE is unable to perform successfully. Disposition of the request for change will be determined on the basis of the affirmative actions taken as required herein.

When a race/gender conscious DBE firm is removed from eligibility, the Contractor shall take the following steps:

- 1. If a subcontract has not yet been executed, the Contractor shall not count work performed by the firm toward the contract goal. The Contractor will be directed to meet the contract goal with an eligible DBE firm or demonstrate that it has made a good faith effort to do so.*
- 2. If a subcontract has been executed before the firm has been declared ineligible, the Contractor shall continue to count work performed by the firm toward the contract goal.*

SECTION 103, BEGIN LINE 95, DELETE AND INSERT AS FOLLOWS:

DBE joint ventures type A do not require DBE joint venture certification. DBE joint venture type B do require DBE joint venture certification. A request for DBE joint ventures type B certification shall be submitted not later than 9:00 a.m. local time the last ~~work~~ business day before the letting and shall be approved prior to bidding in order to receive credit toward the DBE goal. The DBE shall be certified with the Department prior to requesting DBE joint venture certification. The work for the DBE shall be identified, performed, managed, and supervised by its forces.

SECTION 103, DELETE LINES 102 THROUGH 119.

SECTION 103, DELETE LINES 143 THROUGH 242.

SECTION 103, AFTER LINE 243, INSERT AS FOLLOWS:

(e) Determination of Good Faith Efforts

Appendix A of 49 CFR Part 26 has been used for guidance in preparing the Department's procedures to determine the adequacy of good faith efforts. Additional factors consistent with 49 CFR Part 26, and the Department's policies and procedures have also been utilized.

1. Good Faith Efforts Prior to Award

The following factors will be considered in determining good faith efforts prior to award of a contract. The Contractor, including DBE Contractors, shall submit evidence on each of the factors.

- 1. The Contractor shall make reasonable effort to contact all ready, willing, and able DBEs who express a desire to work on any of the pay items of the contract.*
- 2. To effectively participate, the DBE shall have the opportunity to analyze the contract and submit quotations prior to letting. Information provided by the Contractor to the DBEs shall include, at a minimum, the contract number, pay items, quantities for those pay items to be subcontracted, and the date the subcontract bid is desired.*
- 3. The Contractor shall select the portions of the work to be performed by DBEs in order to increase the likelihood of DBE participation. This shall include, where appropriate, an attempt to break down the contract into economically feasible units to facilitate DBE participation.*

4. *The Contractor shall provide the interested DBEs with complete information about the plans, specifications, and requirements of the contract. Attempts shall be made to have plans available or to notify the DBE of the location of available plans. The Contractor shall notify the DBE of revisions to the contract.*
5. *It will be considered unacceptable to avoid subcontracting to DBEs if such subcontracting to DBEs results in the need to further subdivide remaining work items.*
6. *The Contractor shall negotiate in good faith with interested DBEs and not reject such DBEs as unqualified without sound reasons based on thorough investigation of their capabilities. Confirmed documentation that a DBE has not been able to perform previous work through no fault of others will be considered to be sound reason. Unacceptable criteria include, but are not limited to, unsubstantiated oral statements and unsigned documentation.*
7. *The Contractor shall make efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance required by the State. However, the Contractor shall affirmatively consider waiving requirements it may have in order to assist the DBE.*
8. *Only firms certified as DBEs prior to the letting date can be used to meet the contract goal for the Department's DBE program.*

The Contractor will be considered to have made good faith efforts if it either:

1. *Documents that it has obtained enough DBE participation to meet the goal, or*
2. *Documents that it made adequate good faith efforts in accordance with the factors set out above to meet the goal even though it did not succeed in obtaining enough DBE participation to do so.*

If a DBE goal has been established for the contract, the Contractor shall take good faith efforts to achieve the established goal prior to the bid opening. The Affirmative Action Certification shall be completed and submitted with the Proposal Book to indicate both race/gender conscious and race/gender neutral proposed DBE utilization.

The award of the contract will be made to the lowest and best bidder when all other requirements have been met and good faith efforts have been taken toward meeting the DBE goal, if required, in accordance with these requirements.

If the apparent low bidder has not achieved the contract DBE goal, the bidder shall respond in writing within three business days after notification by the Department of the failure to meet the DBE goal. The response shall provide evidence identifying the bidder's good faith efforts and all affirmative actions taken prior to letting to achieve the required DBE goal. Failure to respond within the three business day period will result in rejection of the bid, and may result in forfeiture of the bid bond, and the referral of the bidder to the Prequalification Committee.

Responses shall be sent to the Department's Division of Contract Administration. The Department will review the bidder's good faith efforts for compliance with these requirements.

If the Department determines that adequate good faith efforts have been made, and the bidder has met all other bidding requirements, the contract will be awarded.

If the Department determines that good faith efforts were inadequate, the Department will issue written notification of the determination to the bidder. The determination will outline the reasons for determination of non-compliance with good faith effort requirements.

The bidder may request a review of a determination of non-compliance by making a written submittal within five business days of the bidder's receipt of notification of non-compliance from the Department. The request for review shall include evidence disputing the Department's reasons for issuing a determination of non-compliance. The request shall be sent to the Department's Division of Contract Administration.

Upon receipt of a request, the Department will contact the bidder to schedule a review. The review will be held by the Department's Deputy Commissioner and Chief Counsel, or a designee who did not participate in the original determination of non-compliance. The review will be conducted in accordance with the Department's policy for review of good faith efforts requirements. A copy of the policy is available on the Department's website or through the Division of Contract Administration.

If the Deputy Commissioner's finding determines that the bidder's good faith efforts were adequate, and the bidder has met all other bidding requirements, the contract will be awarded and the Department will adjust the contract time by the number of calendar days from the date of the original determination of non-compliance to and including the date of the Deputy Commissioner's findings.

If the Deputy Commissioner's finding determines that the bidder's good faith efforts were inadequate, the finding will be forwarded to the Commissioner. The Commissioner will review the Deputy Commissioner's finding and issue a written Contract Award Determination.

If the Commissioner's Contract Award Determination finds that the bidder's good faith efforts were adequate, and the bidder has met all other bidding requirements, the contract will be awarded and the Department will adjust the contract time by the number of calendar days from the start of the original determination of non-compliance to and including the date of the Commissioner's determination.

If the Commissioner's Contract Award Determination finds that the bidder's good faith efforts were inadequate, at the Commissioner's sole option and without further proceedings, either all bids will be rejected or the contract will be awarded to the next lowest and qualified bidder. An apparent low bidder who has not met the DBE goal and requirements for good faith efforts may be requested not to rebid on this contract during subsequent lettings.

The Commissioner's Contract Award Determination will be the final decision of the Department.

2. Good Faith Efforts for Extra Work

When extra work in accordance with 104.03 is added to a contract with a DBE goal, the Contractor shall hire or make good faith efforts to hire a DBE subcontractor to perform significant extra work.

For purposes of DBE good faith efforts, significant extra work is defined as new pay items added to a Contract that result in a new contracting opportunity not reasonably related to existing pay items being performed by the Contractor or a subcontractor.

When significant extra work related to existing pay items being performed by a DBE subcontractor is added to a contract with a DBE goal, the Contractor shall offer that same DBE subcontractor the opportunity to perform the extra work whether or not the existing pay items are counted toward the DBE goal. The Contractor shall consider other DBE subcontractors if the extra work would result in the original DBE subcontractor exceeding its prequalification limits. The Department may consider an exception to a DBE subcontractor's prequalification limit. If the DBE subcontractor is unable to perform the extra work, the Contractor shall hire or make good faith efforts to hire an alternate DBE subcontractor to perform the work.

When significant extra work related to existing pay items being performed by a non-DBE subcontractor is added to a contract with a DBE goal, the non-DBE subcontractor may perform the extra work. If the non-DBE subcontractor is unable to perform the extra work, the Contractor may self-perform the extra work. If the Contractor chooses not to self-perform the extra work, the Contractor shall hire or make good faith efforts to hire a DBE firm to perform the work.

When significant extra work related to existing pay items being performed by the Contractor is added to a contract with a DBE goal, the Contractor may self-perform the extra work. If the Contractor chooses not to self-perform the extra work, the Contractor shall hire or make good faith efforts to hire a DBE firm to perform the work.

The Contractor shall forward documentation of good faith efforts to hire a DBE subcontractor to perform extra work to the District Equal Employment Opportunity (EEO) Officer for review. The EEO Officer will determine if good faith efforts have been met in accordance with 103.01(e)1.

If the EEO Officer determines that the Contractor failed to make good faith efforts to hire a DBE firm when required as a result of significant extra work, written notice will be sent to the Contractor. The Contractor may appeal the determination in accordance with 103.01(e)1.

(f) Affirmative Action Certification

The Affirmative Action Certification, included in the Proposal book, shall be completed when the Proposal book is submitted to the Department. The certification shall list ~~DBEs or shall state the reasons DBEs are not listed~~ *all DBE firms the Contractor plans to utilize, either race/gender consciously or race/gender neutrally*. Blank certifications shall cause the bid to be rejected. If a portion of a pay item is to be performed by a DBE, an explanation shall be included stating exactly what the DBE is performing or supplying. Failure to do so may affect the award of the contract. *The Contractor shall ensure that DBE firms listed on the Affirmative Action Certification are certified DBE firms as listed in the Department's DBE directory at the time of letting. In addition to the listing of DBE firms that will be used race/gender consciously to meet the goal, the Contractor shall also provide a total for the amount of work that it anticipates will be performed by other DBE firms used race/gender neutrally on the contract beyond the goal requirements.*

Race/gender neutral awards involve the utilization of a DBE firm because the DBE firm is the best firm to perform the work. Race/gender conscious awards involve the utilization of a DBE firm primarily to achieve the contract DBE goal.

SECTION 103, BEGIN LINE 269, DELETE AND INSERT AS FOLLOWS:

Upon receipt of notification from the Department, a Disadvantaged Business Enterprise Utilization Affidavit, Form ~~MBE-3~~ *DBE-3*, shall be completed by the Contractor and returned to the Department. The Contractor and the subcontractor/lessor/supplier shall certify on Form ~~MBE-3~~ *DBE-3* that specific amounts have been paid and received. *A DBE-3 Form certification shall be completed and submitted for every DBE utilized on the contract, not just those listed on the Affirmative Action Certification.*

SECTION 103, BEGIN LINE 285, DELETE AND INSERT AS FOLLOWS:

~~by the DBE, or leased from another DBE, that are utilized on the project. DBE hauling lessors who sublease a portion of their hauling shall take positive affirmative actions to sublease to DBEs and shall provide Form MBE-2 to the Department, evidencing those efforts prior to commencing work. Trucks that are leased by a DBE for a period of at least 12 months will be considered the same as trucks owned by the DBE. In addition, DBE credit will also be given for any fee or commission the DBE receives as a result of the lease arrangement for any additional non-DBE trucks.~~

In order to count leased trucks toward the goal, the lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from being used by others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the DBE goals.

The Contractor shall provide the Engineer copies of any lease agreements between DBE trucking subcontractors and any DBE or non-DBE trucking firms or owner/operators that will be used to supplement the DBE trucking subcontractor's trucks for the purpose of meeting the DBE goal. Copies of these lease agreements shall be provided by the time of use of any supplemental trucks on the Contract.

In addition to delivery ticket information required by Section 106, the following information shall be included on each ticket for material delivered to the job site by a DBE trucking subcontractor or lessee:

- 1. Name of trucking firm*
- 2. Printed name of the driver*

The Contractor shall submit weekly reports to the Engineer on forms provided by the Department, documenting the number of DBE trucks utilized and a breakdown of the dollar amount credited toward the Contract DBE goal. The reports shall be submitted within 5 business days of the end of the week being reported. Forms are available on the Department's website or from the Division of Contract Administration.

SECTION 103, BEGIN LINE 304, DELETE AND INSERT AS FOLLOWS:

(i) Records and Reports

The Contractor shall keep such records as necessary to determine compliance with its DBE utilization obligations and compliance with Determination of Good Faith Efforts ~~for Goal Contracts~~. The records kept by the Contractor shall indicate the minimum requirements as follows:

SECTION 103, AFTER LINE 341, INSERT AS FOLLOWS:

103.02.1 Record Keeping

All firms performing work on Department contracts, bidding on Department contracts, or offering quotes for subcontract or trucking services shall register with the Department, annually, by submitting the following information to the Department's Economic Opportunity Division.

- (a) firm's name;*
- (b) firm's address;*
- (c) firm's status as a DBE or non-DBE;*
- (d) the age of the firm; and*
- (e) the annual gross receipts of the firm*
- (f) approximately how many Department projects has the firm bid or quoted in the past 12 months. (If none, please indicate 0)*
- (g) in which of the following markets has the firm participated?*
 - 1. prime Contractor*
 - 2. subcontractor*
 - 3. trucking firm*
 - 4. consultant*

SECTION 109, AFTER LINE 618, INSERT AS FOLLOWS:

Within 10 business days of receipt of payment for any such estimate, the Contractor shall make payment to all subcontractors for the value of their work performed and materials complete in place in accordance with this contract. Failure to comply with this clause shall constitute a material breach of the contract and may result in sanctions under the contract.

Any delay or postponement of payment among the parties may take place only for good cause, with the Department's written approval. The explanation from the Contractor shall be made in writing to the Department.

100-C-151d EXECUTIVE ORDER 11246

(Revised 03-09-06)

The Standard Specifications are revised as follows:

SECTION 103, LINE 342, DELETE AND INSERT AS FOLLOWS:

103.03 ~~Blank~~. Executive Order 11246: Notice of Requirements for Affirmative Action to Ensure Equal Employment Opportunity

This requirement will apply only to a federal aid contract. The Code of Federal Regulations 41 CFR 60-4.2(d) is amended by revising Paragraph 2 of the Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246), to read as follows:

2. *The Contractor's or Bidder's attention is called to the Equal Opportunity Clause and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth herein.*

(a) Timetables

The timetables for minority and female participation for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

1. Minorities

Immediately.

2. Women

April 1, 1980 to indefinite.

The goals are shown in 103.03(j) and 103.03(k).

Contractors who are signatory to an area (Hometown) plan are covered by 103.03(b). All Contractors, signatory or not to an area (Hometown) plan, will be covered by the minority goals as shown in 103.03(j).

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, in accordance with 41 CFR 60-4 as set out in Volume 45, No. 194 of the Federal Register dated October 3, 1980. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

(b) Area (Hometown) Plans

Until further notice, the following goals and timetables for minority utilization shall be included in all Federal or federally-assisted construction contracts and subcontracts in excess of \$10,000.00 to be performed in the respective covered areas. The goals are applicable to the Contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a Federal or federally-assisted construction contract or subcontract.

1. Cincinnati, Ohio Area

Area Covered: Ohio counties of Clermont, Hamilton, and Warren; Kentucky counties of Boone, Campbell, and Kenton; and Indiana county of Dearborn. The minority hiring goal in Dearborn County, Indiana is 11 percent.

2. Indianapolis, Indiana Area

Area Covered: Marion County. The minority hiring goal in Marion County is 12.5 percent.

(c) Written Notification

The Contractor shall provide written notification to the Department within ten work days of award of any construction subcontract in excess of \$10,000.00 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, estimated dollar amount of the contract, estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

(d) 41 CFR 60-4.3 Equal Opportunity Clauses

The equal opportunity clause published as 41 CFR 60-1.4(a) of this chapter is required to be included in, and is part of, all non-exempt Federal contracts and subcontracts, including construction contracts and subcontracts. The equal opportunity clause published at 41 CFR 60-1.4(b) is required to be included in, and is a part of, all non-exempt federally-assisted construction contracts and subcontracts. In addition to the clause described above, all Federal contracting officers, all applicants and all non-construction Contractors, as applicable, shall include the specification set forth in this section in all Federal and federally-assisted construction contracts in excess of \$10,000.00 to be performed in geographical areas designated by the Department pursuant to 41 CFR-60-4.6 of this part and in construction subcontracts in excess of \$10,000.00 necessary in whole or in part to the performance of non-construction Federal contracts and subcontracts covered under the Executive Order.

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:

- (1) *Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);*
 - (2) *Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);*
 - (3) *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*
 - (4) *American Indian or Alaskan Native 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 \$10,000.00 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 7.a through 7.p of this specification. The goals set forth in the solicitation form 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. The Contractor is expected to make substantially uniform progress toward 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 non-working 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 actions. 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 organization 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 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 Department 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 source 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 onsite 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.*
- i. *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.*
- j. *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 the Contractor's workforce.*

- k. *Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.*
 - l. *Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to see 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 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 non-segregated 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 supervisor's 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 under 7.a. through 7.p. of this specification. The efforts of a contractors' 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 7.a. through 7.p. of this specification 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 workforce 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 non-compliance.*

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.*
11. *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 suspensions, 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, of these specifications, the Department will 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 number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g. mechanic, trainee, helper, or laborer), date 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).*

The notice set forth in 41 CFR 60-4.2 and the specifications set forth in 41 CFR 60-4.3 replace the New Form for Federal Equal Employment Opportunity Bid Conditions for Federal and Federally-Assisted Construction published as 41 CFR 32482 and commonly known as the Model Federal EEO Bid Conditions. The New Form shall not be used after the regulations in 41 CFR part 60-4 become effective.

(e) 41 CFR 60-4.5 Hometown Plans

If the Contractor is participating, either individually or through an association, in an approved Hometown Plan (including heavy highway affirmative action plans) it shall comply with its affirmative action obligations under Executive Order 11246 by complying with its obligations under the Plan: Provided, that each Contractor or subcontractor participating in an approved Plan is individually required to comply with the equal opportunity clause set forth in 41 CFR 60-1.4; to make a good faith effort to achieve the goals for each trade participating in the Plan in which it has employees; and that the overall good 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's goals and timetables. If the Contractor is not participating in an approved Hometown Plan it shall comply with the specifications set forth in 41 CFR 60-4.3 and with the goals and timetables for the appropriate area as listed in the Notice required by 41 CFR 60-4.2 with regard to that trade. For the purposes of 41 CFR 60-4, the Contractor is not participating in a Hometown Plan for a particular trade if it:

- 1. Ceases to be signatory to a Hometown Plan covering that trade.*
- 2. Is signatory to a Hometown Plan for that trade but is not party to a collective bargaining agreement for that trade.*
- 3. Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with labor organizations which are not or cease to be signatories to the same Hometown Plan for that trade.*
- 4. Is signatory to a Hometown Plan for that trade and is party to a collective bargaining agreement with a labor organization for that trade but the two have not jointly executed a specific commitment in the Hometown Plan for that trade.*
- 5. In participating in a Hometown Plan for that trade which is no longer acceptable to the Office of Federal Contract Compliance Programs.*
- 6. Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with a labor organization for that trade and the labor organization and the Contractor have failed to make a good faith effort to comply with their obligations under the Hometown Plan for that trade.*

7. *If the Contractor participates in Hometown Plans, it must be able to demonstrate its participation and document its compliance with the provisions of the Hometown Plan.*

(f) 41 CFR 60-4.6 Goals and Timetables

The Department, from time to time, shall issue goals and timetables for minority and female utilization which shall be based on appropriate workforce, demographic or other relevant data and which shall cover construction projects, or construction contracts performed in specific geographical areas. The goals shall be applicable to each construction trade in a covered Contractor's or subcontractor's entire workforce which is working in the area covered by the goals and timetables, shall be published as notices in the Federal Register, and shall be inserted by the contracting officers and applicants, as applicable, in the Notice required by 41 CFR 60-4.2.

(g) 41 CFR 60-4.7 Effect on Other Regulations

The regulations in this part are in addition to the regulations contained in this chapter which apply to construction Contractors and subcontractors generally. So particularly, 41 CFR 60-1.4(a), (b), (c), (d), and (e); 60-1.5; 60-1.7; 60-1.8; 60-1.26; 60-1.29; 60-1.30; 60-1.32; 60-1.42; 60-1.43; and 41 CFR part 60-3; part 60-20; part 60-30; part 60-40; and part 60-50.

(h) 41 CFR 60-4.8 Show Cause Notice

If an investigation or compliance review reveals that a construction Contractor or subcontract has violated the Executive Order, any contract clause, specifications or the regulations in this chapter and if administrative enforcement is contemplated, the Department will issue to the Contractor or subcontractor a notice to show cause which shall contain the items specified in 41 CFR 60-2.2(c)(1). If the Contractor does not show good cause within 30 days, or in the alternative, fails to enter an acceptable conciliation agreement which includes where appropriate, make up goals and timetables, back pay, and seniority relief for affected class members, the compliance agency shall follow the procedure described in 41 CFR 60-1.26(b), provided that where a conciliation agreement has been violated, no show cause notice is required prior to the initiation of enforcement proceedings.

(i) 41 CFR 60-4.9 Incorporation by Operation of the Order

By operation of the Order, the equal opportunity clause contained in 41 CFR 60-1.4, 41 CFR 60-4.2 and 41 CFR 60-4.3 shall be deemed to be a part of every solicitation or of every contract and subcontract, as appropriate, required by the Order and regulations in this chapter to include such clauses whether or not they are physically incorporated in such solicitation or contract and whether or not the contract is written.

(j) Minority Hiring Goals by County

<i>COUNTY</i>	<i>PCT.</i>	<i>COUNTY</i>	<i>PCT.</i>	<i>COUNTY</i>	<i>PCT</i>
<i>Adams</i>	<i>4.4</i>	<i>Hendricks</i>	<i>12.5</i>	<i>Pike</i>	<i>3.5</i>
<i>Allen</i>	<i>4.4</i>	<i>Henry</i>	<i>3.9</i>	<i>Porter</i>	<i>20.9</i>
<i>Bartholomew</i>	<i>9.7</i>	<i>Howard</i>	<i>4.4</i>	<i>Posey</i>	<i>4.8</i>
<i>Benton</i>	<i>1.5</i>	<i>Huntington</i>	<i>4.4</i>	<i>Pulaski</i>	<i>18.4</i>
<i>Blackford</i>	<i>3.9</i>	<i>Jackson</i>	<i>9.7</i>	<i>Putnam</i>	<i>9.7</i>
<i>Boone</i>	<i>12.5</i>	<i>Jasper</i>	<i>18.4</i>	<i>Randolph</i>	<i>3.9</i>
<i>Brown</i>	<i>9.7</i>	<i>Jay</i>	<i>3.9</i>	<i>Ripley</i>	<i>9.2</i>
<i>Carroll</i>	<i>1.5</i>	<i>Jefferson</i>	<i>9.6</i>	<i>Rush</i>	<i>9.7</i>
<i>Cass</i>	<i>3.7</i>	<i>Jennings</i>	<i>9.7</i>	<i>St. Joseph</i>	<i>7.1</i>
<i>Clark</i>	<i>11.2</i>	<i>Johnson</i>	<i>12.5</i>	<i>Scott</i>	<i>9.6</i>
<i>Clay</i>	<i>3.1</i>	<i>Knox</i>	<i>3.5</i>	<i>Shelby</i>	<i>12.5</i>
<i>Clinton</i>	<i>1.5</i>	<i>Kosciusko</i>	<i>6.2</i>	<i>Spencer</i>	<i>3.5</i>
<i>Crawford</i>	<i>9.6</i>	<i>LaGrange</i>	<i>6.2</i>	<i>Starke</i>	<i>18.4</i>
<i>Daviess</i>	<i>9.7</i>	<i>Lake</i>	<i>20.9</i>	<i>Steuben</i>	<i>4.4</i>
<i>Dearborn</i>	<i>11.0</i>	<i>LaPorte</i>	<i>18.4</i>	<i>Sullivan</i>	<i>3.1</i>
<i>Decatur</i>	<i>9.7</i>	<i>Lawrence</i>	<i>9.7</i>	<i>Switzerland</i>	<i>9.2</i>
<i>Dekalb</i>	<i>4.4</i>	<i>Madison</i>	<i>4.9</i>	<i>Tippecanoe</i>	<i>2.7</i>
<i>Delaware</i>	<i>5.3</i>	<i>Marion</i>	<i>12.5</i>	<i>Tipton</i>	<i>4.4</i>
<i>Dubois</i>	<i>3.5</i>	<i>Marshall</i>	<i>7.1</i>	<i>Union</i>	<i>3.9</i>
<i>Elkhart</i>	<i>4.0</i>	<i>Martin</i>	<i>9.7</i>	<i>Vanderburgh</i>	<i>4.8</i>
<i>Fayette</i>	<i>3.9</i>	<i>Miami</i>	<i>3.7</i>	<i>Vermillion</i>	<i>3.1</i>
<i>Floyd</i>	<i>11.2</i>	<i>Monroe</i>	<i>3.1</i>	<i>Vigo</i>	<i>3.1</i>
<i>Fountain</i>	<i>1.5</i>	<i>Montgomery</i>	<i>1.5</i>	<i>Wabash</i>	<i>3.7</i>
<i>Franklin</i>	<i>9.2</i>	<i>Morgan</i>	<i>12.5</i>	<i>Warren</i>	<i>1.5</i>
<i>Fulton</i>	<i>6.2</i>	<i>Newton</i>	<i>18.4</i>	<i>Warrick</i>	<i>4.8</i>
<i>Gibson</i>	<i>4.8</i>	<i>Noble</i>	<i>4.4</i>	<i>Washington</i>	<i>9.6</i>
<i>Grant</i>	<i>3.7</i>	<i>Ohio</i>	<i>9.2</i>	<i>Wayne</i>	<i>3.9</i>
<i>Greene</i>	<i>9.7</i>	<i>Orange</i>	<i>9.6</i>	<i>Wells</i>	<i>4.4</i>
<i>Hamilton</i>	<i>12.5</i>	<i>Owen</i>	<i>9.7</i>	<i>White</i>	<i>1.5</i>
<i>Hancock</i>	<i>12.5</i>	<i>Parke</i>	<i>2.5</i>	<i>Whitley</i>	<i>4.4</i>
<i>Harrison</i>	<i>9.6</i>	<i>Perry</i>	<i>3.5</i>		

(k) Female Hiring Goal

The female hiring goal is 6.9 percent throughout the State. Minority females may be counted both as a minority and as a female. Double counting will be permitted for reporting on Form CC-257.

100-C-151e TITLE VI ASSURANCES

(Adopted 05-01-08)

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds or race, color, sex, age, disability, religion or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, sex, or national origin.
4. **Information and Reports:** The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Indiana Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Indiana Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Indiana Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to: (a) withholding of payments to the contractor under the contract until the contractor complies, and/or (b) cancellation, termination or suspension of the contract, in whole or in part.

6. **Incorporation of Provisions**: The contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto.

The contractor shall take such action with respect to any subcontract or procurement as the Indiana Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for non-compliance, provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Indiana Department of Transportation to enter into such litigation to protect the interests of the Indiana Department of Transportation, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

100-C-188 STANDARD SPECIFICATIONS

(Revised 04-09-09)

Wherever in the contract documents the 1999, 2006 or 2008 Standard Specifications are referenced, it shall be interpreted to mean the 2010 Standard Specifications.

100-C-214 CONSTRUCTION LETTING E-MAIL BOX

(Revised 04-23-08)

The Contractor has the option to submit certain contract bid documents, as defined in the proposal, either as original paper copies filed with the proposal or as electronic documents.

To submit electronic documents, the Contractor shall attach the documents to an e-mail sent to the following address:

constructionletting@indot.in.gov

To ensure that the electronic documents are placed in the correct contract folder with a date and time stamp and that they cannot be altered, the subject line of the e-mail shall contain the following information in the exact format shown:

CompanyNameDocumentTitleLettingDate-ContractNumber

The subject line shall contain no spaces, periods, commas, apostrophes or other punctuation marks other than the one hyphen indicated between CompanyNameDocumentTitleLettingDate and ContractNumber.

LettingDate shall be in the format MMDDYY.

ContractNumber shall be in the format AA#####Z, where AA is the 1 or 2 letter prefix, ##### is the 5 digit number and Z is the 1 letter suffix.

The following is an example of the subject line for the Jones Construction Co., Inc., submitting a drug testing plan for contract IR-30999-A for a March 15, 2008 letting:

JonesConstructionCoIncDrugPlan031508-IR30999A

Documents must be time stamped by the INDOT e-mail box prior to the time stated in the advertisement.

103-C-222 CONTRACTOR REPORTING REQUIREMENTS FOR 2009 FEDERAL RECOVERY
ACT CONTRACTS

(Revised 06-13-09)

General Requirements

Funding for this contract has been provided through the American Recovery and Reinvestment Act of 2009, ARRA, and is subject to the reporting and operational requirements of ARRA. Each contract subject to ARRA, including subcontractors, is subject to audit by appropriate federal or state entities. Failure to comply with the terms herein may result in withholding of progress estimates by the Department.

The State makes no representations or guarantees about funding beyond the contract period as this contract is being funded with one time dollars from the ARRA.

Employment Reporting Requirements

The Contractor shall complete an ARRA monthly employment report for each month the contract is active, beginning with the month that the notice to proceed is issued and continuing through the month that the Contractor is relieved of further maintenance in accordance with 105.15.

ARRA monthly employment reports shall be completed by the Contractor and shall include data for their workforce and the workforce of each subcontractor. Data shall be reported for employees actively engaged in the contract who work on the jobsite, in the project office, in the home office or by telework from a home or other alternative office location.

ARRA monthly employment reports shall be submitted by completing an on-line form available on the Department's website. Instructions for completion of the form are also available on the website. A separate report shall be submitted for each Project Control Number, PCN, in the contract.

The Contractor shall obtain a Data Universal Numbering System, DUNS, number. Instructions for obtaining a DUNS number free of charge are included on the website. The Contractor's DUNS number shall then be included with each report.

Reports shall be submitted for the Contractor and all approved subcontractors no later than 10 days after the end of each month for which reports are required. Reports shall be submitted even in the event that the employment data for the Contractor or subcontractor is zero for the reporting month.

The Department reserves the right to change the employment reporting requirements for ARRA contracts at any time without any additional compensation to the Contractor.

Authority of the U.S. Comptroller General

Section 902 of the ARRA provides the U.S. Comptroller General and his representatives with the authority to:

to examine any records of the contractor or any of its subcontractors, or any State or local agency administering such contract, that directly pertain to, and involve transactions relating to, the contract or subcontract; and

to interview any officer or employee of the contractor or any of its subcontractors, or of any State or local government agency administering the contract, regarding such transactions.

Accordingly, the Comptroller General and his representatives shall have the authority and rights as provided under Section 902 of the ARRA with respect to this contract, which is funded with funds made available under the ARRA. Section 902 further states that nothing in this section shall be interpreted to limit or restrict in any way any existing authority of the Comptroller General.

Authority of the U.S. Inspector General

Section 1515(a) of the ARRA provides the U.S. inspector General and his representatives the authority to examine any records or interview any employee or officers working on this contract. The Contractor is advised that representatives of the Inspector General have the authority to examine any record and interview any employee or officer of the Contractor, its subcontractors or other firms working on this contract.

Section 1515(b) further provides that nothing in this section shall be interpreted to limit or restrict in any way any existing authority of the Inspector General.

48 CFR 25.6 Buy American Requirement

The Contractor shall comply with the requirements of 48 CFR 25.6, including any interim rules. In the case of a discrepancy between the requirements of 48 CFR 25.6 and any other Buy American requirements in the contract, the stricter requirement shall be followed.

105-C-164 CELLULAR TELEPHONES/RADIOS

(Adopted 01-30-06)

The Contractor shall provide radio or cellular telephone/radio equipment and services, as specified below, for use by the Department on the contract.

Each radio or cellular telephone/radio unit shall be capable of 2-way radio communication with all other units provided under this contract. Each radio or cellular telephone/radio unit shall have a service coverage area that includes the limits of the contract. Each radio or cellular telephone/radio unit shall include a belt clip system, a 120v AC charger, and a 12v DC mobile charger.

All equipment shall be covered by normal manufacturer's warranties. All radio or cellular telephone/radio units and associated equipment will remain the property of the Contractor and will be returned to the Contractor upon completion of the contract.

The Contractor shall provide the following services for each radio or cellular telephone/radio unit.

Radio Service

Radio service shall include the following:

- (a) unlimited direct connect radio service
- (b) no cellular telephone service

Cellular Telephone/Radio Service

Cellular telephone/radio service shall include the following:

- (a) 1000 cellular telephone anytime minutes per month
- (b) unlimited nights and weekends service
- (c) unlimited direct connect radio service
- (d) voice mail and caller ID

The Department will be responsible for damage and/or loss of the units beyond that covered by normal manufacture's warranties, while in use by the Department. The Contractor shall provide replacement cellular telephone/radio units, batteries, chargers, etc within one business day of notification of need for the item.

The Contractor shall not enter into any agreement with any service provider or purchase any radio or cellular telephone/radio units for use by the Department until authorized by the Engineer. The Engineer will notify the Contractor a minimum of 10 business days prior to the need for the units.

Radio and cellular telephone/radio units will be paid for at the contract unit price per each. Radio and cellular telephone/radio service will be paid for at the contract unit price per month per each phone. Monthly charges for cellular telephone minutes in excess of those specified in the contract will be paid for by the dollar amount for the invoiced price per each occurrence as cellular telephone/radio, additional charges.

Pay Item	Pay Unit Symbol
Cellular Telephone/Radio	6 EACH
Cellular Telephone/Radio Service.....	30 MOS
Radio.....	EACH
Radio Only Service.....	MOS
Cellular Telephone/Radio, Additional Minutes.....	DOL

The Contractor shall provide a copy of the detailed invoice from the service provider for each cellular telephone/radio or radio unit each month.

107-B-040 ENVIRONMENTAL RESTRICTIONS

(Revised 04-01-08)

The Standard Specifications are revised as follows:

SECTION 107, AFTER LINE 518, INSERT AS FOLLOWS:

107.14.1 Environmental Restriction

The work shall be performed in accordance with the environmental restrictions shown below.

(a) Tree Habitat

All trees outside the construction limits shall not be disturbed.

(b) Indiana Bat

All felling of trees equal to or greater than 3 in. (75 mm) in diameter at breast height shall be performed between October 1 and the following March 31, inclusive, so as to minimize project-related impacts on the Indiana bat, Myotis Sodalis.

(c) Fish Spawning

If the contract contains an in-channel excavation restriction due to impacts upon fish spawning, the Contractor may request a waiver of a portion of the restriction period by means of written contact to the Indiana Department of Natural Resources Division of Fish and Wildlife, Environmental Supervisor. Such request shall be made not more than 2 weeks prior to anticipated in-channel work during the restriction period shown above. The expected response time from the Indiana Department of Natural Resources will be approximately 5 work days. The Indiana Department of Natural Resources will consider each waiver on a case by case basis.

The information and criteria shown below shall be provided with the waiver request.

- 1. Location of the project, including stream name, route number or road name, Indiana Department of Natural Resources Certificate of Approval of Construction in a Floodway docket number, and description of the proposed work.*
- 2. Amount of time required to do the work, and the dates requested to be waived. The amount of time required shall be reasonable to accomplish the proposed work.*
- 3. The amount of in-channel area proposed to be disturbed by the work. Disturbance across the full width of the stream may result in more negative impacts than disturbance of smaller portions of the stream.*
- 4. Water level at the time of the request.*
- 5. Approximate water temperature at the time of the request.*

6. *The substrate of the stream bottom at the project site, 100 yd (91 m) upstream of the site, and 100 yd (91 m) downstream of the site. A bedrock substrate is not necessarily beneficial for spawning areas. However, silt, sand, or small gravel is more readily usable. Spawning locations which are downstream of the project may more likely be impacted by disturbances than such locations which are upstream. Sediments may cover eggs.*

A waiver of a portion of the in-channel excavation restriction will be cause for the Department to adjust contract times accordingly. Final approval of the waiver will be made by the Department. Such approval will not occur until the contract time adjustment is agreed upon.

107-C-208 USE OF CONES IN LIEU OF DRUMS

(Adopted 03-30-07)

SECTION 107, BEGIN LINE 416, DELETE AND INSERT AS FOLLOWS:

Pavements and shoulders having an edge drop of more than 3 in. (75 mm) shall be delineated with drums in accordance with 801.09. Delineation shall be at a maximum spacing of 200 ft (60 m). The use of cones in accordance with 801.08 will be permitted ~~during daylight hours in lieu of drums~~ *as shown on the plans except cones shall not be used for interstate lane restrictions.*

SECTION 801, BEGIN LINE 259, DELETE AND INSERT AS FOLLOWS:

Cones shall be made of a material to withstand impact without damage to striking vehicles. They shall have a substantial base to restrict overturning. Cones and tubular markers shall be as shown on the plans.

Cones shall be used only during temporary activities where portability is advantageous and they remain in place and do not create a hazard to traffic. The use of cones in lieu of drums will be permitted ~~during daylight hours unless otherwise directed~~ *as shown on the plans except cones shall not be used for interstate lane restrictions.*

Tubular markers shall be used for separating two-lane two-way traffic as shown on the plans or as directed.

Cones and tubular markers shall be secured in place either by weighting or adhesives. The use of metal bases will not be permitted.

107-R-169 STATEMENTS ABOUT EXISTING CONDITIONS OF UTILITIES, ADDITIONAL
RIGHT-OF-WAY, AND ENCROACHMENTS

(Revised 02-18-08)

The Standard Specifications are revised as follows:

SECTION 107, AFTER LINE 740, INSERT AS FOLLOWS:

107.26 Existing Conditions of Utilities, Additional Right-of-Way, and Encroachments

Such existing conditions are as described below.

(a) Utilities

The status of all utility companies and organizations potentially involved with the work to be performed are described below as known at the time this contract was prepared.

*The Facilities of Shelby Energy Cooperative INC. **do not** exist within the limits of this Contract, but are not expected to be affected by the proposed construction. If questions arise, David Martin of the utility may be contacted at 502-643-0900.*

*The Facilities of Vectren Energy **do** exist within the limits of this Contract, but are not expected to be affected by the proposed construction. If questions arise, Paul J. Schroeder of the utility may be contacted at 812-948-4954.*

*The Facilities of Duke Energy **do** exist within the limits of this Contract. It is anticipated that they will adjust their facilities for construction on or before September 1, 2010. If questions arise, Brad Hora of the utility may be contacted at 812-265-6610.*

*The Facilities of Verizon Communications **do** exist within the limits of this Contract. It is anticipated that they will adjust their facilities for construction on or before Contract start and after Duke Electric's relocation is complete. If questions arise, Mark Weichman of the utility may be contacted at 812-522-0254*

*The Facilities of Carrollton Utilities **do not** exist within the limits of this Contract, but are not expected to be affected by the proposed construction. If questions arise, Terry Roach of the utility may be contacted at 507-732-7055*

*The Facilities of Kentucky Utilities **do** exist within the limits of this Contract. The utility will be able to complete its involvement with the Contract when the Contractor has provided final plans to Kentucky Utilities so that they may develop relocation plans for its Poles and Equipment in the location of The Bridge and Ferry. Upon approval of the relocation plan, KYTC will provide an agreement to Kentucky Utilities for reimbursement of these relocation costs. It is anticipated that the utility will take approximately 3 calendar days to adjust its facilities in this area. If questions arise, Paula Clifford of the utility may be contacted at 502-333-6611.*

*The Facilities of AT&T Communications **do** exist within the limits of this Contract. It is anticipated that they will adjust their facilities for construction while working with winning contractor to determine how to reconnect existing services. AT&T will relocate 1 pole with anchor and down guy and reconnect 1 existing service. If questions arise, Morgan Herndon of the utility may be contacted at 502-458-7312*

*The Facilities of Insight Communications **do** exist within the limits of this Contract. It is anticipated that they will adjust their facilities within 1 week of the 2 poles being relocated by Kentucky Utilities. If questions arise, Deno Barbour of the utility may be contacted at 502-664-7395.*

*The Facilities of City of Milton, Water and Sewer **do** exist within the limits of this Contract, but are not expected to be affected by the proposed construction. If questions arise, Dan Purvis of the utility may be contacted at 502-268-5223*

*The Facilities of Time Warner Cable **do not** exist within the limits of this Contract and are not expected to be affected by the proposed construction. If questions arise, Mardy Osterman of the utility may be contacted at 812-265-5499.
(Utility determining if conflicts will arise at this time)*

*The Facilities of the City of Madison **do** exist within the limits of this Contract, but are not expected to be affected by the proposed construction. If questions arise, Randy Eggenpiller of the utility may be contacted at 812-265-8312..
(Utility unresponsive at this time)*

(b) Right-of-Way

There is no involvement of additional right-of-way for the contract.

(c) Encroachments

There is no involvement of encroachments for the contract.

(d) Other Noteworthy Conditions

There are no other noteworthy conditions which may affect the prosecution and progress of the contract.

(e) Preconstruction Conference Notification

The Contractor shall provide notification during the preconstruction conference about known corrections to or omissions of the information presented in 107.26(a) through 107.26(d) above. Otherwise, notification shall be provided as required in 105.06. Notifications regarding such corrections or omissions shall not alleviate the Contractor's inquiry or interpretation obligations as contained in 120 IAC 3-6-6.

108-C-091 FAILURE TO COMPLETE ON TIME FOR RESTRICTION

(Revised 08-21-06)

The Standard Specifications are revised as follows:

SECTION 108, AFTER LINE 543, INSERT AS FOLLOWS:

The work specified shall be arranged and prosecuted such that traffic is restricted on US 421 for not longer than the number of calendar days shown on the Proposal sheet.

If the necessary work is not completed and US 421 is not reopened to unrestricted traffic within the number of calendar days for restriction shown on the Proposal sheet, \$25,000.00 will be assessed as liquidated damages, not as a penalty, but as damages sustained for each calendar day for which traffic on US 421 remains restricted in excess of the number shown on the Proposal sheet.

Extension of restriction time, if required, shall be in accordance with 108.08.

108-C-095 FAILURE TO COMPLETE ON TIME FOR CALENDAR COMPLETION DATE

(Revised 09-01-05)

The Standard Specifications are revised as follows:

SECTION 108, DELETE LINES 521 THROUGH 533.

SECTION 108, AFTER LINE 534, INSERT AS FOLLOWS:

If the necessary work is not completed on or before the Substantial Completion of Project date shown on the Proposal sheet, \$2,500.00 will be assessed as liquidated damages, not as a penalty, but as damages sustained, for each calendar day that the contract is not complete.

If the contract is not completed on or before the contract completion date shown on the Proposal sheet, \$2,500.00 will be assessed as liquidated damages, not as a penalty, but as damages sustained, for each calendar day that the contract is not complete.

If the necessary work for Substantial Completion is not completed on or before the contract completion date shown on the Proposal sheet, then liquidated damages will be assessed cumulatively for exceeding the contract completion date.

Extension of contract time, if required, shall be in accordance with 108.08.

108-C-192 TEMPORARY EROSION CONTROL MEASURES

(Revised 03-20-08)

The Standard Specifications are revised as follows:

SECTION 108, BEGIN LINE 107, DELETE AND INSERT AS FOLLOWS:

An amended Erosion Control Plan shall be submitted in accordance with 327 IAC 15-5 for those areas not included in the Department submittal or as necessary for changes initiated by the Contractor. Items to include consist of sequencing of operations, stockpile sites, equipment storage sites, plant sites, ~~borrow and disposal areas~~, and haul roads as well as any revision to the Department's submittal. All appropriate erosion control items shall be in place prior to disturbing the project site. A copy of the amended plan shall be provided to the Engineer.

Borrow and disposal sites shall be in accordance with 203.08.

For areas in Indiana, the Contractor shall submit the planned sequencing of erosion and sediment control measures to be used on the project to:

<i>IDEM</i>	<i>Indiana Dept. of Transportation</i>
<i>Rule 5 Coordinator</i>	<i>Senior Environmental Manager</i>
<i>100 N. Senate Avenue</i>	<i>Room N642</i>
<i>Mail Code 65-42 Room 1255</i>	<i>100 N. Senate Avenue</i>
<i>Indianapolis, IN 46204</i>	<i>Indianapolis, IN 46204</i>

For areas in Kentucky, the Contractor shall be in compliance with KYTC Construction Memo 03-07 dated April 24, 2007 for all areas disturbed.

When required by 327 IAC 15-5, stockpile and storage sites shall be permitted by an IDEM Notice of Intent (NOI). The Contractor shall submit either a new IDEM NOI or revise the original NOI for the project. A copy of the new or revised NOI shall be submitted to the Engineer prior to any operations at a stockpile or storage site.

All information shall be submitted and approved prior to land disturbing activities. All appropriate erosion control items shall be in place prior to disturbing the project site. A copy of the amended plan shall be provided to the Engineer.

The Contractor shall designate one or more of its employees as an Erosion Control Supervisor. The Erosion Control Supervisor shall be responsible for the preparation, submittal, and ensuring receipt of the approval of the amended erosion control plan. Such individual(s) shall also be responsible for obtaining all other necessary permits including the wetland inspection and archaeological record check and field survey in accordance with 203.08, and for all environmental inspections. Such individual(s) shall oversee the installation of all erosion control measures and shall conduct ~~regular~~ weekly and post-event inspections and perform all other tasks related to the installation, maintenance, and removal of erosion control measures. The Erosion Control Supervisor shall accompany personnel from IDEM or other governmental agencies, as required, during site visits by those agencies. ~~and~~ The Erosion Control Supervisor shall be responsible for completion of all reports in accordance with 205.

A minimum of 14 days prior to commencing work, the Contractor shall prepare and submit to the Engineer, for approval, an erosion control plan that includes, at a minimum, the following items:

- (a) Locations of all proposed soil stockpiles.*
- (b) Locations of all proposed equipment storage areas, fueling locations, construction trailers, batch plants, and designated concrete truck washout areas.*
- (c) Proposed construction sequence and phasing of erosion control measures.*
- (d) Location of all construction entrances where vehicles and equipment will enter and exit the site.*
- (e) Material handling and spill prevention plan, which shall include a list of expected materials that may be present on the site during construction operations, as well as a written description of how these materials will be handled to minimize the potential that the materials may enter the storm water runoff from the site.*
- (f) Statements that the erosion control measures for the project shall, at a minimum, be inspected on a weekly basis and within 24 h of every 1/2 in. (13 mm) rain event.*
- (g) Monitoring and maintenance plan for erosion control measures.*

The erosion control plan shall be signed by the Erosion Control Supervisor. The Engineer will submit the erosion control plan to the Department's Office of Environmental Services Permit Coordinator.

The name(s) of the ~~designated individual(s)~~ *Erosion Control Supervisor* shall be furnished the Engineer at, or prior to, the preconstruction meeting. Should the designated individual(s) need to be replaced during the contract, replacements shall be designated within seven calendar days and notification shall be furnished the Engineer.

Permanent erosion control measures shall be incorporated into the work at the earliest practicable time as the construction progresses to stabilize the site.

In order to minimize pollution to bodies of water, the practices and controls set out below shall be followed.

- (a) When work areas are located in or adjacent to bodies of water, such areas shall be separated by a dike or other barrier to keep contained. Sediment disturbance of these bodies of waters shall be minimized during the construction and removal of such barriers.*
- (b) All waterways shall be cleared as soon as practicable of false-work, temporary piling, debris, or other obstructions placed during construction operations.*

- (c) Water from aggregate washing or other operations containing sediment shall be treated by filtration, a settling basin, or other means sufficient to reduce the sediment content.
- (d) Pollutants such as fuels, lubricants, asphalt, sewage, wash water, or waste from concrete mixing operations, and other harmful materials shall not be discharged into existing bodies of water.
- (e) All applicable regulations and statutes relating to the prevention and abatement of pollution shall be complied with in the performance of the contract.

SECTION 108, AFTER LINE 177, INSERT AS FOLLOWS:

The cost of preparation of the erosion control plan shall be included in the cost of the various erosion and sediment control items.

SECTION 205, AFTER LINE 33, INSERT AS FOLLOWS:

Temporary erosion control measures shall be placed as soon as possible. Silt fence and sediment traps shall be installed prior to beginning earth disturbing activities.

Temporary seeding shall be placed on disturbed areas that are expected to be undisturbed for over 7 days or as directed by the Engineer.

Check dams shall be installed as soon as possible in areas of construction. Once ditches are to grade, permanent erosion control measures shall be placed as soon as possible and no later than 5 workdays after ditch grading is completed. During construction, if ditch flow patterns change, erosion control measures may need to be moved or adjusted so that no areas are left unprotected.

Pipe end sections and anchors shall be placed when the structure is installed. If the pipe end sections or anchors cannot be placed at the same time, temporary riprap splashpads shall be placed at the outlets of the pipes until the pipe end sections or anchors can be placed.

SECTION 205, AFTER LINE 108, INSERT AS FOLLOWS:

(o) Stable Construction Entrance

The Contractor shall provide a stable construction entrance at the points where construction traffic will enter onto an existing road. This entrance shall be a minimum of 12 ft wide, 50 ft long, and constructed of 12 in. of No. 2 stone. The radii shall be large enough to accommodate the vehicles utilizing the entrance. Additional stone may be required, as directed, to maintain the usefulness of the stable construction entrance. Where there is insufficient room for a stable construction entrance, other measures shall be taken to prevent the tracking of sediment onto the pavement.

SECTION 205, AFTER LINE 118, DELETE AND INSERT AS FOLLOWS:

205.04 Maintenance

Temporary erosion and sediment control measures shall be inspected by the Contractor's *Erosion Control Supervisor* once every seven days and after ~~each rain activities~~ activity. Inspections shall be documented and records shall be maintained by the Contractor, to be made available for review upon request. Records shall include, at a minimum, the date, the inspector's name, the maintenance and corrections needed based on this inspection, and the status of previously identified deficiencies. The temporary protection measures shall be returned to good working conditions within 48 hours after inspection or as directed. Sediment shall be removed as approved and disposed of in accordance with 201.03 and 203.08. *Inspection records shall be kept until the entire contract is complete and has been permanently stabilized.*

SECTION 205, AFTER LINE 148, INSERT AS FOLLOWS:

No. 2 stone for stable construction entrances will be measured by the ton (megagram) in accordance with 109.01(b).

SECTION 205, LINE 166, INSERT AS FOLLOWS:

for at the contract unit price per each unit installed. No. 2 stone for stable construction entrances will be paid for at the contract unit price per ton.

SECTION 205, AFTER LINE 176, INSERT AS FOLLOWS:

No. 2 Stone..... TON (Mg)

SECTION 205, AFTER LINE 213, INSERT AS FOLLOWS:

The cost of constructing, maintaining, and removal of the stable construction entrance shall be included in the cost of No. 2 stone.

108-C-209 REPORTING SUBCONTRACT PAYMENTS

(Adopted 07-11-07)

The Standard Specifications are revised as follows:

SECTION 108, AFTER LINE 28, INSERT AS FOLLOWS:

The Contractor shall submit monthly reports, in a format approved by the Department, of all payments made to subcontractors. Reports shall be submitted no later than 10 days after the end of each month in which a subcontractor is paid for work on the contract. Reports shall include any release of retainage payments made to subcontractors.

109-C-212 PROJECT ESTIMATE ADJUSTMENT

(Adopted 07-27-07)

The Department's construction record management software generates partial payment estimates based on the total contract, inclusive of all projects within the contract. In the event that one or more projects within the contract has a total dollar value less than zero for any given partial payment period, the software will not generate a partial payment estimate for the total contract. If this occurs, the Engineer will apply a project estimate adjustment in order to generate a total contract partial payment estimate.

A project estimate adjustment will initially be a positive dollar amount of a value that will adjust a negative project partial payment estimate to zero for the given partial payment period.

After application of the project estimate adjustment, the Engineer will track the affected project to determine when sufficient additional work has been completed to offset the project estimate adjustment amount. At that time, the Engineer will apply a second project estimate adjustment to the project. The second project estimate adjustment will be a negative dollar amount of a value that will adjust the project estimate adjustment item to a balance of zero for the project.

The Engineer will apply project estimate adjustments as described above as often as necessary during the life of the contract in order to generate total contract partial payment estimates. The final quantity of the project estimate adjustment item will be zero prior to final payment.

The contract unit price for project estimate adjustment will be one dollar.

Payment will be made under:

Pay Item	Pay Unit Symbol
Project Estimate Adjustment.....	DOL

109-C-213 CONTRACT LIENS

(Adopted 07/27/07)

Upon receipt of a claim under Indiana Code 8-23-9-26, the Department will retain out of the amount due the Contractor the amount of the claim. The amount to be retained will be withheld from partial payment estimates until the total amount of the claim has been retained.

In order to retain an amount when required by the code, the Engineer will apply a negative quantity to the contract liens pay item for the actual dollar amount of the claim. Upon resolution of the claim, the Engineer will post a positive quantity to the contract liens pay item equal to the amount originally retained. The final quantity of the contract liens pay item will be zero prior to final payment.

The contract unit price for contract liens will be one dollar.

Payment will be made under:

Pay Item	Unit Symbol
Contract Liens.....	DOL

109-C-219 PG ASPHALT BINDER MATERIAL COST ADJUSTMENTS

(Revised 12-11-08)

The Standard Specifications are revised as follows:

SECTION 109, AFTER LINE 643, INSERT AS FOLLOWS:

109.05.3 PG Asphalt Binder Material Cost Adjustments

The Contractor shall elect at the time the bid proposal is submitted, in a manner determined by the Department, whether or not to enact PG asphalt binder material cost adjustments. If the Contractor elects not to enact such adjustments, there will be no adjusted payment made to the Contractor for changes in the cost of PG asphalt binder materials used on the project and the provisions of this specification will not be applied to the contract. PG asphalt binder material cost adjustments will not be added to the contract at any time after the Contractor has elected not to enact such adjustments with submittal of the bid proposal.

When the Contractor elects to enact PG asphalt binder material cost adjustments at the time the bid proposal is submitted, the Department will adjust payment to the Contractor due to an increase or decrease in the cost of PG asphalt binder material used on the project to produce HMA mixtures that are paid in accordance with 304, 401, 402, 410, 610 or 718. Payment will be adjusted when an increase or decrease in the PG asphalt binder index for the contract exceeds 10 percent. Payment will only be adjusted when the total original or revised quantity of at least one HMA pay item exceeds 2,000 tons (2,000 Mg).

For contracts without any original HMA pay item quantity equal to or greater than 2,000 tons (2,000 Mg), adjusted payment will not be made until the revised quantity of at least one HMA pay item meets the quantity criteria. No adjusted payment will be made on any quantity of HMA items placed prior to when the 2,000 ton (2,000 Mg) criteria has been met.

The Department will determine a PG asphalt binder index from one or more commercial services that provide regional indices. The PG asphalt binder index will be maintained by the Office of Materials Management and posted on the Department's website. The posting will include an explanation of how the index is determined. A monthly payment adjustment will be calculated for each HMA pay item placed on the contract during that month. The total PG asphalt binder adjustment applied to the contract each month will be the sum of the calculations for each HMA pay item. The payment adjustment for each HMA pay item will be calculated as follows:

For a price increase:

$$MPA = (Q \times Pb) / 100 \times LI \times [(BI - LI) / LI - 0.10]$$

For a price decrease:

$$MPA = (Q \times Pb) / 100 \times LI \times [(BI - LI) / LI + 0.10]$$

Where:

MPA = Mixture Payment Adjustment, in dollars, calculated to the nearest 0.01 dollar for each HMA pay item.

Q = Quantity of a HMA pay item placed, in tons (megagrams), entered to the actual 0.01 unit placed. The quantity will be calculated prior to calculation of any other quantity adjustment.

Pb = Percent of virgin asphalt binder from the DMF, in the adjustment period, or JMF for the HMA mixture, entered to the nearest 0.1.

BI = PG asphalt binder index for the month the HMA pay item is placed, reported to the nearest whole dollar.

LI = PG asphalt binder index for the contract. The LI for all original contract HMA pay items equals the BI for the month immediately prior to the month of letting for the contract. The LI for any HMA extra work pay item will be the BI for the month the unit price for the pay item is submitted by the Contractor.

The calculation of (BI-LI)/LI will be rounded to the nearest 0.001. Payment will only be adjusted when the absolute value of (BI-LI)/LI is equal to or greater than 0.101.

If HMA pay items are placed beyond the specified contract completion date for the contract, the Department will calculate pay adjustments on the BI for the month of the specified completion date or the month of placement, whichever result is less.

The unit price of PG asphalt binder payment adjustment will be one dollar and the pay quantities will be in units of dollars.

Payment will be made under:

<i>Pay Item</i>	<i>Pay Unit Symbol</i>
<i>Payment Adjustment, PG Asphalt Binder</i>	<i>DOL</i>

111-C-178 STOCKPILED MATERIALS

(Revised 04-08-09)

The Standard Specifications are revised as follows:

SECTION 111, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

be incorporated into the work and delivered in the vicinity of the project, or stored in approved storage facilities. Such materials shall be limited to structural steel, concrete structural members, ~~pavement reinforcement~~ *reinforcing bars*, pavement contraction joints, granular base and subbase materials, aggregates for HMA and concrete pavements, and structural supports for signals, signs, and luminaires.

In addition to the aforementioned, the Department will consider the stockpiling of other steel products, such as guardrail, culvert pipe, etc if it has been determined that a critical shortage of material would cause delay to the project.

SECTION 111, BEGIN LINE 115, DELETE AS FOLLOWS:

Approval of partial payment for stockpiled materials will not constitute final acceptance of such materials for use in completing the work. Structural steel members and ~~pavement reinforcement~~ *reinforcing bars* may be subjected to additional inspection and testing prior to final acceptance and incorporation into the work. All other stockpiled pay items will be subjected to additional inspection and testing prior to final acceptance and incorporation into the work.

200-R-401 RECYCLED FOUNDRY SAND

(Revised 01-12-07)

Description

Recycled foundry sand (RFS) consist of a mixture of residual materials used from ferrous or non-ferrous metal castings and natural sands. The Contractor shall have the option of incorporating RFS into applicable operations in accordance with 105.03.

Materials

RFS sources are to be selected from the Department's list of approved Foundry Sand Sources. RFS may be substituted for B borrow (211) or Borrow (203) upon the approval of the Department's Geotechnical Section.

The Contractor shall provide the Engineer with a copy of the Material Safety Data Sheet (MSDS) and a copy of the Indiana Department of Environmental Management's (IDEM) waste classification certification for Type III or IV residual sands prior to use. IDEM certification and MSDS shall clearly identify the stockpiles with regard to their extent and geographical location.

The Contractor shall provide the Engineer with a type A certification in accordance with 916 for RFS prior to use of the materials. The type A certification shall consist of applicable laboratory tests results of gradation and permeability. Consultants on the Department's list of approved Geotechnical Consultants shall perform the testing of RFS materials.

RFS use is restricted to the following additional requirements:

1. RFS derived from Type III residual sand shall not be permitted within 30 m (100 ft) horizontally, of a stream, river, lake, reservoir, wetland or any other protected environmental resource area.
2. RFS derived from Type III or Type IV residual sand shall not be placed within 50 meters (150 ft), horizontally, of a well, spring, or other ground source of potable water.
3. RFS shall not be permitted adjacent to metallic pipes, or other metallic structures.
4. RFS shall not be used as encasement material.
5. RFS shall not be used in MSE wall applications.

If RFS is used in embankment, excavation and replacement operations as a replacement for B borrow or borrow, the following additional requirements shall be considered.

1. Borrow: RFS shall be in accordance with 903.
2. B borrow: RFS shall be in accordance with 211.

Construction Requirements

RFS shall be transported in a manner that prevents the release of fugitive dust and loss of material. Adequate measures shall be taken during construction operations to control fugitive dust from RFS. RFS shall not be applied when wind conditions create problems in adjacent areas or create a hazard to traffic on any adjacent roadway. The spreading of RFS shall be limited to an amount that can be encased within the same workday. If weather causes stoppage of work or exposes the RFS to washing or blowing, additional RFS may be spread when the work resumes. Spraying with water, limewater, or other sealing type sprays will be considered to be acceptable methods for dust control.

When RFS is used as borrow or B borrow, compaction of the materials shall be in accordance with the respective uses in 203. If compaction operations are deemed to be insufficient, the Contractor shall arrange with the Department's Geotechnical Section, to develop and conduct alternative compaction means. Nuclear density testing of RFS is not allowed.

When RFS is used in embankment construction, the sideslopes of the RFS shall be encased with 1 ft (0.3 m) of borrow materials. The encasement materials shall be placed and compacted concurrently with the RFS lifts. Encasement materials not meeting the AASHTO M 145 Classifications of A-4, A-5, A-6, and A-7 shall be submitted to the Department's Geotechnical Section for approvals.

Method of Measurement

RFS applications will be measured in accordance to the respective uses for borrow or B borrow.

Basis of Payment

RFS will be paid for at the contract unit price in accordance to the respective uses for borrow or B borrow.

No payment will be made for the transportation, handling, or any special construction requirements such as alternative compaction means or encasement activities, when using RFS materials.

The cost of the use of water, limewater, sprays, or other activities necessary for dust control, shall be included in the cost of the respective pay item.

The cost of geotechnical testing for the use of RFS materials shall be included in the cost of the respective pay item.

RECYCLED FOUNDRY SAND SOURCES APPROVAL CRITERIA

The following procedures covers the requirements for Foundry Sand source approvals or otherwise prescribed subject matter to be added, maintained and removed from a Department's approved list.

Products covered by the procedures may involve hazardous materials, operations, and equipment. These procedures do not purport to address all of the safety problems associated with the use of the product. The source's responsibility is to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

General Requirements

1. A source, requesting approval for addition to a Department's list, shall provide to the Material and Tests Division the following:
 - (a) Name and location of source or manufacturer,
 - (b) List of material and specification reference for the material that the approval is being requested,
 - (c) Average monthly production of the material by size, type or grade,
 - (d) Name, address and telephone number of responsible contact person,
 - (e) Facility layout or production process of the material,
 - (f) Quality parameters of the material,
 - (g) Raw material sampling and testing frequency,
 - (h) Procedures for conforming materials which provides a positive linkage between the furnished materials and the quality control test data,
 - (i) Procedures for non-conforming materials,
 - (j) Procedures for marking and tracking materials,
 - (k) Procedures for documentation maintenance,
 - (l) Finished material sampling and testing frequency,
 - (m) Procedures for reviewing and updating the source operations,
 - (n) Testing laboratory quality system,
 - (o) Names, titles and qualifications of sampling and testing personnel,
 - (p) Location and telephone number of the laboratory testing office,
 - (q) Laboratory equipment and calibration frequency,
 - (r) Test methods, procedures and laboratory equipment used for each type of material,
 - (s) Sample management describing procedures for samples identification, maintenance of the samples prior to testing, sample retention and disposal of samples,
 - (t) Testing report procedures,
 - (u) Methods used to identify improper test results and procedures followed when testing deficiencies occur,
 - (v) Statistical analysis of test results, and
 - (w) Maintenance of test records.

The application shall be signed and dated by the source's or manufacturer's representative at the time it is submitted for acceptance. The application shall be maintained to reflect the current status and revisions shall be provided to the Department in writing.

2. Testing may be required which will be performed outside the Department's laboratories. A recognized laboratory shall be the following:
 - (a) A State transportation agency testing laboratory,
 - (b) A testing laboratory regularly inspected by the AMRL, or
 - (c) A testing facility approved by the Department

Approval Requirements

In addition to the general requirements, the source shall also submit the following to the Materials and Tests Division.

- (a) A current MSDS and summary of results of all specified tests for the previous year's production shall be submitted. No test results shall be more than two years old at time of submission.
- (b) Name of Testing Facility
- (c) Dates Samples were obtained
- (d) Dates Samples were tested
- (e) Test method used for IDEM classification
- (f) Letter from IDEM indicating the waste classification of the materials.
- (g) Test results for Leachate
- (h) Test results for Microtox™ in accordance with ITM 215
- (i) Stockpile sampling locations, including depths and available historical testing results.
- (j) Gradation test results
- (k) Hydraulic conductivity (permeability) test results
- (l) Recycled Foundry Sand Source Certification

The Recycled Foundry Sand source certification is included as Attachment A. A new approval submission shall be required when re-sampling is required in accordance with 329 IAC 10-9-4(e)(3). (In accordance with 329 IAC 10-9-4 (e)(3) for foundry waste, re-sampling is conducted: at two year intervals; whenever the process changes; or according to a schedule for re-sampling by the IDEM Commissioner based on variability noted in previous sampling and other factors affecting the predictability of waste characteristics.)

When metal concentration of the Type III residual sand exceeds 80% of the allowable limits within IDEM classification, an indemnification clause is required and a "Recycled Foundry Sand (RFS) Indemnification Clause" is included as Attachment B. Residual sand shall be analyzed for metal concentration using Microtox™ (ITM 215) test criteria.

Maintaining Approval

Test reports shall be generated in accordance with specification requirements for the material and submitted monthly to the Materials and Tests Division. If the material is not produced by the source in a given month, the monthly submittal shall state:

“No _____ was manufactured during _____.”
Material month/year

Samples of material may be obtained randomly for verification at the source or at the point of incorporation into the work in accordance with 106.02.

The source shall provide written notification of any changes, revisions or updates of their operations, MSDS, source name or address, contact person or product name to the Materials and Tests Division.

To maintain approval, a summary of new stockpile test results for Microtox™ testing in accordance with ITM 215, and the acceptance analysis will be submitted monthly indicating testing on a lot-by-lot basis. Tested and approved RFS stockpiles shall be properly signed for easy identification. If no new stockpiles are created in a given month, a letter indicating, "no new RFS stockpiles for month/year were created" shall be submitted to the Materials and Tests Division.

Removal From Approved List

A source will be removed from the approved list for the following, but not limited to, reasons:

- (a) Test failures determined by Department verification sampling,
- (b) Monthly test reports not provided for three consecutive months,
- (c) Test reports generated by the source which show non-compliance with specification requirements, and
- (d) Performance of product no longer meets intended purpose.

ATTACHMENT A

RECYCLED FOUNDRY SAND (RFS) SOURCE CERTIFICATION

This is to certify recycled foundry sand (RFS) stockpiles geographically located as follows:

RFS _____

RFS was produced by the _____
Company located in _____ (City), and _____
(State) and was shipped for use on Indiana Department of Transportation projects is Type _____ (III or IV) material according to IDEM's restricted waste criteria and that the material has passed Microtox™ (ITM 215) test criteria. If any metal concentration exceeds 80% of the allowable limits for a Type III the foundry shall provide the Department with an acceptable indemnification clause. The _____ RFS source also agree that processes and stockpiles associated with the production of such RFS may be inspected and sampled at regular intervals by properly identified representatives of the Department or a duly assigned representative.

_____ (Date of Signing) _____
(RFS Producer)

_____ (Title)
_____ (Signature)

State of _____) SS:
County of _____)

Subscribed and sworn to before me by
_____ of the firm of
_____ this _____ day of
_____ 20__.

_____ Notary Public
My Commission Expires: _____

This certification has been reviewed and approved by:

_____ Date
(Materials and Tests Division representative)

ATTACHMENT B

RECYCLED FOUNDRY SAND (RFS) INDEMNIFICATION CLAUSE

_____ RFS producer shall indemnify, defend, exculpate, and hold harmless the State of Indiana, its officials, and employees from any liability of the State of Indiana for loss, damage, injury, or other casualty of whatever kind or to whomever caused, arising out of or resulting from a violation of the federal or Indiana Occupational Safety and Health Acts (OSHA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or any other environmental law, regulation, ordinance, order or decree (collectively referred to hereinafter as "Environmental Laws"), as a result of the supply, testing, and application of residual sand or other materials supplied under this Contract by _____ source, whether due in whole or in part of the negligent acts or omissions of: (1) _____ Foundry, its agents, officers, or employees, or other persons engaged in the performance of the contract; or (2) the joint negligence of them and the State Of Indiana, its officials, agents, or employees.

This contract shall include, but not be limited to, indemnification from: (1) any environmental contamination liability due to the supply, testing, and application of residual sand in road base, embankments, or other projects designated by the Department as agreed to by the parties, and (2) any liability for the clean up or removal of residual sand, or materials incorporating such sand, pursuant to any Environmental Law.

The RFS producer also agrees to defend any such action on behalf of the State of Indiana, to pay all reasonable expenses and attorneys fees for such defense, and shall have the right to settle all such claims. Provided, however, that no liability shall arise for any such fees or expenses incurred prior to the time that _____ Foundry shall have first received actual and timely written notice of any claim against the State which is covered by this Indemnification Agreement. If timely written notice of any claim hereunder is not received by _____ Foundry, and _____ Foundry is thereby prejudiced in its ability to defend or indemnify, then to the extent of such prejudice, this Indemnification Agreement shall be void.

This Indemnification Agreement does not create any rights in any third party, and is solely for the benefit of the State Of Indiana and its agents, officials, and employees.

201-C-052 CLEARING RIGHT-OF-WAY

(Revised 09-01-05)

The Standard Specifications are revised as follows:

SECTION 201, AFTER LINE 174, INSERT AS FOLLOWS:

The initial payment for clearing right-of-way will be limited to 1% of the original total bid. If the contract lump sum price for clearing right-of-way is greater than 1% of the original total bid, the amount over 1% will be paid when the contract work is 50% complete, or when the clearing work is complete, whichever is later.

203-R-550 APPROVAL OF BORROW AND DISPOSAL SITES

(Adopted 03-20-08)

The Standard Specifications are revised as follows:

SECTION 201, BEGIN LINE 3, INSERT AS FOLLOWS:

201.01 Description

This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris, except such objects as are designated to remain or are to be removed in accordance with other sections of these specifications, within the construction limits shown on the plans. If no construction limits are shown, the right-of-way and easement areas will be the construction limits. This work shall include the preservation from injury or defacement of all vegetation and objects designated to remain. *Disposal of material shall be in accordance with 203.08.*

SECTION 201, BEGIN LINE 43, DELETE AND INSERT AS FOLLOWS:

Unless burned in accordance with the requirements herein, perishable materials and debris shall be removed from the right-of-way and disposed of ~~at locations off the construction site and outside the limits of view from the traveled roadway in accordance with 203.08. If permitted, sod. Sod~~ may be disposed of within the right-of-way, but outside the construction limits, ~~if permitted. Written permission shall be obtained from the property owner on whose property the materials and debris are to be placed. All necessary arrangements shall be made with the owner for obtaining suitable disposal locations. The cost involved shall be included in the contract price of pay items.~~

SECTION 202, BEGIN LINE 13, DELETE AND INSERT AS FOLLOWS:

202.02 General Requirements

All buildings and foundations in accordance with 202.06, structures, fences, tanks, and other obstructions, any portions of which are on the right-of-way shall be razed, removed, and disposed of, except utilities and those features for which other provisions have been made for removal. Designated salvageable material shall be removed without unnecessary damage in sections or pieces which may be transported readily and shall be stored at specified places within the project limits or as otherwise designated. ~~Unless otherwise permitted and except~~ *Except* for regulated materials, which ~~are defined in~~ *shall be disposed of in accordance with 104.06*, and bridge painting debris which is subject to 619, non-salvageable material shall be disposed of in accordance with 203.08 ~~State, Federal, and local regulations.~~

~~Unregulated material that may be disposed of on private property, other than approved landfill sites, shall only be done with written approval of the Engineer and the property owner with appropriate permits and shall be outside the limits of view from the traveled roadway. Copies of all agreements with property owners shall be furnished. Unsuitable material shall be removed from cisterns, septic tanks, other tanks, basements, and cavities. The disposition of this material shall be in accordance with all applicable and current State, Federal, and Local Regulations.~~

SECTION 203, BEGIN LINE 49, DELETE AND INSERT AS FOLLOWS:

203.08 Borrow or Disposal

Borrow shall consist of approved material required for the construction of embankments or for other portions of the work and shall be obtained from approved locations and sources outside the right-of-way. Borrow material shall be free of substances that will form deleterious deposits, or produce toxic concentrations or combinations that may be harmful to human, animal, plant or aquatic life, or otherwise impair the designated uses of ~~the~~ a stream or area. Unless otherwise designated in the contract, arrangements shall be made for obtaining borrow. Borrow, as designated herein, shall not include material excavated beyond the right-of-way limits at intersecting public roads, private and commercial drive ~~approaches, nor approaches and~~ material furnished as B borrow.

Disposal of waste material, other than regulated material, from within the right-of-way shall only be allowed at approved locations either within or outside the right-of-way. Disposal of regulated material shall be in accordance with 104.06.

~~Proposed borrow sites and proposed disposal sites for excavated material shall be identified before such material is excavated or disposed of within or outside the right-of-way.~~

~~Except where a permitted or a licensed commercial site or a permitted site is utilized for borrow or disposal, the Contractor shall obtain all permits required by local, state and federal laws prior to the start of any operations at the site.~~

Licensed commercial sites and permitted sites are defined as follows:

- (a) A licensed commercial site is a solid waste facility with a current IDEM or Kentucky Energy and Environment Cabinet (KEEC) operation number.*
- (b) A permitted site is a location that is operated under permits required by local, state and federal laws for the activities proposed by the Contractor. A permitted site shall also have documentation that a wetlands delineation and an archaeological survey have been performed by qualified professionals.*

For proposed borrow or disposal sites other than licensed commercial or permitted sites, an inspection of areas outside the construction limits shall be conducted by a qualified wetland professional approved by the Department to determine if wetlands are present on the site. An approved wetland professional shall be prequalified with the Department to perform environmental services work type 5.4 Ecological Surveys or shall be certified by the Society of Wetland Scientists as a wetland professional-in-training or professional wetland scientist.

A list of approved wetland professionals is maintained on the Department's website. This The wetlands inspection shall be in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. The inspection shall also determine if isolated wetlands as defined by the IDEM are present. The Contractor shall submit a document, signed by the wetland professional, verifying that the site has been inspected for the presence of wetlands in accordance with the federal manual and for isolated wetlands and, if any are present, specifying the area to be demarcated as jurisdictional waters and/or wetland. The Contractor shall demarcate in a method approved by the Engineer the boundary of all wetlands identified within the proposed borrow or disposal site. Once the area to be used for borrow or for disposal of excavated material has been shown not to contain jurisdictional or isolated wetlands, the boundary of the area cleared shall be demarcated. The methods of demarcation shall be as approved by the Engineer.

For proposed borrow or disposal sites other than licensed commercial or permitted sites, a qualified archaeologist shall perform a record check and field survey to determine if any significant archaeological sites exist within the proposed site. The Indiana Department of Natural Resources Division of Historic Preservation and Archeology and Kentucky Heritage Council maintain a roster of qualified archeological consultants. If any archaeological sites are identified, the archaeologist shall establish the limits of the site along with a reasonable border. The Contractor shall demarcate in a method approved by the Engineer the border of all archeological sites identified within the proposed borrow or disposal site.

Identified archeological sites shall not be disturbed unless the site is cleared by established procedures and written authorization to enter the site has been obtained by the Contractor. Under no circumstances shall an employee of the Contractor or the State of Indiana share in the ownership or profit from the sale of any archaeological artifacts that may be salvaged.

The Department maintains a list of professional consultants who are prequalified to perform various types of work. A qualified wetland professional shall be a professional consultant who is prequalified with the Department to perform Environmental Services work type 5.4 Ecological Surveys, or is certified by the Society of Wetland Scientists, SWS, as a wetland professional in training or professional wetland scientist. The Department's list of prequalified professional consultants is located at <http://www.in.gov/dot/div/legal/rfp/eligiblefirms.xls>.

Previously approved sites may be utilized for borrow or disposal operations if the Contractor furnishes a valid permit or document signed by a wetland professional prior to utilizing the site.

Borrow and disposal sites shall be approved by the Engineer prior to the start of any earth disturbing operations at the site. A request for approval of a borrow or disposal site shall be submitted to the Engineer a minimum of 14 days prior to the Contractor's planned start of operations at the site. All requests for approval of a borrow or disposal site shall include a description of the Contractor's planned operations at the site. In the case of disposal sites, the description shall include a listing of the types of material to be disposed of at the site.

A request for approval of a licensed commercial site shall include the following:

- (a) The name and address of the facility.*
- (b) The IDEM or KEEC operating number.*
- (c) The expiration date of the IDEM or KEEC operating permit.*

A request for approval of a permitted site shall include the following:

- (a) Name of the site owner.*
- (b) Address of the site.*
- (c) A list of the permits, permit numbers and permit expiration dates for all permits under which the site operates.*
- (d) Documentation that a wetlands delineation and an archaeological survey have been performed by qualified professionals.*

A request for approval of a site, other than a licensed commercial or permitted site, shall include the following:

- (a) Name of the property owner.*
- (b) Address or location of the site.*
- (c) A copy of a right-of-entry obtained from the property owner. Rights-of-entry shall include rights for access by Department personnel to the site for the purposes of monitoring, measurement and sampling.*
- (d) A site plan showing the site location, site dimensions, adjacent property and right-of-way lines, all demarcated jurisdictional wetlands or isolated wetlands, all demarcated archeological sites, existing and proposed finished contours and proposed finished slope grades.*
- (e) A site operations plan detailing the operations proposed for the site, what equipment will be utilized, how the site will be accessed and any other information relevant to the operation of the site.*
- (f) A copy of the Rule 5 Notice of Intent, if required under 327 IAC 15-5.*
- (g) An erosion control plan for the site including the types of erosion control measures to be incorporated and the sequencing of the measures in respect to the operations plan for the site.*
- (h) Documentation signed by a wetlands professional verifying that the site has been inspected for the presence of both wetlands and isolated wetlands and, if any are present, specifying the area to be demarcated as jurisdictional or isolated wetlands.*
- (i) Documentation of the archeological record check and field survey signed by a qualified archeologist including the limits and border of any archeological site discovered.*
- (j) Copies of all other permits obtained by the Contractor to perform operations at the site.*

The Contractor shall provide the Engineer a minimum of 14 days notice prior to opening borrow areas for the purpose of obtaining original cross section elevations and measurements and to sample the borrow material prior to use.

The Contractor shall install temporary erosion and sediment control measures at borrow or disposal sites other than licensed commercial and permitted sites prior to the start of any earth disturbing activity. ~~If the Contractor elects to use the site, all required permits shall be obtained.~~ The Contractor shall develop and construct all mitigation measures necessary to ~~and fulfill all the requirements detailed by such of all permits obtained by the Contractor for operation of a borrow or disposal site.~~ The Contractor shall also obtain written permission from the land owner for Department personnel to access the site for monitoring.

No excavation shall occur or no material shall be disposed of ~~beyond~~ within the boundaries of the demarcated wetlands and archeological areas unless the operations are in compliance with all required permits and these specifications.

No extension of completion time will be granted due to any delays by the Contractor in securing approval of borrow or disposal sites.

~~Before borrow or disposal operations are begun, the Contractor shall submit operation plans for approval. Such plans shall include the following:~~

- ~~(a) a detailed sketch showing the limits relative to property and right of way lines;~~*
- ~~(b) the grade of all slopes;~~*
- ~~(c) an erosion control plan in accordance with the requirements of 327 IAC 15-5;~~*
- ~~(d) the encasement, finished grading, and seeding procedures; and~~*
- ~~(e) archaeological clearance.~~*

~~Notice shall be given in advance of opening borrow areas so that cross section elevations and measurements of the ground surface after stripping may be taken and the borrow material may be tested before being used.~~

~~Except when a commercial source is utilized, a qualified archaeologist shall perform a record check and field survey of borrow or disposal limits to determine if any significant archaeological sites are within the limits. Results of the record check and survey shall be furnished in writing prior to the excavation of any material. If any archaeological sites are identified, the archaeologist shall establish the limits of the site along with a reasonable border. The site shall not be disturbed unless the archaeological site is cleared by established procedures and written authorization to enter the site has been issued. Under no circumstances shall an employee of the Contractor or the State of Indiana share in the ownership or profit from the sale of any archaeological artifacts that may be salvaged. No extension of completion time will be granted due to any delays in securing approval of a borrow or disposal site.~~

Approval of a proposed borrow or disposal site by the Engineer, whether the proposed site is commercial, permitted, or otherwise, shall not relieve the Contractor of its responsibility to utilize an appropriate site and to comply with all Local, State and Federal laws and regulations.

SECTION 203, BEGIN LINE 286, DELETE AND INSERT AS FOLLOWS:

203.10 Disposal of Excavated Material Except Waterway and Peat Excavation

Excavation material shall be used for the construction of embankments, shoulders, special fill, or other places as may be specified or directed, depending on the nature of the material. Excavated material that is suitable for embankment construction that is not required for maintenance of traffic shall be placed in the embankment before placing any borrow material, unless otherwise authorized in writing.

If more material is excavated from within required cut slopelines than is needed to construct embankments or special fills, the excess may be used to widen embankments, flatten fill slopes, or be used otherwise as directed. All excess excavated material that cannot be used constructively within the project limits shall be disposed of off the right-of-way in accordance with ~~201.03~~ and 203.08.

Excavation obtained from the right-of-way and planned to be used in fills may be wasted and replaced with borrow with no additional payment only after written permission is obtained. All required samples of the borrow or the excavation materials involved shall be furnished with no additional payment.

203.11 Disposal of Waterway Excavation

Unless otherwise provided, material resulting from waterway excavation shall be used ~~to fill old channels and~~, if suitable, in embankment, special fill, and approach embankments, or any combination of these, as specified or directed.

~~A~~ Any portion of waterway excavation *material* which is unsuitable for the above uses, ~~a~~ any portion which is suitable but is in excess of that required for such uses, or if ~~when~~ locations for such ~~disposal~~ *uses* are not available, the ~~disposal~~ *material* shall be *disposed* of in accordance with ~~201.03~~ 203.08.

203.12 Disposal of Peat

All material removed as peat excavation, removed or displaced by machine operation, or displaced by the advancing backfilling material shall be ~~uniformly spread between the toes of fill slopes and the swamp ditches or beyond, or otherwise~~ disposed of in accordance with 203.08.

206-B-113 GENERAL BRIDGE REQUIREMENTS

(Revised 04-08-09)

The Standard Specifications are revised as follows:

SECTION 206, BEGIN LINE 139, INSERT AS FOLLOWS:

206.08 Preparation of Foundation Surfaces

Excavation for foundations on rock without piles shall extend a minimum of 2 ft (600 mm) into solid rock. All rock or other hard material, if

SECTION 702, AFTER LINE 21, INSERT AS FOLLOWS:

Concrete in superstructure, integral bents, and railings shall be class C. Concrete in bent caps, unless poured integrally with the superstructure; pier caps; abutment caps; pier stems; abutment walls; mudwalls; columns; crashwalls; collision walls; and wingwalls, unless poured with integral end bents, shall be class A. Concrete in footings shall be class B.

SECTION 702, BEGIN LINE 582, DELETE AND INSERT AS FOLLOWS:

Forms for exposed concrete edges shall be ~~filleted and chamfered as shown on the plans and~~ 1 in. (25 mm). Forms shall be given a bevel or draft ~~for~~ in the case of all projections, such as girders and copings, to ensure easy removal.

SECTION 702, BEGIN LINE 1483, INSERT AS FOLLOWS:

The cost of forms, polyvinyl chloride deck drains, falsework, falsework piling, centering, expansion joints, waterproofing, curing, finishing, and necessary incidentals shall be included in the cost of the pay items. The cost of placing epoxy resin adhesive on existing concrete surfaces shall

SECTION 703, BEGIN LINE 55, INSERT AS FOLLOWS:

703.06 Placing and Fastening

Reinforcing bars shall not be ordered for piers or bents to be founded on soil or rock until the foundation conditions have been investigated. The bottom elevations of such footings will then be determined. Written permission will then be given to order such reinforcing bars. Sufficient excavation and all necessary soundings shall be made as directed so that exact bottom elevations of footings may be determined.

All dimensions shown on the plans for spacing of reinforcing bars apply to

SECTION 707, AFTER LINE 200, INSERT AS FOLLOWS:

Voids in precast concrete members shall be formed of approved material. Voids shall be vented during curing. All voids shall be drained by means of an approved method.

SECTION 707, LINE 219, INSERT AS FOLLOWS:

face and top of the curb section shall be finished in accordance with 702.21. The outside faces of fascia beams and the tops of all beams shall be sealed in accordance with 702.21. Such faces shall not be rubbed.

400-R-553 HMA PROVISIONS

(Revised 04-1-10)

The Standard Specifications are revised as follows:

SECTION 401, BEGIN LINE 46, INSERT AS FOLLOWS:

ESAL CATEGORY	ESAL
1	< 300,000
2	300,000 to < 3,000,000
3	3,000,000 to < 10,000,000
4	10,000,000 to < 30,000,000
5	≥ 30,000,000

QC/QA HMA may be produced as warm-mix asphalt, WMA, by using a water-injection foaming device for ESAL category 1, 2 and 3 mixtures. The DMF shall list the minimum plant discharge temperature for HMA and WMA as applicable to the mixture.

SECTION 401, BEGIN LINE 135, INSERT AS FOLLOWS:

A maximum of 15.0% RAP or 3.0% ARS by weight (mass) of the total mixture may be used in ESAL category 3, 4, or 5 surface mixtures and open graded mixtures. The RAP recycled material for the ESAL category 3, 4, or 5 surface mixtures shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.

A maximum of 25.0% RAP or 5.0% ARS by weight (mass) of the total mixture may be used in WMA for ESAL category 1, 2 and 3 mixtures except ESAL category 3 surface mixtures.

SECTION 401, BEGIN LINE 158, INSERT AS FOLLOWS

401.08 Job Mix Formula

A job mix formula, JMF, shall be developed by a certified HMA producer. A JMF used in the current or previous calendar year that was developed to N_{des} will be allowed. The mixture compaction temperature shall be $300 \pm 9^{\circ}F$ ($150 \pm 5^{\circ}C$) for dense graded mixtures and $260 \pm 9^{\circ}F$ ($125 \pm 5^{\circ}C$) for open graded mixtures. The JMF shall list the minimum plant discharge temperature for HMA and WMA as applicable to the mixture. The JMF for each mixture shall be submitted to the Engineer and shall use the same MAF as the DMF.

SECTION 401, BEGIN LINE 493, INSERT AS FOLLOWS:

If the Lot PWL for any one of the properties is less than 50 or a subplot has an air void content less than 1.0% or greater than 7.0%, the lot will be referred to the Office of Materials Management for adjudication as a failed material in accordance with normal Department practice as listed in 105.03.

SECTION 401, BEGIN LINE 622, INSERT AS FOLLOWS:

401.20 Appeals

If the QC test results do not agree with the acceptance test results, a request, along with the QC test results, may be made in writing for additional testing. The appeal sample will be analyzed in a lab different than the lab that analyzed the original sample when requested by the Contractor. Additional testing may be requested for one or more of the following tests: MSG, BSG of the gyratory specimens, binder content, or BSG of the density cores.

The request for the appeal for MSG, BSG of gyratory specimens, binder content or BSG of the density cores shall be submitted within seven calendar days of receipt of the Department’s written results for ~~that~~ *the lot accepted under 401.19(a) or the subplot accepted under 401.19(b)*. The subplot and specific test(s) shall be specified at the time of the appeal request. Only one appeal request per *lot for mixture accepted under 401.19(a) or subplot for mixture accepted under 401.19(b)* is permitted. Upon approval of the appeal, the Engineer will perform additional testing as follows.

SECTION 402, BEGIN LINE 39, INSERT AS FOLLOWS:

Mixture Type	Type A	Type B	Type C	Type D
Design ESAL	200,000	2,000,000	9,000,000	11,000,000
Surface	9.5 mm	9.5 mm	9.5 mm	9.5 mm
	<i>12.5 mm</i>	<i>12.5 mm</i>	<i>12.5 mm</i>	<i>12.5 mm</i>
Surface – PG Binder	64-22	64-22	70-22	70-22
Intermediate	<i>12.5 mm</i>	<i>12.5 mm</i>	<i>12.5 mm</i>	<i>12.5 mm</i>
	19.0 mm	19.0 mm	19.0 mm	19.0 mm
Intermediate – PG Binder	64-22	64-22	64-22	70-22
Base	<i>19.0 mm</i>	<i>19.0 mm</i>	<i>19.0 mm</i>	<i>19.0 mm</i>
	25.0 mm	25.0 mm	25.0 mm	25.0 mm
Base – PG Binder	64-22	64-22	64-22	64-22

HMA may be produced as warm-mix asphalt, WMA by using a water-injection foaming device for temporary HMA mixtures and type A, B and C mixtures. The DMF shall list the minimum plant discharge temperature for HMA and WMA as applicable to the mixture.

SECTION 402, BEGIN LINE 119, INSERT AS FOLLOWS:

A maximum of 15.0% RAP or 3.0% ARS by weight (mass) of the total mixture may be used in type C and D surface mixtures. *The RAP recycled material for the type C and D surface mixtures shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95% to 100% passing the No. 4 (4.75 mm) sieve.*

A maximum of 25.0% RAP or 5.0% ARS by weight (mass) of the total mixture may be used in WMA for temporary HMA mixtures and type A, B and C mixtures except type C surface mixtures.

SECTION 410, BEGIN LINE 44, DELETE AND INSERT AS FOLLOWS:

410.05 SMA Mix Design

The DMF shall be determined for each mixture from a SMA mix design by a design laboratory selected from the Department’s list of approved Mix Design Laboratories. A SMA mixture shall be designed in accordance with AASHTO M 325 and R 35 46.

SECTION 410, BEGIN LINE 406, INSERT AS FOLLOWS:

410.20 Appeals

If the QC test results do not agree with the acceptance test results, a request, along with the QC test results, may be made in writing for additional testing. Additional testing may be requested for one or more of the following tests: binder content, gradation, or MSG of the mixture samples and bulk specific gravity of the density cores.

The appeal request shall be submitted within seven calendar days of receipt of the Department's written results for that subplot. The request for the appeal for MSG, BSG of the density cores or binder content and gradation shall be submitted within seven calendar days of receipt of the Department's written results for that subplot. The subplot and specific tests shall be specified at the time of the appeal request. Only one appeal request per subplot is permitted. Upon approval of the appeal, the Engineer will perform additional testing.

SECTION 902, BEGIN LINE 87, DELETE AND INSERT AS FOLLOWS:

The requirements for asphalt emulsions shall be in accordance with the following:

Characteristic ^{(1) (2)}	AASHTO Test Method	RS-2	HFRS-2	AE-90	AE-90S	AE-T	SS-1h	AE-150	AE-150L	AE-PL	AE-PMT ⁽⁶⁾	AE-PMP ⁽⁶⁾
Test on Emulsion												
Viscosity, Saybolt Furol at 25°C, min.	T 59			50			20	50				20+
Viscosity, Saybolt Furol at 25°C, max.	T 59					100	100		100	115	100	
Viscosity, Saybolt Furol at 50°C, min.	T 59	75	75		50			75				
Viscosity, Saybolt Furol at 50°C, max.	T 59	400	400					300				
Demulsibility w/35 mL, 0.02N CaCl ₂ , %, min.	T 59	50	50		30							
Demulsibility w/50 mL, 0.10N CaCl ₂ , %, min.	T 59			75		75					25+	25+
Oil Distillate by Distillation, mL/100 g Emul ⁽³⁾	T 59	4.0	4.0	4.0	3.0	4.0	4.0	7.0	7.0	3.0	3.0	3.0
Residue by Distillation, %, min.	T 59	68	68	68	65 ⁽⁵⁾	54	57	68	60	30		
Residue by Distillation, % max.	T 59					62			65			
Sieve Test, %, max.	T 59	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Penetrating Ability, mm, min.	902.02(w)									6		
Stone Coating Test, %	902.02(t)3a			90				90	90			
Settlement, %, max.	T 59	5	5	5								
Storage Stability, %, max.	T 59				1							
Asphalt Content by Distillation at 204°C, %, min.											54	45
Asphalt Content by Distillation at 204°C, %, max.											62	
Tests on Residue												
Penetration (0.1 mm) at 25°C, 100g, 5 s, min. ⁽⁴⁾	T 49	100	100	100	90	50	40				50	300+
Penetration (0.1 mm) at 25°C, 100g, 5 s, max. ⁽⁴⁾	T 49	200	200	200	150	200	90				200	
Penetration (0.1 mm) at 25°C, 50g, 5 s, min. ⁽⁴⁾	T 49							100	100			
Penetration (0.1 mm) at 25°C, 50g, 5 s, max. ⁽⁴⁾	T 49							300	300			
Ductility at 25°C, mm, min.	T 51	400	400	400		400	400					
Solubility in Org. Sol., %, min.	T 44	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5
Float Test at 50°C, s, max. ⁽⁴⁾	T 50											
Float Test at 60°C, s, min. ⁽⁴⁾	T 50		1200	1200	1200	1200		1200	1200			
Force Ratio	T 300				0.3							
Elastic Recovery, at 4°C	T 301				58							
Polymer Content by Infrared											1.5+	1.5+

Notes: (1) Broken samples or samples more than 10 days old will not be tested.
 (2) Combined percentage of the residue and oil distillate by distillation shall be at least 70% (note the different units - ml for oil and % for residue).
 (3) Oil distillate shall be in accordance with ASTM D 396, table 1, grade no. 1
 (4) The Engineer may waive the test.
 (5) Maximum temperature to be held for 15 minutes 200 ± 5°C.
 (6) Asphalt shall be polymerized prior to emulsification.

400-R-565 FULL DEPTH PAVEMENT CORING FOR PAVEMENT INVENTORY

(Adopted 06-25-09)

Prior to the start of any pavement work, the Contractor shall obtain full depth pavement cores from each lane of pavement within the project limits.

One core shall be obtained for each 5 lane-mile segment, or any portion thereof, in each direction. Core locations within each segment will be determined by the Engineer. Coring operations shall only be performed when the Engineer is present to witness the operation and take possession of the cores. A core log and photograph of the core shall be produced and given to the Engineer showing the pavement layers composition and depths.

Core holes shall be filled and compacted with HMA base or intermediate mixture Type B in accordance with 402.04.

Full depth pavement coring will not be measured for payment.

The cost of full depth pavement coring, including the cost of HMA mixtures, backfilling and compacting shall be included in the cost of the pay item for mobilization and demobilization.

Coring in addition to the minimum amount required by the frequency stated in this specification will be paid for in accordance with 104.03. Final payment will not be made until a core log and photograph is given to the Engineer.

408-R-564 SEALING CRACKS AND JOINTS

(Adopted 05-21-09)

The Standard Specifications are revised as follows:

SECTION 408, BEGIN LINE 9, INSERT AS FOLLOWS:

408.02 Materials

Materials shall be in accordance with the following:

Asphalt Emulsion for	
Crack Sealing, AE-90, AE-90S, AE-150.....	902.01(b)
Asphalt Binder for Crack Sealing, PG 64-22.....	902.01(a)
Fine Aggregates, No. 23 or 24	904
Joint Sealing Materials.....	906.02

SECTION 408, BEGIN LINE 30, DELETE AND INSERT AS FOLLOWS:

408.05 Routing and Filling Cracks and Joints

Cracks and joints shall be routed when specified, with a ~~vertical spindle router with carbide-tipped or diamond router bits~~ routing machine capable of cutting a uniform shape to form a reservoir not exceeding 0.5 0.75 in. (13 19 mm) wide with a minimum depth of 0.75 in. (19 mm). The operation shall be coordinated such that routed materials do not encroach on pavement lanes carrying traffic and all routed materials are disposed of in accordance with 104.07. Cracks and joints shall be filled with asphalt rubber to within 0.25 in. (7 mm) of the surface in accordance with the manufacturer's recommendations.

SECTION 507, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

507.02 Materials

Materials shall be in accordance with the following:

Asphalt Emulsion AE-90, AE-90S, AE-150.....	902.01(b)
<i>Asphalt Binder for Crack Sealing, PG 64-22.....</i>	<i>902.01(a)</i>
Dowel Bars.....	910.01(b)10
Fine Aggregates, Size No. 23 or 24	904
Joint Sealing Materials.....	906.02
Rapid Set Patching Materials.....	901.07

SECTION 507, BEGIN LINE 25, DELETE AND INSERT AS FOLLOWS:

(a) Routing, Cleaning and Sealing

Cracks in PCCP shall be routed and cleaned when specified. Cracks shall be routed with a vertical-spindle router with carbide-tipped or diamond router bits routing machine capable of cutting a uniform shape to form a reservoir not exceeding 0.5 0.75 in. (13 19 mm) wide with a minimum depth of 0.75 in. (19 mm). The operation shall be coordinated such that routed materials do not encroach on pavement lanes carrying traffic and all routed materials are disposed of in accordance with 104.07. The cracks shall be cleaned with compressed air or by other suitable means. Air compressors shall be capable of producing a minimum air pressure of 100 psi (690 kPa). Water blasting shall not be utilized.

SECTION 507, BEGIN LINE 46, DELETE AND INSERT AS FOLLOWS:

(b) Cleaning and Filling

The cracks shall be cleaned by blowing with compressed air or by other suitable means when specified. Air compressors shall be capable of producing a minimum air pressure of 100 psi (690 kPa). Water blasting shall not be utilized.

Cracks shall be filled with asphalt ~~emulsion~~ *material*. The cracks shall be completely filled or overbanded not to exceed 5 in. (125 mm), or as required. Asphalt ~~emulsion~~ *material* shall be placed utilizing a “V” shaped wand tip, to allow the penetration of the materials into the cracks. The filled cracks shall be covered with sufficient fine aggregate to prevent tracking of the asphalt ~~emulsion~~ *material*. All excess cover material shall be removed from the pavement.

Application of asphalt ~~emulsion~~ *material* shall be completed without covering existing pavement markings. When traffic is to be maintained within the limits of the section, temporary traffic control measures in accordance with 801 shall be used. Treated areas shall not be opened to traffic until the asphalt emulsion has set.

601-R-338 GUARDRAIL BLOCKOUTS

(Revised 09-01-05)

In lieu of the wood blockouts currently allowed by the specifications, blockouts may be selected from the following list. The blockouts shall be dimensioned as tested and shall be used with the type of guardrail as tested in accordance with NCHRP 350. If selected from the list, the blockouts shall be accompanied by a certification from the manufacturer stating the blockouts furnished have the same chemistry, mechanical properties, and geometry as those certified to have passed the NCHRP 350 crash test and have been certified by the Federal Highway Administration to be acceptable for use on NHS facilities.

Blockouts from the following list may be used interchangeably with wood blockouts as long as the line and grade of the face of the guardrail is true to that shown on the plans and the conditions of the first paragraph above are met.

Manufacturers wishing to have blockouts placed on the following list shall furnish the Department copies of the NCHRP 350 test results and a letter from the Federal Highway Administration approving them for use on NHS facilities. Such information shall be forwarded to the Standards Manager, Indiana Department of Transportation, Room N642, 100 N. Senate Avenue, Indianapolis, IN 46204-2216.

Anro Block

Anro Timber Products, Inc.
7887 Ashwood Dr. SE
Ada, Michigan 49301
(616) 682-4518

Dura-Bull

Creative Building Product
Div. of Spirit of America Corp.
4307 Arden Drive
Fort Wayne, IN 46804
(800) 860-2855

Eco-Block

Eco-Composites LLC
17169 Hayes Road
Grand Haven, MI 49417
(616) 844-2001

King Block

Trinity Industries, Inc.
655 East Dixie Drive
Elizabethtown, KY 42701
(800) 282-7668

MONDO Block

MONDO Polymer Technologies
State Route 7
P.O. Box 250
Reno, OH 45773
(740) 376-9396

Polylumber PL6814R
RAMCO International
P.O. Box 9625
Pittsburg, PA 15226
(412) 494-0743

Polylumber PL5814R
RAMCO International
P.O. Box 56
Imperial, PA 15126

PBLOCK
R. G. Steel Corporation
P.O. Box 356
Rt. 551
Pulaski, PA 16143
(724) 656-1722

701-B-132 PILE DRIVING

(Revised 01-15-09)

The method for driving the piles will be by the formula specified in 701.05 and approved by the Department.

The pile and driving equipment form to be submitted by the Contractor is available on the Department's website.

The Department will approve the minimum time period required prior to the restrike of indicator pile or test pile as necessary for 70010.05(a), Dynamic Formula or 701-05 (b), Dynamic Pile Load Test.

701-B-154 OVERSIZED PREDRILLED PILE HOLES AND BENTONITE GROUT FOR
REDUCTION OF PILE DOWNDRAG

(Revised 01-15-09)

Description

This work shall consist of pre-drilling pile holes to the elevations and at the location shown on the plans, driving piles, and backfilling with bentonite grout.

Materials

Bentonite grout shall be untreated, sodium bentonite mined in South Dakota or Wyoming, finely ground with not more than 5% retained on the No. 200 (75 μ m) sieve. It shall be free of lumps and objectionable materials that would prevent easy mixing into a smooth fluid free of lumps of unmixed bentonite. Calcium bentonite will not be acceptable.

The following are acceptable suppliers of bentonite.

Baroid, Haliburton Services, Houston (281) 871-5900

Local distributors are:

IES Drilling Supply, Pearl City, IL (800) 388-2906

Hughes Supply, Indianapolis, IN (317) 543-3603

Laibe Supply, Indianapolis, IN (317) 231-2250

Cetco, Arlington Heights (847) 392-5800

Wyo-ben, Billings MT (406) 652-6351

Local distributors are:

- Midsouth Supply, Greenfield, IN (317) 894-2210
- Griffin Dewatering, Hammond, IN (219) 931-1662
- J Line Pump, Yorkville, IL (630) 553-5100
- Pump and Irrigation Supply, Evansville, IN (812) 985-3545

The grout shall be proportioned at 2 lbs (0.907 kg) of pure bentonite powder per 1 gal. (3.785 L) of potable water. Deviations from these proportions require approval of the Engineer.

Construction Requirements

The minimum diameter of the holes shall be 4 in. (100 mm) greater than the maximum cross sectional dimension of the pile. The holes shall be drilled to the elevations shown on the plans. The piles shall then be driven to the required penetration depth and nominal driving resistance. If pile sleeves are shown on the plans, the drilled holes shall be sleeved to maintain the opening during the driving of the piles.

Immediately after driving the piles, the annular space between the pile and the permanent casing or the pre-drilled hole shall be filled with the bentonite grout. The grout shall be emplaced at depths shown on the plans or as directed. The method of emplacement will be to fill the entire annular space from the bottom upwards to the top of the pile in one pumping operation using tremie pipe.

Tremie pipe construction shall include side discharge ports. Termination of the tremie pipe using a tee connection will be acceptable. Tremie pipe may be constructed of polyvinyl chloride, however, joints shall not be glued or cemented.

Method of Measurement

Predrilled pile holes will be measured by the linear foot (linear meter). Bentonite grout will not be measured.

Basis of Payment

Predrilled pile holes will be paid for at the contract unit price per linear foot (linear meter) for oversized predrilled pile holes.

Payment will be made under:

Pay Item	Pay Unit Symbol
Predrilled Oversized Pile Holes.....	LFT (m)

The costs of sleeves and sleeving, maintaining open holes during pile driving, bentonite grout, and placing bentonite grout and all miscellaneous materials and work shall be included in the cost of predrilled oversized pile holes.

727-B-012 CONCRETE REPAIR BY EPOXY INJECTION

(Revised 09-01-05)

The Standard Specifications are revised as follows:

SECTION 727, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 727 – CONCRETE REPAIR BY EPOXY INJECTION

727.01 Description

This work shall consist of furnishing all supervision, labor, materials, and equipment to structurally rebond concrete cracks, fractures, or delaminations by means of an epoxy injection system.

727.02 Approvals

Prior to the start of the work, the Contractor shall submit a certification which indicates that the firm has been engaged in this type of work for not less than five years. The certification shall also indicate that the personnel performing the repair shall have a minimum of five years experience with the epoxy injection system.

The epoxy injection system proposed for use shall be subject to approval prior to the start of the repair work. One copy of comprehensive preparation, mixing, and application instructions shall be furnished. Such instructions shall have been developed especially for use with the proposed epoxy injection system.

727.03 Construction Requirements

The location and extent of cracks to be repaired by epoxy injection will be determined. The work shall be performed with 2-component automatic metering and mixing equipment.

Concrete surfaces adjacent to the cracks shall be cleaned to the extent necessary to achieve adequate bond of the surface seal material. Entry ports shall be provided along the crack at intervals determined in the field to ensure full depth penetration of the injection resin. Surface seal shall be applied between entry ports, and on both faces of through cracks when possible.

Epoxy injection shall begin at the lower entry port and continue until there is an appearance of epoxy at the adjacent entry port. Injection shall continue until all cracks are completely filled. If port to port travel is not apparent, the work shall be stopped immediately. The Engineer shall be notified.

Upon completion of the injection, the adhesive shall be permitted to cure for sufficient time to permit removal of surface seal without draining or runback of material from the cracks. Surface seal material and injection adhesive runs or spills shall be removed from concrete surfaces. The face of the crack shall be finished flush to the adjacent concrete. The face of the concrete shall show no indentations or protrusions caused by the placement of entry ports.

727.04 Method of Measurement

Furnishing equipment for epoxy injection will not be measured for payment. Crack preparation for epoxy injection will be measured by the linear foot (meter) of prepared crack. Epoxy material will be measured by the gallon (liter) placed.

727.05 Basis of Payment

This work will be paid for at the contract lump sum price for epoxy injection, furnishing equipment. Crack preparation will be paid for at the contract unit price per linear foot (meter) for epoxy injection, crack preparation. Epoxy resin adhesive will be paid for at the contract unit price per gallon (liter) for epoxy injection, epoxy material.

Payment will be made under:

Pay Item Pay Unit Symbol

<i>Epoxy Injection, Crack Preparation</i>	<i>LFT (m)</i>
<i>60 Epoxy Injection, Epoxy Material.....</i>	<i>GAL. (L)</i>
<i>Epoxy Injection, Furnishing Equipment</i>	<i>LS</i>

SECTION 909, AFTER LINE 626, INSERT AS FOLLOWS:

909.12 Epoxy Resin Additives for Injection into Concrete

The epoxy resin adhesive shall be of low enough viscosity such that it flows to the next open port in the surface seal material. The adhesive shall be capable of penetrating crack widths down to 0.005 in. (125 μm). The adhesive shall be capable of bonding to dry or damp surfaces. The adhesive shall exhibit a slant shear strength exceeding the concrete strength when tested fully cured in accordance with AASHTO T 237.

The surface seal material shall have adequate strength to hold injection fittings firmly in place and to resist injection pressures adequately to prevent leakage during injection.

The epoxy resin adhesive for injection shall be covered by a type C certification in accordance with 916.

801-C-157 CERTIFICATION OF TEMPORARY TRAFFIC CONTROL DEVICES

(Revised 09-01-05)

Category 1 Devices

The Contractor shall certify that the following temporary traffic control devices to be used do not exceed the maximum values shown in the table below, and are considered crashworthy at Test Level 3 in accordance with National Cooperative Highway Research Program Report No. 350.

Device	Composition	Maximum Weight (Mass)	Maximum Height
Single Piece Traffic Cones	Rubber	20 lb (9 kg)	36 in. (920 mm)
	Plastic	20 lb (9 kg)	48 in. (1220 mm)
Tubular Markers	Rubber	13 lb (6 kg)	36 in. (920 mm)
	Plastic	13 lb (6 kg)	36 in. (920 mm)
Single Piece Drums	High Density Plastic	77 lb (35 kg)	36 in. (920 mm)
	Low Density Plastic	77 lb (35 kg)	36 in. (920 mm)
Delineators	Plastic, Fiberglass	N/A	48 in. (1220 mm)

No lights, signs, flags, or other auxiliary attachments are included in the weight (mass) of the devices listed above. Reflective sheeting or reflective buttons are included on delineators. Maximum weights (masses), including ballast, do not exceed the values shown in the table. "Single piece" refers to the construction of the body of the drum exclusive of a separate base, if any.

Type A or type C warning lights in accordance with the following specifications will be allowed on drums if they are firmly attached with vandal resistant 1/2 in. (13 mm) diameter by 4 in. (95 mm) cadmium plated steel bolt with nut and a 1 1/2 in. (38 mm) high cup washer.

1. The weight (mass) shall be no more than 5 lb (2.4 kg).
2. The lens diameter shall be 7 to 8 in. (180 to 200 mm).
3. The height of the light shall be 11 to 14 in. (270 to 340 mm).

Category II Devices

Category II temporary traffic control devices include type III barricades, vertical panels, portable sign standards, and other light-weight traffic control devices.

Category II temporary traffic control devices shall be in accordance with the NCHRP Report 350, test level 3.

A form will be provided at the pre-construction conference for the Contractor to complete and return to the Engineer prior to the placement of category I or II traffic control devices.

801-R-542 WORKSITE ADDED PENALTY SIGNS

(Revised 06-25-07)

Worksite Added Penalty signs shall be placed as shown in the plans or as directed by the Engineer. The signs shall typically be placed in advance of the first Road Construction Ahead signs at either end of the project. The actual location and quantity of the signs will be determined by the Engineer in coordination with the Worksite Traffic Control Supervisor.

805-T-078 ELECTRICAL INSULATION SEALANT

(Adopted 09-01-05)

The electrical insulation sealant for this contract shall be chosen from the following list:

- (a) Aquaseal
- (b) Electrical 430
- (c) 3M Electrical Insulation Putty
- (d) Plyseal Insulating Mastic
- (e) or approved equal

808-T-116 SNOWPLOWABLE RAISED PAVEMENT MARKERS

(Adopted 09-01-05)

Snowplowable raised pavement markers manufactured by the following companies will be considered approved to meet the requirements of this contract. The slots cut in the pavement shall be in accordance with the manufacturer's recommendations.

Stimsonite Corporation 6565 W. Howard Street Niles, Illinois 60714	Models detailed on Standard Sheets 808-MKRM-10 or 808-MKRM-11
Hallen Products Ltd. 39960 N. Millcreek Rd. Wadsworth, Illinois 60083.	Iron Star Model 664H

USE OF THE WORD CONTRACTOR

Whenever in these contract documents the word Contractor, per 101.15, is used, it shall be interpreted to be Design/Builder.

WORK HOURS

The Design/Builder shall be allowed to work 24 hours a day, 7 days a week as allowed by the City of Madison Noise Ordinance, which is included in the plan details attached with the Contract Information Book, and as noted below.

The Design/Builder will be required to shut down construction operations for the following days:

Madison Regatta	July 1-3, 2011
	July 6-8, 2012

No Truck traffic or materials will be allowed to enter or leave the work area for the following dates:

Nov 25-28 2010
 Dec 24-26 2010
 Dec 31, 2010

Jan 1, 2011
 May 28-30, 2011
 July 1-4, 2011
 Sept 3-5, 2011
 Nov 24-27 2011
 Dec 23-25 2011
 Dec 31, 2011

Jan 1, 2012
 May 26-28, 2012
 July 3-5, 2012
 Sept 1-3, 2012
 Nov 22-25, 2012
 Dec 24-25, 2012
 Dec 31, 2012
 Jan 1, 2013

Local Noise Restrictions

No person shall pay for, use or operate any machine or device nor any other machine or tool that produces sound, nor shall any person operate any motor vehicle that contains a modified defective exhaust system, if such machine, tool or vehicle is located in or on any of the following:

1. Any public property, including any public right-of-way, highway, building, sidewalk, or public space, park or thoroughfare, and the sound generated there from is:
 - a. Plainly audible 200 ft or more from its source; or
 - b. Is at a decibel level that is greater than the maximum sound level as listed in the table below;
 - c. Otherwise fits the definition of "plainly audible" as defined above.

MAXIMUM SOUND LEVELS			
Residential		Commercial	
Daytime	Nighttime	Daytime	Nighttime
65 dBA*	55 dBA*	75 dBA*	65 dBA*

*The dBA measurement is to be taken using a decibel meter at the complaining party's property line, or at least 60 feet from the property line of the source of the noise or sound. In addition, the dBA limitations apply, based upon from where the noise or sound originates; i.e., if the sound or noise originates from a residential area, then the 65 dBA/55 dBA limitation applies; if the sound or noise originates from a commercial area, then the 75 dBA/65 dBA limitation applies.

The sound or noise shall be measured while the normal entrance and exit doors of any business or commercial operation are closed. Increases in sounds or noises occurring while persons enter and exit a business or commercial operation, in the normal course of business, shall not constitute a violation of the dBA levels established herein.

Exemptions. The following are exempted from the provisions of this section:

- 2. Lawnmowers, weed blowers, garden tractors, construction and repair equipment, go-carts and power tools, when in good working order and properly muffled, if applicable, between the hours of 6:00 a.m. and 10:00 p.m. only.

FINAL AS-BUILT QUANTITIES

The Design/Builder shall provide reports of final as built quantities in Estimator format complete with item codes. The final as built quantities shall conform to applicable methods of measurement, pay items, and pay units. The final as built quantities shall be divided into the following reports:

Des. No. 0902256	Kentucky Bridge Span
Des. No. 0902256	Main Bridge Span
Des. No. 0902256	Indiana Bridge Span
Des. No. 0902256	Kentucky Road Approach
Des. No. 0902256	Indiana Road Approach

GEOTECHNICAL EVALUATION REPORT

A geotechnical evaluation report for the contract is available and posted on the project FTP portal. The Design/Builder shall review the document and implement all recommendations provided in the report.

COORDINATION OF PLANS, STANDARD SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, PLAN AND SPECIAL PROVISIONS

The Standard Specifications are revised as follows:

SECTION 105, BEGIN LINE 81, INSERT AND DELETE AS FOLLOWS:

105.04 Coordination of Plans, Standard Specifications, Supplemental Specifications, and Special Provisions.

These specifications, the supplemental specifications, the contract plans, Scope of Services, special provisions, and all supplementary documents are essential parts of the contract. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; and the following relationships apply:

Instruction to Bidders and description of pay items listed in the Schedule of Pay Items hold over:

Scope of Services
Special Provisions
Contract Plans
Supplemental Specifications
Standard Specifications

Scope of Services hold over:

Special Provisions
Contract Plans
Supplemental Specifications
Standard Specifications

Special Provisions hold over:

Contract Plans
Supplemental Specifications
Standard Specifications

Contract Plans hold over:

Supplemental Specifications
Standard Specifications

Supplemental Specifications hold over:

Standard Specifications

In case of discrepancy relative to other contract documents, the list of approved or Prequalified Materials will be regarded the same as supplemental specifications. Notes on the plans which are not also included in either the special provisions or among the general notes portion of the plans, and refer to payment, non-payment, or cost to be included in that of other pay items, will not govern over specifications. The precedence outlined herein shall not absolve the Design/Builder of its responsibility in accordance with 107.17.

Advantage shall not be taken of any apparent error or omission in the *Contract* plans, *Scope of Services*, or specifications. In the event such an error or omission is discovered, the Engineer shall be notified immediately. Such corrections and interpretations as may be deemed necessary for fulfilling the intent of the *contract* plans, *Scope of Services*, and specifications will then be made.

EXAMINATION OF CONTRACT PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND SITE WORK

The Design/Builder is required to attend the pre-bid meeting and one of the field checks. The Design/Builder is expected to examine carefully the site of the proposed work, contract plans, and scope of services before submitting a proposal. The submission of a bid shall be considered evidence that the Design/Builder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the contract plans and scope of services.

Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code, or Laws or Regulations in effect on the last day of receipt of Proposals except as may be otherwise specifically stated in the contract plans and Contract Documents.

PLANS AND WORKING DRAWINGS

The Standard Specifications are revised as follows:

SECTION 105, BEGIN LINE 25, DELETE AND INSERT AS FOLLOWS:

~~cofferdam plans, or other detailed drawings as may be required and as in accordance with 711.05 Special Provision "Shop Drawings" shall be furnished. The approval of such drawings will relate only to the requirements for strength and detail. Such approval will not relieve the Contractor from responsibility for errors, adequacy or safety of falsework, cofferdams, or other temporary work.~~

~~Authorized alterations will be endorsed on approved plans or shown on supplementary sheets. All work done or material ordered prior to the approval of such plans and drawings shall be at the risk of the Contractor.~~

~~Plans required for approval and for construction purposes shall be submitted as soon as practicable after contract award, and shall be drawn on vellum or similar material suitable for reproducing copies of working drawings by the white print process. No direct payment will be made for such tracings. When detailed plans for falsework, cofferdams, or other detailed drawings are submitted for approval as a witness or hold point, they shall be signed by and bear the seal of a registered professional engineer.~~

SHOP DRAWINGS

The Standard Specifications are revised as follows:

SECTION 105, BEGIN LINE 43, INSERT AS FOLLOWS:

Shop drawing approval shall be the responsibility of the Design/Builder. Drawings shall be 22 in. by 34 in. (560 mm by 860 mm) in overall size. The shop drawing approval shall be a hold point. The hold point shall require written notice of approval and submission of 1 set of approved shop drawings to the Engineer. The Engineer will release the hold point upon receipt of shop drawing approval and approved shop drawings. Fabrication, erection, and installation shall not begin until the hold point is released. Revisions to the approved shop drawings shall be considered as a witness point. The Design/Builder shall give verbal notice to the Engineer of shop drawing revision prior to approval of revised shop plans, and provide 1 set of approved shop drawings to the Engineer within 3 days of verbal notice.

SECTION 707, BEGIN LINE 51, DELETE AND INSERT AS FOLLOWS:

Submitted for approval in accordance with 105.02. The Design/Builder shall be responsible for shop drawing approval. Certified mill test reports shall be furnished for all high tensile strand. Fabrication shall not begin until the shop drawings are approved.

STRUCTURE NUMBERS

The bridge file numbers shown on the plans shall correspond to the structure numbers shown below:

Bridge File on Plans	Structure No.
Kentucky Approach Bridge	1
Main-Span Bridge	2
Indiana Approach Bridge	3
Ind. Pedestrian Bridge	4

BASIS FOR USE OF APPROVED OR PREQUALIFIED MATERIALS

The Standard Specifications are revised as follows:

SECTION 106, AFTER LINE 51, INSERT AS FOLLOWS:

The basis for use of materials shown in the List of Approved or Prequalified Materials will be the Engineer's verification that the materials provided are included in the List of Approved or Prequalified Materials.

MAXIMUM EQUIPMENT HEIGHT

The maximum equipment height allowed for use in construction is 280 feet above ground level. If any equipment exceeds this height, the Contractor shall be responsible for amending the FAA permit.

PERMITS

Indiana Department of Natural Resources

The "Construction in a Floodway" permit was issued by the Indiana Department of Natural Resources on April 22, 2010. The permit stipulates that the contractor shall conform to the General Conditions and the following Special Conditions:

1. Revegetate all bare and disturbed areas with a mixture of native grasses, wildflowers, and native shrub and hardwood species as soon as possible upon completion; do not use any varieties of Tall Fescue or other non-native species (e.g. crown-vetch).
2. Minimize and contain within the project limits interchannel disturbance and the clearing of trees and brush.
3. Do not work in the waterway from April 1 through June 30 without prior written approval of the Division of Fish and Wildlife.
4. Do not cut any trees suitable for Indiana bat roosting (greater than 3 inches diameter-at-breast height, living or dead, with loose hanging bark) from April 1 through September 30.
5. Do not excavate in the low flow area except for the placement of piers, foundations, and riprap, or removal of the old structure.

6. Use minimum average 6-inch graded riprap stone extended below the normal water level to provide habitat for aquatic organisms in the voids.
7. Plant native hardwood trees along the top of the bank and right-of-way to replace the vegetation destroyed during construction.
8. Post "Do Not Mow Or Spray" signs along the right-of-way.
9. Appropriately design and implement measures for controlling erosion and sediment to prevent sediment from entering the stream or leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized.
10. Seed and protect disturbed stream banks and slopes that are 3:1 or steeper with photo- or biodegradable heavy-duty erosion control blankets; follow manufacture's recommendation for installation; seed and apply mulch on all other disturbed areas.
11. Plant five trees, 1 inch to 2 inches in diameter-at-breast height, for each tree which is removed that is ten inches or greater in diameter-at-breast height; if this project results in the removal of 5 or more trees that are 10 inches or greater in diameter-at-breast height, an approvable mitigation plan must be developed in coordination with the south region environmental biologist. Note: Design/Builder shall work with the Department and agencies to resolve discrepancy with IDEM stipulation.
12. Install a silt curtain approved for use in large rivers around all in-stream excavation or fill areas prior to the beginning of in-stream activities to minimize the off-site and downstream movement of sediment-contaminated water; the silt-curtain must remain in place and be maintained in good working condition until the completion of all in-stream activities at the locations where in-stream excavation and/or fill will occur.
13. Restore all disturbed stream banks, including both at the bridge construction site and at the ferry location after the new bridge is opened and the ferry service is discontinued as soon as possible after completion of bridge project-related activities using bioengineering bank stabilization methods as described at <http://directives.sc.egov.usda.gov/17553.wba>; revegetate disturbed banks with native trees, shrubs, and herbaceous plants; restore stream bank slopes after project completion to stable-slope steepness not steeper than 2:1.
14. Place all excavated material landward of the floodway except for the material used as backfill as shown on the above referenced project plans on file at the Division of Water. For regulatory purposes, the floodway is defined as that shown on the Ohio River Floodway Map (transferred to a large scale map by the Division of Water), dated February 25, 2010 based on the US Army Corps of Engineers revised Floodway Sensitivity Study.
15. All work must conform with the existing bank at the upstream and downstream limits of the project site.
16. Do not leave felled trees, brush, or other debris in the floodway.

17. Upon completion of the project, remove all construction debris from the floodway.
18. Issuance of this Certificate does not constitute approval of any temporary causeways, coffer dams, runarounds, access bridges or borrow areas associated with the proposed bridge construction; separate written approval must be obtained from the Indiana Department of Natural Resources for these types of projects prior to beginning any work within the floodway.
19. Any equipment or cables placed on a public waterway must be clearly marked with navigation buoys described in 312 IAC 5-4 in a manner that would be visible to any watercraft operator in the area.
20. Any equipment or cables left in a public waterway in times of limited visibility must, in addition to the requirement listed above, be marked with flashing amber warning lights and reflective signage warning watercraft operators of the hazards.

Indiana Department of Environmental Management

The Section 401 "Water Quality Certification" permit was issued from the Indiana Department of Environmental Management on March 9, 2010 and modified on April 27, 2010. The permit stipulates that the contractor shall:

1. Submit a modification to the Section 401 Water Quality Certification for all dredging activities in the Ohio River. A separate modification is required for all cofferdam dewatering activities. The modification for dredging activities should be submitted 60 days prior to the initiation of dredging activities. The modifications should include the following information:
 - a) The actual quantity of dredged material to be removed.
 - b) The location of the dredge disposal area. This will be dependent upon the characterization of the dredged material (special waste, hazardous waste).
 - c) Sediment analysis report for the characterization of the dredged material.
 - d) Design plans for upland disposal areas including retention times and return water location if this is the selected course of disposal.
 - e) The location of the licensed waste disposal areas including the license number.
 - f) For cofferdam dewater, include the methods of cofferdam dewatering and return water discharge locations. Also include treatment methods for return water.
2. Install erosion control methods prior to any soil disturbance to prevent soil from leaving the construction site. Appropriate erosion control methods include, but are not limited to, straw bale barriers, silt fencing, erosion control blankets, phased construction sequencing, and earthen berms. Monitoring and maintain erosion control structures and devices regularly, especially after rain events, until all soils disturbed by construction activities have been permanently stabilized.

3. Install silt fence or other erosion control measures around the perimeter of any wetlands and/or other waterbodies to remain undisturbed at the project site.
4. Allow the IDEM commissioner or an authorized representative of the commissioner (including an authorized contractor), upon the presentation of credentials:
 - a) to enter your property, including impact and mitigation site(s);
 - b) to have access to and copy at reasonable times any records that must be kept under the conditions of this certification;
 - c) to inspect, at reasonable times, any monitoring or operational equipment or method; collection, treatment, pollution management or discharge facility or device; practices required by this certification; and any mitigation wetland site;
 - d) to sample or monitor any discharge of pollutants or any mitigation site.
5. Complete all approved discharges no later than 3 years of the date of the issuance of this Section 401 Water Quality Certification. The Design/Builder shall coordinate with the Department to request a 1 year extension to the Section 401 Water Quality Certification by submitting a written request 90 days prior to the deadline stated above, if necessary. The written request shall contain an account of which discharges and mitigation have been completed and list the reasons an extension is requested.
6. Ensure a silt curtain approved for use in large rivers is installed around all in-stream excavation or fill areas prior to the beginning of in-stream activities to minimize the off-site and downstream movement of sediment. The silt curtain must remain in place and be maintained in good working condition until the completion of all in-stream activities at the locations where in-stream excavation and/or fill will occur.
7. Ensure the trees being removed from the proposed staging area and ferry landing are replaced with a minimum of 15 containerized trees 3 in. in diameter. Note: Design/Builder shall work with the Department and agencies to resolve discrepancy with IDEM stipulation
8. Avoid impacts to the small forested stream channel located immediately downstream of the proposed ferry landing.
9. Allow no construction equipment, temporary run-arounds, coffer dams, temporary causeways, temporary crossings, or other such structures to enter or be constructed within the Ohio River, unless specifically stated, depicted, or detailed in the aforementioned correspondence and project plans. A modification of this Section 401 Water Quality Certification is required from the Indiana Department of Environmental Management if any of the aforementioned items are needed for project construction.

10. Remove any temporary causeway or other approved temporary structures used to facilitate construction or access upon completion of construction activities.
11. Restore the Ohio River stream banks impacted from causeway construction and the ferry landing with native vegetation.
12. Ensure that bridge removal activities in the Ohio River Navigational channel are completed within 24 hours, and that upon removal of demolition material from the navigation channel, removal of material from the non-navigational channel is to commence immediately and will continue during all normal work hours until removal is complete.
13. A sediment analysis report is being prepared by the Department on the proposed dredging materials. This report should be available to the Design/Builder by July 30, 2010.

Kentucky Division of Water

A Section 401 "Water Quality Certification" permit was issued by the Kentucky Division of Water on March 23, 2010. The permit stipulates that the contractor shall conform to the following general conditions for Water Quality Certification:

1. Limit work under this permit to:
 - a. The work associated with the strengthening of 2 existing piers below the Ordinary High Water Mark (OHWM) utilizing dredging, jet grouting within the river substrate, and covered by a layer of appropriately sized rip rap to address scour mitigation. Proposed dredging of the channel bed around the existing piers shall incorporate upland disposal of the dredged material.
 - b. The temporary construction of 2 cofferdams, which shall be constructed around Piers 3 and 4. Removal of the temporary cofferdams shall be accomplished in an attempt to remove any and all material utilized for their construction, once pier strengthening is complete.
 - c. The construction of a temporary ferry landing located at Ferry Street in Milton, Kentucky, using clean earthen fill material, which shall aid in the travel restraints imposed during the bridge reconstruction. All temporarily placed clean earthen fill material shall be removed from below the OHWM after project construction is complete. Proposed dredging within the temporary ferry landing shall include the removal and disposal of the dredged material into an approved upland location.
 - d. The construction of a temporary work platform located on the Kentucky bank, temporarily filling approximately 160 linear feet of the Ohio River below the OHWM. The temporary work platform shall consist of clean stone fill material and sheet pilings. All temporarily placed fill material shall be removed once project construction is complete.

2. Ensure all work performed under this certification shall adhere to the design and specifications set forth in the Application for Water Quality Certification received by the Kentucky Division of Water on January 22, 2010. All work performed under this certification shall also adhere to the design and specifications set forth in the U.S. Army Corps of Engineers Public Notice Number LRL-2010-90-sam, dated February 23, 2010.
 3. Coordinate with the Department to notify the Kentucky Division of Water, Water Quality Certification Section, at the start of project construction in accordance with the Clean Water Act.
 4. Coordinate with the Department to notify the Kentucky Division of Water, Water Quality Certification Section, once construction is complete in accordance with the Clean Water Act.
 5. Be responsible for preventing degradation of waters of the Commonwealth from soil erosion. An erosion and sedimentation control plan must be designed, implemented, and maintained in effective operating condition at all times during construction in accordance with the Clean Water Act.
 6. The Division of Water reserves the right to modify or revoke this certification should it be determined that the activity is in noncompliance with any condition set forth in this certification, in accordance with the Clean Water Act.
 7. If construction does not commence within two years of the date of this permit, this certification will become void. A letter requesting a renewal should be submitted in accordance with the Clean Water Act.
1. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
 2. All dredged material shall be removed to an upland location and/or graded on adjacent areas (so long as such areas are not regulated wetlands), to obtain original streamside elevations, i.e. overbank flooding shall not be artificially obstructed.
 3. In areas not riprapped or other wise stabilized, revegetation of stream banks and riparian zones shall occur concurrently with project progression. At a minimum, revegetation will approximate pre-disturbance conditions.
 4. To the maximum extent practicable, all in-stream work under this certification shall be performed during low flow.
 5. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize resuspension of sediments and disturbance to substrates and bank or riparian vegetation.

6. Any fill or riprap including refuse fill, shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.
7. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the Department shall notify the operator when work will be done.
8. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
9. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity, either from a spill or other forms of water pollution, the Kentucky Division of Water shall be notified immediately by calling 800/564-2380.
10. Other permits may be required from the Division of Water for this project. If this project takes place within the floodplain, and is not an exempt Federal transportation project, a permit may be required from the Surface Water Permits Branch. The contact person is Barry Elmore. If this project will disturb one acre or more of land, a KPDES general storm water permit will be required from the Surface Water Permits Branch. The contact person is Allen Ingram. Both can be reached at 502-564-3410.

Army Corps of Engineers

The Section 404 Permit was issued by the US Army Corps on May 24, 2010. The permit stipulates that the Design/Builder shall comply with the general conditions listed in the permit, in addition to the following special conditions:

1. If future operations by the United States require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice of the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
2. The permittee shall submit written notification to the USCG Louisville District office at least 45 days prior to dredging activities that documents the amount of dredged material to be removed, the method of dredging, and the dredged soil disposal site. A sediment control plan must also be provided for the disposal site.
3. Upon completion of construction, all temporary fill must be removed from the Ohio River and properly disposed of at an offsite upland disposal facility.

4. All disturbed areas on the banks of the Ohio River shall be restored with native vegetation once the project is complete and the temporary fill has been removed.

5. The applicant must comply with all Terms and Conditions identified in the Memorandum of Agreement among the Federal Highway Administration, the Advisory Council on Historic Preservation, the Indiana State Historic Preservation Officer, and the Kentucky State Historic Preservation Officer, signed February 17, 2010 concerning the US 421 Project Over the Ohio River Between Milton, Kentucky and Madison, Indiana.

6. The Completion Certification form accompanying the issued DA permit shall be completed and returned to the USCG Louisville office upon completion of the work.

US Coast Guard

A Coast Guard permit was issued on May 26, 2010. Navigation lighting requirements and vertical clearance gauges shall be installed as described in the permit and in the NAVIGABLE WATERWAYS AND COAST GUARD REQUIREMENTS. The Design/Builder shall comply with any conditions specified in this permit including the following:

1. No deviation from the approved plans may be made either before or after completion of the structure unless the modification of said plans has previously been submitted to and received the approval of the Commandant.

2. The construction of falsework, pilings, cofferdams or other obstruction, if required, and the scheme for constructing the bridge shall be in accordance with plans submitted to and approved by the Commander, Eighth Coast Guard District, prior to construction of the bridge. All work shall be so conducted that the free navigation of the waterway is not unreasonably interfered with and the present navigable depths are not impaired. Timely notice of any and all events that may affect navigation shall be given to the District Commander during construction of the bridge. The channel or channels through the structure shall be promptly cleared of all obstructions placed therein or caused by the construction of the bridge to the satisfaction of the District Commander, when in the judgment of the District Commander the construction work has reached a point where such action should be taken, but in no case later than 90 days after the bridge has been opened to traffic.

3. Issuance of this permit does not relieve the permittee of the obligation or responsibility for compliance with the provisions of any other law or regulation as may be under the jurisdiction of any federal, state or local authority having cognizance of any aspect of the location, construction or maintenance of said bridge.

4. Prior to commencement of construction, the permittee shall submit to the District Commander for approval, plans showing the final design chosen for the construction of the bridge. The final design chosen shall, at a minimum, provide the navigational clearances as shown on the approved plan sheets 2 and 3 (of 3) dated 12 March 2010. Failure by the permittee to adhere to any part of this condition renders this permit null and void.

5. Clearance gauges shall be installed and maintained in a good and legible condition by the Design/Builder when so required by the District Commander. The type of gauges and the locations in which they are to be installed shall be submitted to the District Commander for approval.

6. All parts of the existing to-be-replaced Milton-Madison (U.S. 421) Bridge across the Ohio River, mile 557.3, not utilized in the new bridge which are located within the waterway shall be removed down to or below elevation 408.0 feet, Mean Sea Level. All other parts shall be removed down to or below the natural ground line and the waterway cleared to the satisfaction of the District Commander. A period of 90 days subsequent to the opening to traffic of the new bridge, mile 557.3, will be allowed for such removal and clearance.

7. The permit approval hereby granted shall cease and be null and void unless construction of the bridge is commenced within three years and completed within five years after the date of this permit.

All construction activities shall be in accordance with issued permits. Modifications to permits by amendment shall be the responsibility of the Design/Builder. No increase in contract time will be allowed for permit amendments.

CRITICAL PATH METHOD SCHEDULE

The Standard Specifications are revised as follows:

SECTION 108, DELETE LINES 62 THROUGH 90.

SECTION 108, BEGIN LINE 178, INSERT AS FOLLOWS:

108.04.1 Critical Path Method Schedule

(a) General Requirements

Contractor shall provide a project schedule using the critical path method (CPM).

The CPM schedule shall show the various activities of work in sufficient detail to demonstrate a reasonable and workable plan to complete the work in the specified contract time.

The Contractor shall be responsible for ensuring that all work sequences are logical and that the schedule indicates a coordinated plan. The CPM schedule shall indicate the order and interdependence of activities and the sequence for accomplishing the work.

The CPM schedule shall include sufficient detail to allow the Engineer to readily identify the work and evaluate the progress of each activity. The CPM schedule shall include activities for all work to be performed by the Contractor, subcontractors and suppliers. The schedule shall also include activities specific to the project to be performed by the Department, other governmental bodies, regulatory agencies, utilities and any others necessary to complete the work.

The schedule shall reflect the scope of work, construction phasing, maintenance of traffic requirements, environmental requirements, utility coordination, coordination with other contractors, intermediate completion dates, the contract completion date, and any other work or milestones established in the contract. The schedule shall include activities for working and shop drawing preparation, Contractor submittals, submittal review time by the Department, material procurement and fabrication, and the delivery of materials, plant, and equipment and other similar activities.

Failure by the Contractor to include any element of work or to accurately reflect the relationships among the work activities required for performance of the Contract does not excuse the Contractor from completing all work within the specified time.

The Contractor shall submit to the Engineer the name of a project scheduler who shall be responsible for coordinating all CPM schedule requirements with the Engineer. The submittal shall include the following:

- a) Name of the proposed scheduler
- b) The number of years experience the proposed scheduler has in the construction industry
- c) The number of years experience the proposed scheduler has in the use of CPM scheduling software

The required documentation shall be submitted along with the initial CPM schedule.

(b) Definitions

The following definitions shall be applied to the terms used in this specification and shall not be taken to modify in any way the definitions in 101.02 through 101.74.

ACTIVITY - A discrete, identifiable task or operation that takes time, has a definable start and stop date, furthers the work's progress, and can be used to plan, schedule, and monitor a project.

ACTIVITY CALENDAR - A set of days assigned to a specific activity on which work for the activity may be scheduled.

ACTIVITY CALENDAR DAY - A day on which work is scheduled to be performed on a specific activity.

ACTIVITY IDENTIFICATION (ID) NUMBER - A unique, alphanumeric, identification code assigned to a specific activity.

ACTIVITY NETWORK DIAGRAM - A graphic representation of a CPM schedule, including a timescale, which shows the relationships among activities.

BAR CHART - A graphic representation of a schedule without relationship lines displayed. A timescale appears along the horizontal axis.

BASELINE SCHEDULE - An approved CPM schedule showing the original plan to complete the entire project.

CALENDAR DAY - As defined in 101.07.

CALENDAR ID - An alphanumeric identification code assigned to an activity calendar.

CONSTRAINT - A restriction imposed on the start or finish dates of an activity that modifies or overrides the activity's logic relationships.

CONTRACT COMPLETION DATE - The original date or revised date specified in the contract for completion of the project.

CONTROLLING ACTIVITY - The first incomplete activity on the Critical Path.

CRITICAL ACTIVITY - Any activity on the critical path.

CRITICAL PATH - The longest path of activities which determines the scheduled completion date of the project.

DATA DATE - The first day in an Initial, or Baseline, Schedule and the first day for performance of the work remaining in a Monthly Update Schedule or a Revised Schedule.

FINAL SCHEDULE - The last monthly update CPM schedule containing actual start and finish dates for every activity.

FREE FLOAT - The amount of time an activity can be delayed and not delay a successor.

INITIAL SCHEDULE - A schedule showing the original plan for the first 60 calendar days of work.

INTERMEDIATE COMPLETION DATE - A date specified in the contract for completion of an interim milestone, phase or other portion of the project.

MILESTONE - An activity with no duration that is typically used to represent the beginning or end of the project or an interim phase. Includes, but is not limited to, intermediate completion dates and the contract completion date.

MONTHLY UPDATE SCHEDULE - A CPM schedule produced by incorporating the project's actual progress into the Baseline Schedule or a revised schedule.

OPEN END - The condition that exists when an activity has either no predecessor or no successor, or when an activity's only predecessor relationship is a finish-to-finish or only successor relationship is a start-to-start.

ORIGINAL DURATION - The estimated time, expressed in activity calendar days, required to perform an activity.

PREDECESSOR - An activity that is defined by schedule logic to precede another activity. A predecessor may control the start or finish date of its successor.

RELATIONSHIP - The interdependence among activities. Relationships link an activity to predecessors and successors.

REMAINING DURATION - The estimated time, expressed in activity calendar days, required to complete an activity.

REVISED SCHEDULE - A CPM schedule that includes a significant modification to the schedule's logic or activity durations.

SCHEDULE - Activities organized by relationships to depict the plan for execution of a project.

SCHEDULED COMPLETION DATE - The completion date forecast by the CPM schedule. The schedule may also forecast intermediate completion dates for milestones, phases, or other portions of the project.

Successor - An activity that is defined by schedule logic to succeed another activity. The start or finish date of a successor may be controlled by its predecessor.

TOTAL FLOAT - The amount of time an activity can be delayed and not delay the contract completion date.

(c) Required CPM Schedule Submissions

1. Initial Schedule

The Contractor shall submit an initial schedule to the Engineer for approval no later than the day of the pre-construction conference. The submittal shall include a detailed schedule for the first 60 calendar days of work in accordance with 108.04.1(d) and a summary of activities for the balance of the contract in accordance with 108.04.

The schedule shall show milestones for intermediate and contract completion dates no later than those specified in the contract. All specified closure or restriction periods, non-work periods or any other time restrictions in the contract shall be addressed in the initial schedule. The initial schedule will be discussed at the pre-construction conference. No work within the project limits shall be performed until the initial schedule and required documentation for the project scheduler is submitted.

The Engineer will provide written notice within 7 calendar days after receipt of the initial schedule that the schedule is either approved or rejected or that additional information is requested. The Engineer's written notice will identify the reasons for rejection or what additional information is requested. Within 7 calendar days of the Engineer's written notice, the Contractor shall submit a corrected initial schedule that addresses the reasons for rejection and provides any additional information requested.

2. Baseline, Monthly Update and Revised Schedules

The Contractor shall submit a baseline CPM schedule in accordance with 108.04.1(d) no later than 45 calendar days after the first day of work.

If a baseline schedule is not submitted within the allotted time, the Engineer may order work on the project to be suspended until a baseline schedule is submitted. If the baseline schedule is not approved within 90 days of the first day of work, the Engineer may order work on the project to be suspended until a baseline schedule is approved.

The Contractor shall submit a monthly update CPM schedule in accordance with 108.04.1(d) no later than 7 calendar days after the end of each month during the contract beginning with the month after approval of the baseline schedule. The update schedule shall depict the status of the project at the end of the month just completed. The update schedule shall reflect a new data date, work performed up to, but not including the new data date, and the plan for completing the remaining work. If a monthly update schedule submittal is more than 30 days past due, the Engineer may order work on the project to be suspended until monthly update schedule submittals are current.

The Contractor shall submit a revised CPM schedule when any of the following occur:

- (a) A monthly update schedule projects a delay of 14 calendar days or more to an intermediate or contract completion date.
- (b) There is an actual delay in any critical activity of 7 calendar days or more.
- (c) There is a significant difference, as determined by the Engineer, between the scheduled and actual work sequence.

The Engineer will notify the Contractor in writing when a revised CPM schedule is required due to any of the reasons listed above. The Contractor shall submit a revised CPM schedule in accordance with 108.04.1(d) no later than 14 calendar days after notification by the Engineer. The revised schedule shall depict the status of the project on the date of the Engineer's notification for a revised schedule. The schedule shall reflect a new data date, work performed up to, but not including the new data date, and the plan for completing the remaining work.

The Engineer may request a revised CPM schedule due to changes in the work. The Engineer will notify the Contractor in writing when a revised schedule is requested. Changes that may initiate a request for a revised schedule include, but are not limited to:

- (a) An increase or decrease in the amount of work due to extra work or force account work.
- (b) An approved increase or decrease in contract time.
- (c) A Department requested change in the phasing or contract time of the project.

When a revised CPM schedule is requested by the Engineer, the Contractor shall submit a revised schedule in accordance with 108.04.1(d) no later than 14 calendar days after notification by the Engineer. The revised schedule shall depict the status of the project on the date of the Engineer's request for a revised schedule. The schedule shall reflect a new data date, work performed up to, but not including the new data date, and the plan for completing the remaining work.

If a revised schedule is not submitted within 30 days of written notification, the Engineer may order work on the project to be suspended until the revised schedule is submitted. If a revised schedule is not approved within 60 days of the written notification, the Engineer may order work on the project to be suspended until the revised schedule is approved.

The Contractor may request to submit a revised schedule to reflect changes in the plan to perform the work. When a revised CPM schedule is proposed by the Contractor, the Contractor shall provide the Engineer with a written notice 7 calendar days prior to submitting the revised schedule. The notice shall include a description of the changes to be made and the reason for the changes. The revised schedule shall be submitted in accordance with 108.04.1(d) and shall depict the status of the project on the date of the Contractor's written notice to the Engineer. The schedule shall reflect a new data date, work performed up to, but not including the new data date, and the plan for completing the remaining work. A revised schedule submitted at the request of the Contractor will not be considered to be in effect until approved by the Engineer.

3. Final Schedule

The Contractor shall submit a final CPM schedule in accordance with 108.04.1(d) no later than 30 calendar days after final acceptance. The final schedule shall depict the actual start and finish dates for each activity. The Department may withhold 10% of each progress pay estimate after final acceptance until the final schedule is approved by the Engineer.

4. Approval of Schedules

The Engineer will provide written notice within 14 calendar days of receipt of a baseline, monthly update, revised or final CPM schedule that the schedule is either approved or rejected or that additional information is requested. The Engineer's written notice will identify the reasons for rejection or what additional information is requested. Within 14 calendar days of the Engineer's written notice, the Contractor shall submit a corrected baseline, monthly update, revised or final schedule that addresses the reasons for rejection and provides any additional information requested.

If the Engineer does not respond in writing to the submittal of a schedule within the allotted time, the schedule shall be considered to be approved.

The Engineer's review of a submitted schedule will be for compliance with the specifications. Approval by the Engineer does not relieve the Contractor of responsibility for the accuracy or feasibility of the schedule. Approval of a schedule does not constitute a modification of the contract or endorsement or validation of the Contractor's logic, activity durations, or assumptions in creating the schedule. Approval of a schedule does not guarantee that the project can be performed or completed as scheduled. Omissions and errors in a CPM schedule shall be corrected by submittal of a revised schedule and will not entitle the Contractor to additional compensation or contract time.

5. Float and Scheduled Completion

Total float belongs to the project and shall be a shared commodity between the Contractor and the Department. Float is not for the exclusive use or benefit of either party. Either party has full use of float until it is depleted.

Float generated during the course of the project due to the efficiencies of either party shall be considered to be part of total float.

Float generated during the course of the project due to favorable weather within a calendar month, where the number of days of inclement weather is less than the normal inclement weather days for the month, shall be considered to be part of total float.

Negative float generated during the course of the project will not be a basis for requesting time extensions. Time extension requests shall be developed in accordance with Section 108.04.1(f). A CPM schedule may indicate a scheduled completion date in advance of the contract completion date. However, the Department shall not be liable in any way for the Contractor's failure to complete the project prior to the contract completion date. Any costs incurred by the Contractor as a result of such a failure shall be the responsibility of the Contractor. The Contractor will not be entitled to claim or recover any such cost from the Department.

An approved schedule that indicates a scheduled completion date in advance of the contract completion date will be considered to have total float equal to the time between the scheduled completion date and the contract completion date.

When a contract has an incentive/disincentive date for all or a portion of the work, and the Contractor elects to show a completion date in advance of the contract completion date, the Contractor shall show an activity in the CPM schedule for accruing incentive. The duration of this activity shall be the length of time, in calendar days, between the Contractor's scheduled completion date and the contract completion date. The Contractor may assign the activity a duration up to and including the number of days necessary to earn the specified maximum incentive. Any time between a scheduled completion date earlier than the maximum incentive date and the maximum incentive date will be considered to be part of total float.

(d) CPM Schedule Technical Requirements

The CPM project schedule shall be generated using software completely compatible with Primavera 5.0 by Primavera Systems Inc., Bala Cynwyd, PA.

The CPM schedule shall at a minimum include codes for project phase, location of work and responsibility for each activity. Additional coding fields may be used if approved by the Engineer.

Each CPM schedule submittal shall include the following:

1. A letter of transmittal identifying the schedule submission.
2. A narrative report in accordance with 108.04.1(e).
3. A compact disc (CD) containing an electronic file of the schedule in Primavera .XER format that is completely compatible with and may be directly imported into Primavera 5.0 without any loss or modification of data or need for any conversion or other software. Any electronic schedule file submitted by the Contractor that is not completely compatible with the Department's Primavera 5.0 software will be rejected.
4. The critical path in bar chart format created using the longest path sort.
5. A full color plot of the activity network diagram on 11 x 17 or 22 x 34 paper in landscape layout in a time scale suitable to provide sufficient detail. Other formats may be accepted with prior approval by the Engineer. Arrows shall be used to show the relationships between activities on the activity network diagram. The critical path and critical activities shall be plotted in red.

Each page of the schedule plot shall at a minimum include a column for each of the following:

- a. Activity ID
- b. Activity description
- c. Original duration
- d. Early start
- e. Early finish
- f. Late start
- g. Late finish
- h. Float

Each page of the schedule plot shall include a legend with the following information:

- a. Contract number
- b. District
- c. Name of the Contractor
- d. Project location
- e. Notice to Proceed date
- f. Original contract completion date
- g. Revised contract completion date (as applicable)
- h. Data date

6. A predecessor/successor report with the following information for each activity:

- a. Activity ID and description
- b. Original duration
- c. Remaining duration
- d. Calendar ID
- e. Early start date
- f. Early finish date
- g. Late start date
- h. Late finish date
- i. Total float
- j. Relationship type
- k. Lags

1. Constraints - Each activity shown on the CPM schedule shall meet the following requirements:

1. Each activity shall have a unique activity identification number which shall not be modified or re-assigned to a different work activities once assigned to an activity in the network logic diagram.
2. Each activity shall have a unique description specifying the work type and location.
3. Each activity description shall describe work associated with only 1 operation.
4. Each activity shall have an original duration not to exceed 20 activity calendar days unless approved by the Engineer.
5. Activities for submittal reviews by the Department shall allow reasonable durations, but in no case less than 14 calendar days.
6. Each activity, except the first activity, shall have at least 1 predecessor.
7. Each activity, except the last activity, shall have at least 1 successor.
8. Activity relationships shall be finish-to-start with no leads or lags, finish-to-finish or start-to-start with lags less than the predecessor's duration.
9. The use of lags with a negative value shall not be allowed on any activity relationship type.
10. All activities shall have their start and finish tied to the logic of the schedule.
11. Activities shall not have constraints unless approved by the Engineer.
12. Each activity shall have an activity calendar identified. A project may have more than 1 activity calendar, but only 1 activity calendar shall be applicable to each activity.
13. Normal inclement weather days as set out in 101.02 shall be considered and included in the planning of all work from April 1 through November 30.
14. Seasonal weather conditions shall be considered and included in the planning of all work from December 1 through March 31. The CPM schedule shall only be calculated using retained logic. Schedule duration shall be contiguous. Total float shall be calculated based on finish dates.

(e) Narrative Reports

The Contractor shall submit a narrative report with each schedule submission pertaining to the work identified in the schedule. For the initial and baseline schedule submittals, the narrative report shall include the following:

1. An explanation of the overall plan to complete the project, including where the work will begin and how the work and crews will progress through the project.
2. An explanation of the use and application of the workdays per week, number of shifts per day, number of hours per shift, holidays observed and how the schedule accommodates adverse weather days for each month.
3. Description of the work to be completed each season for multi-year projects.
4. A description of any problems or issues.

5. A description of any delays, including identification of any delayed activities, the type of delay, the cause of the delay, the effect of the delay on other activities and project milestones and identification of actions required to mitigate the delay.
6. A description of the critical path.
7. An explanation of the use of any allowed constraints, including the reason and purpose for each constraint.
8. A statement describing the status of any required permits.
9. A statement describing the reason for the use of each lag.

For each monthly update and revised schedule submittal, the narrative report shall include the following:

1. A description of the status of the scheduled completion date, focusing on any changes since the previous submission.
2. An explanation if the scheduled completion date is projected to occur after the contract completion date.
3. An explanation if any contract milestone dates are projected to occur after the dates set out in the contract.
4. A description of the work performed since the last schedule update.
5. A description of unusual labor, shift, equipment or material conditions or restrictions encountered.
6. A description of any problems encountered or anticipated since the last schedule update.
7. A statement that identifies any current and anticipated delays. A discussion of delays in the narrative report does not constitute notice in accordance with 105.16. The statement should include identification of the delayed activity, the type of delay, the cause of the delay, the effect of the delay on other activities and project milestones and identification of actions required to mitigate the delay.
8. A description of the critical path.
9. A description of changes in the critical path and any contract milestone dates from the last schedule update.
10. A report that identifies the changes made between the previous schedule update and the current proposed schedule, including, but not limited to:

- a. Data date
- b. Completion date
- c. Activity code assignments
- d. Schedule calculation options
- e. Activity descriptions
- f. Added activities
- g. Deleted activities
- h. Added activity relationships
- i. Deleted activity relationships
- j. Activity original durations
- k. Activity remaining durations
- l. Activity actual start and finishes
- m. Percent complete
- n. Constraints
- o. Activity coding for phase, location and assigned contractor
11. A statement providing status of pending items, including, but not limited to:
 - a. Permits
 - b. Change orders
 - c. Time extension requests

(f) Extension of Contract Time

If the Contractor believes work on the contract has been delayed for reasons beyond its control, a written request for extension of contract time may be submitted in accordance with 108.08. Upon receipt of the request, the Department will perform a delay analysis by comparing the approved project schedule at the time of the delay with as-built information of the work actually performed. The analysis will identify the actual critical path of work and progress on the critical path and will be used to determine the amount of contract time extension that may be warranted.

The Contractor's request for extension of time shall include its own analysis of the delay using the approved schedule at the time of delay and as-built information of work actually performed.

The determination of contract time extension will be based solely on the Department's analysis.

Delays or suspensions of work due to the Contractor's failure to comply with the specifications will not be cause for additional compensation or extension of contract time.

(g) Method of Measurement

Initial, baseline and final CPM schedules will not be measured for payment.

Monthly update CPM schedules and revised schedules requested by the Engineer will be measured as each for each such schedule approved by the Engineer.

Revised schedules submitted at the request of the Contractor will not be measured for payment.

Time impact analysis will not be measured for payment.

(h) Basis of Payment

Initial, baseline and final CPM schedules will not be paid for directly.

Monthly update CPM schedules and revised schedules requested by the Engineer will not be paid for directly.

All costs necessary to provide initial, baseline and final CPM schedules, including the cost of the project scheduler, shall be included in the lump sum bid price for design/build.

All costs necessary to provide monthly update CPM schedules shall be included in the lump sum bid price for design/build.

All costs necessary to provide revised CPM schedules requested by the Engineer shall be included in the lump sum bid price for design/build.

DESIGN/BUILD ORIENTATION

Description

The Design/Builder shall designate a minimum of 4 persons from the construction staff, including the designated on-site construction manager and a minimum of 2 persons from the design staff who are required to attend the Design/Build orientation sessions.

The Design/Build Orientation will include representatives from the Design/Builder and from the Department.

Requirements

The requirements for the orientation shall be as follows:

(a) Meeting Room

The size of the room and the number of persons in attendance may vary.

Attendees Approximate	Approximate Number
Central Office Personnel	2
KYTC Personnel	2
FHWA Personnel	4
District Construction Engineer	2
Area Engineer	2
Inspectors or Assistants	8
Design Consultant	6
Project Engineer	1
Prime Design/Builder, Owner or President	1
Prime Contractor's Employees	6
Subcontractor's Personnel	6
Utilities, if applicable	6
Total Approximate Number in Attendance	46

(b) Meeting Length

The workshop is expected to last approximately 8 h.

PROGRESS MEETINGS

Progress and scheduling meetings will be held weekly or as directed by the Engineer at the project field office, or other location designated by the Engineer, and shall be attended by Department and Design/Builder decision-making personnel.

The purpose of these meetings will be to discuss adherence to the CPM and its periodic updates, critical operations and potential problems. The Design/Builder shall confirm the number and duration of work shifts, number of work crews, and specific portions of the work to be performed during the following weeks.

Only the Engineer can waive these meetings.

PUBLIC INFORMATION LIAISON

The Design/Builder shall provide 1 consistently available person to act as a liaison to the Department's Public Information Office. The liaison shall be continuously aware of the current construction schedule, shall be knowledgeable of the types of work being performed, and shall act as the project point of contact to respond to questions from the media and the public. The person assigned as liaison shall be made known to the Engineer at the pre-construction meeting.

CONSTRUCTION WEB-CAMERA FOR PUBLIC PROJECT WEBSITE

The Design/Builder shall provide a web-camera showing the bridge construction site that will be linked on the Department's project website. The web-camera system should be capable of recording time-lapse photography of the construction of the bridge from start to finish.

The costs for the web-cameras shall be included in the lump sum price for design/build.

PUBLIC INFORMATION MEETING

The Design/Builder shall be responsible for coordinating with the Department about and for conducting a public information meeting regarding the Bridge closure, alternate routes, detours and any other important information or information of interest to the public. The Design/Builder shall be responsible for any site fees for the meeting. The meeting time will be as agreed upon and will need to occur in the evening hours. The meeting shall be held in Madison.

The costs for the public information meeting shall be included in the lump sum price for design/build.

TREE CLEARING IN BORROW SITE OUTSIDE THE PROJECT AREA

If a borrow site is required for this project, Section 203.08 shall be followed. If tree clearing is required at this borrow site located outside the project construction limits, tree clearing shall not be performed between April 1 and September 30 to minimize project-related impacts to the Indiana bat.

UNSUITABLE MATERIAL REMOVAL AND BACKFILL

Unsuitable materials may be encountered during embankment construction or footing excavations. In order to minimize the risk to both the Department and Design/Builder, an undistributed quantity of unclassified excavation and B borrow will be included in the contract to be used where determined to be necessary by the Engineer to provide a suitable foundation for pavement or footings. Any soil and other unsuitable materials such as loose bedrock shall be removed in accordance with Section 203 and replaced with B borrow in accordance with Section 211. Unclassified excavation and B borrow will be paid for at the contract unit price per cubic yard.

TEMPORARY MILTON BOAT RAMP

The Contractor shall construct a temporary boat ramp and access road downstream of the bridge in Milton at a location as shown in the Contract Plans. The temporary ramp will provide public access to the Ohio River during the ferry operations. Unless otherwise directed by the Engineer, the Contractor shall have the temporary boat ramp and access road open for operation 2 weeks prior to the closure of the existing ramp at Ferry Street to public use.

Following construction, the temporary boat ramp and access will be removed unless otherwise directed by the Engineer.

No separate payment will be made for this item. This work will be included in the contract lump sum bid price for Design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

PRESERVATION OF BUILDER PLATES

The Contractor shall remove intact the builder plates, and any other existing plaques as directed by the Engineer, from the existing bridge. The Contractor shall coordinate with the City of Madison.

CONSTRUCTION STAGING AREAS

Madison

In Madison, the Design/Builder may use the areas of Jaycee Park nearest the existing bridge (refer to the project plan details contained in the contract information book) for construction staging. If the Design/Builder decides to use another staging area, then the Design/Builder shall be responsible for environmental clearances and permits. If these areas of Jaycee Park are used by the Design/Builder, the following measures shall be completed prior to the use of these areas, or the demolition of the shelter or volleyball courts

1. The Design/Builder shall construct a picnic shelter on a location within Bicentennial Park as directed by the Engineer and agreeable to the City of Madison
2. The Design/Builder shall construct 2 temporary volleyball courts at locations within the park as directed by the Engineer and agreeable to the City of Madison. The City of Madison identified one temporary court to be placed east of the playground equipment and one temporary court to be placed east of the basketball court.
3. As directed by the Engineer, the Design/Builder shall improve the existing waterfront access road located approximately 600 ft west of the bridge so that vehicles with trailers can access the waterfront area. The Design/Builder shall provide a stabilized aggregate pavement section for this access.

Following replacement of the superstructure, the Design/Builder shall:

1. Regrade the affected parcels to correct existing drainage issues;
2. Restore the waterfront access point immediately west of the bridge to its existing condition or better;
3. Re-seed grass to restore landscaped elements of the affected parcels;
4. Restore the three volleyball courts east of the bridge at or near their current location, reconstructed to the existing condition or better; and
5. Restore the picnic shelter west of the bridge at or near its current location, reconstructed to the existing condition or better.

Milton

In Milton, a construction staging area will be provided by KYTC adjacent to the bridge in Kentucky. If the Design/Builder decides to use another staging area, then the Design/Builder shall be responsible for environmental clearances and permits. If the provided staging area is used by the Design/Builder, the following measures shall be completed by the Design/Builder.

Following replacement of the superstructure, the Design/Builder shall:

1. Grade the parcels affected by the staging area as directed by the Engineer;
2. Re-seed grass the parcels affected by the staging area as directed by the Engineer.

WELLHEAD CAPPING

The Contactor shall cap the existing wellhead in Kentucky in accordance with Section 708 - Filling and Capping, Safeloading and Plugging Abandoned Underground Structures of the Current Editions of the Kentucky Standard Specifications for Road and Bridge Construction.

OHIO RIVER HYDROGRAPH

Historical river data provided by the Indiana Kentucky Electric Corporation, Clifty Creek Station is shown in the plan details attached to the Contract Information Book.

The information is made available to the Design/Builder and shall not be interpreted as a direction for means and methods of construction.

Generating and properly utilizing historical or predicted river flow data is entirely the Design/Builder's responsibility.

Other potential river data sources include the following:

National Oceanic and Atmospheric Administration (NOAA), National Weather Service Advanced Hydrologic Prediction Service, Weather Forecast Office Louisville, KY, Ohio River at Clifty Creek (CLFI3)

United States Geological Survey (USGS) Surface Water Data for Kentucky, Station No. 03277200, Ohio River at Markland Dam near Warsaw, KY (River Mile 531.5)

United States Geological Survey (USGS) Surface Water Data for Kentucky, Station No. 03294500, Ohio River at Louisville, KY (River Mile 607.3)

All hydrograph data and resources identified herein are unverified.

PRELIMINARY HYDRAULIC AND SCOUR ANALYSIS REPORT

The document "Preliminary Hydraulic and Scour Analysis Report" dated February 3, 2010, for the Milton Madison Bridge over the Ohio River prepared by Wilbur Smith Associates is a part of the contract documents.

The preliminary report evaluates the 100 year flood water surface elevations, and 100 year and 500 year theoretical scour depths caused by proposed bridge geometry as shown in the plans.

The Design/Builder shall provide hydraulic and scour analysis for a final bridge geometry for any of the following conditions:

1. The waterway opening below the 100 year flood elevation is less than that shown on the plans,
2. The location of the substructure units are different from those shown on the plans,
3. The bridge width is greater than that shown on the plans

The preliminary report for the contract is available and posted on the project FTP portal.

AESTHETIC REQUIREMENTS / ENVIRONMENTAL MITIGATION

The following list of aesthetic requirements has been compiled as a result of the Section 106 consultation to mitigate the environmental impact of the project. These aesthetic requirements shall be incorporated into the construction of the US 421 bridge.

1. The Superstructure of Bridge Structure No. 2 shall be a steel truss.
2. The profile of the truss spans on the bridge shall be as shown on the contract plans and may only be modified as described in the special provision: STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO. 2.
3. All structural steel on the project shall be painted. The final top coat shall be color 35526 in accordance with Federal standard 595.
4. Truss sway bracing in the plane of the vertical members of the main truss lines shall maintain a minimum spacing of 2 panels between centerlines. In lieu of truss sway bracing, a tapered strut with end moment connections may be used at every panel provided the depth of the strut at the interface with the vertical does not exceed 6 ft nor more than 4 ft at the center. Sway bracing shall be provided for the verticals and diagonals which frame into the lower chord at the pier locations (L0, L12, L24, L38, L48)
5. INDOT standard railing type TF-2 shall be used for all traffic barriers adjacent to the shoulder on the bridge. Concrete bridge railing transition TBC and guardrail transition type TGB shall be as shown on the plans.
6. The aluminum bridge pedestrian railing shall conform to the general appearance provided in the contract plan details.
7. Piers 2, 3, 4 and 5 shall be widened to accommodate the replacement truss and bearings. The pier stem from the caisson to the bottom of the pier cap shall be encased as described in the SPC, and shall have the general shape as shown on the contract plans.

8. The pier cap shall have the general shape as shown on the contract plans.
9. Pier 6 shall be similar in appearance to piers 2-5.
10. Form liners shall be used on the outward surfaces of the abutment wall, wing wall and retaining wall structures at the South and North Abutments. The pattern for the form liners shall be Ashlar.

Sample -

The Design/Builder shall submit a 24 inch x 24 inch sample of the formliner pattern to the Department for approval of sample panel.

Shop Drawings-

Plan, elevation, and details showing overall pattern, joint locations, form tie locations, end locations and other special conditions shall be submitted to the Department for approval.

Mock Up Panel-

A mock up panel shall be built on site 30 days prior to commencing work, using the same materials, methods and work force that will be used for the project. The Department will determine specific requirements and location, and whether mockup shall be incorporated as part of the final project. The mock up panel shall be 36 sq. ft. or larger if needed to adequately illustrate the pattern and texture selected. An area to demonstrate formliner butt joint and continuation of pattern through construction joint shall be included.

ALUMINUM BRIDGE PEDESTRIAN RAILING

Description

Aluminum bridge pedestrian railing shall be designed, fabricated and installed in accordance with Section 604.09 of the INDOT Standard Specifications, except as noted herein. The aluminum bridge pedestrian railing shall conform to the general appearance provided in the contract plan details.

Design

(a) Calculations. Prior to fabrication, submit for review and approval calculations signed and sealed by a Professional Engineer registered in Indiana and Kentucky. These calculations shall fully evaluate all aspects of the railing and clearly show how the railing meets or exceeds all requirements of the project.

(b) Loading Criteria. Railing shall be designed to resist loads in accordance with AASHTO 13.8.2.

(c) Aesthetics. Detail drawings are provided for example only of the railing style to be provided.

(d) ADA Compliance. Where the sidewalk slope is greater than or equal to 5%, a continuous "ADA handrail" shall be included in full compliance with the Americans with Disabilities Act (ADA). Additional requirements are included in provided detail drawings.

Material

(a) Railing.

Pipe for the Rails - ASTM B 241 or ASTM B 429, Alloy 6061-T6 or 6063-T6.

Plates - ASTM B 209, Alloy 6061-T6, 6061-T651, 5052-H32, 5052-H34, 3003-H-14, or 5086-H116/H32.

Extruded bars, rods, shapes and tubes - ASTM B 221, Alloy 6061-T6.

Drawn tubes - ASTM B 210, Alloy 6061-T6.

Rolled or extruded structural shapes - ASTM B308, Alloy 6061-T6.

Permanent-mold castings - ASTM B 108, Alloy 356.0-T6.

Cast aluminum alloy rail posts - ASTM B 108, Alloy A444.0.

Certify materials as specified in Section 916.

(b) Toggle Bolts. Use an acceptable galvanized type capable of supporting a 1,000 pound (4.5 kN force) load in tension, when tested through a 1/2 in. (12 mm) round hole. Toggle bolts may be cadmium-plated to conform to the requirements of ASTM B 766 (ASTM A 165), Class 5 (Type TS), in place of being galvanized.

Certify as specified in Section 916 .

(c) Aluminum Wedges, Shims, End Caps, Washers, and Nuts. Certify as specified in Section 916 .

(d) Anchor Bolts, and Nuts and Washers for Anchor Bolts. Anchor Bolts. AASHTO M 270/M 270M (ASTM A 709/A 709M), Grade 36 (Grade 250), anchor bolts (headed or nonheaded, either straight or bent) and cap screws.

Nuts. ASTM A 563/A 563M

Washers. ASTM F 436/F 436M

Hot-dip or mechanically galvanize as specified in Section 910.20.

(e) Caulking Compound - ASTM C834 or C920

Construction

Construct as shown on the drawing provided in the Contract Information Book and as follows:

(a) General. Before fabrication, submit shop drawings for review and acceptance in accordance with the provisions of this Contract.

Before erection, coat surfaces of aluminum alloys in contact with other metals, stone masonry, or concrete, using caulking compound. After erection and alignment, seal openings between metal surfaces and concrete using caulking compound.

After the other bridge construction operations have been completed, clean the aluminum bridge hand railing. Remove accumulations of oil, grease, dirt, or foreign materials using an acceptable solvent cleaner.

(b) Assembly. Assemble the rail members. Place joints as needed for expansion. Make cuts true, smooth, and free from burrs or ragged edges. Fillet drill all re-entrant cuts before cutting. Do not flame cut. Weld according to AWS. In conformance with the NEC, railing shall be grounded, tested with documentation, and continuity shall be maintained.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Linear Foot as the unit of measurement.

Basis of Payment

No separate payment will be made for this item. This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

CERTIFICATION OF FALSEWORK AND TEMPORARY SHORING

Certifications of all temporary structures shall be performed and documented as specified below:

- a. Prior to the use of any erection equipment that is fabricated for the specific purpose of erecting any portion of the work included in this project, the equipment shall be personally inspected by the professional engineer responsible for the design and certified in writing to the Engineer. The professional engineer responsible for the design shall certify that the respective equipment has been fabricated and erected in accordance with the submitted shop drawings and calculations.

After assembly, the professional engineer responsible for the design shall observe the equipment in use and certify to the Engineer in writing that it is being utilized as intended and in accordance with the submitted drawings and calculations. Written certification includes signing and sealing of the certification.

- b. After erection of any falsework, formwork, shoring, and temporary works requiring shop drawings, but prior to the application of any superimposed load, the professional engineer responsible for the design shall personally inspect the falsework, formwork, shoring, and temporary works and provide a certification to the Engineer in writing. This certification shall include signing and sealing letters of certification that assure the work has been constructed in accordance with the materials and details shown on the submitted shop drawings and calculations.

All costs associated with this special provision are incidental to the design/build lump sum.

COFFERDAMS

Description

This work shall consist of the design, installation, maintenance, flooding, and removal of cofferdams at Piers 2 through 6 of Bridge No. 2, the Ohio River Bridge, as required for pier strengthening and construction. This work also includes, but is not limited to bracing, excavation, seals, dewatering, and disposal of excavated material.

Materials

Materials need not be new but shall be in serviceable condition. Certification or laboratory test results shall be provided verifying material properties. For used steel, the salvage design values from the AASHTO Guide Design Specifications for Bridge Temporary Works may be used in lieu of testing. Timber sheeting will not be permitted. Any material used shall meet the following:

Structural Steel	AASHTO M270, (ASTM A709) (Grade 36, Grade 50 or Grade 50W)
Steel Sheet Piling	ASTM A328, (ASTM A572)
Cement	AASHTO M85 and AASHTO M 240
Pre-Stressing Steel	ASTM A416 and ASTM A722 (Grade 270)
Welding Wire Fabric	AASHTO M55, (ASTM A185)
Reinforcement Bars	AASHTO M31 (ASTM A615), ASHTO M42 (ASTM A616, ASTM A617) (Grade 60)
Wet Excavation	Section 206.03
Backfill	Special Provision for Scour Mitigation Countermeasures
Other Material	INDOT Standard Specifications

Construction

Cofferdams shall be constructed at Piers 2 through 6 as required by the Design/Builder's means and methods for pier strengthening and construction.

The cofferdams shall be designed in accordance with AASHTO LRFD Bridge Design Specifications, current FHWA guidelines, and AASHTO Guide Specifications. Soil parameters shall be developed based on geotechnical information included in the contract bid documents, additional geotechnical information obtained independently by the Design/Builder, and per OSHA guidelines. Cofferdams shall be designed for all construction conditions. Where appropriate, surcharge loads due to construction equipment shall be included in the design.

The cofferdam calculations and drawings shall be prepared, signed and sealed by a professional engineer licensed in Kentucky or Indiana. Cofferdam calculations and drawings shall be submitted in accordance with 105.02. All cofferdam drawings shall be submitted to the Engineer at 1 time. The Engineer will coordinate review of the cofferdams by the United States Coast Guard. See special provision NAVIGABLE WATERWAYS AND COAST GUARD REQUIREMENTS for anticipated submittal review durations. No time extension for correction or resubmission will be allowed.

Cofferdams shall be installed in accordance with the approved cofferdam drawings. Metal sheeting shall be driven to a depth below the bottom of the work elevation and substantially braced in all directions to form a cofferdam where required. The foundation area shall be pumped reasonably free of water while concrete or masonry is being placed. Where the foundation area is of sandy or other porous materials, the cofferdam may need to be sealed below the bottom work elevation with sufficient concrete so that it may be pumped reasonably dry.

Dewatering shall be in accordance with the special provision TEMPORARY RETENTION FOR DREDGING AND DEWATERING OPERATIONS.

Sheeting and bracing shall be removed completely, unless otherwise indicated or permitted to remain in place. Baseline readings on all cofferdams shall be taken and regularly monitored for vertical and horizontal movement throughout the construction duration of the project. The Design/Builder's shall certify, sign and seal by a professional engineer, that the cofferdams have been installed in accordance with the approved cofferdam drawings prior to beginning work in the cofferdams. The Design/Builder shall be responsible for the adequacy and safety of the cofferdams.

Flooding of the cofferdams will be permitted in case of high water or other emergency endangering the safety of the cofferdams. This work shall be performed at no additional cost to the Department.

Cofferdams shall be backfilled consistent with the materials and construction specified in Special Provision for RIPRAP SCOUR COUNTERMEASURE.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

HIGH PERFORMANCE CONCRETE (HPC) FOR BRIDGE STRUCTURE NO.2 SUBSTRUCTURE

Description

This work shall consist of furnishing and placing a high performance concrete (HPC) for bridge substructure piers, pier caps and pier strengthening in accordance with 105.03. This HPC contains portland cement and 2 pozzolanic materials to produce a concrete of high durability, low permeability, and low cracking potential.

Quality Control Plan

The concrete shall be produced by an approved plant in accordance with ITM 405, transported, and placed according to a Quality Control Plan, QCP, prepared and submitted by the Contractor in accordance with ITM 803. The QCP shall be submitted to the Engineer at least 15 days prior to commencing concrete operations.

The Design/Builder shall participate in a HPC workshop with the Department before the QCP has been accepted. Participants shall include personnel responsible for the concrete process control, including Contractor's professional engineer for design, Concrete Producer, Superintendent, Concrete Foreman, and Certified Concrete Technicians. Representatives of the Department Materials Division, Resident Engineer and Job Control Inspectors will also participate.

Concrete operations shall not begin before the QCP has been accepted and successful trial batch demonstration completed. Concrete mix designs and trial batch demonstrations may be submitted for approval prior to completion of the QCP submittal. A certified concrete technician shall supervise all sampling and testing for process control as defined by the QCP. A certified concrete technician is a Contractor, producer, or consultant employee who has been certified by the Department.

MATERIALS

Materials

Materials shall be in accordance with the following:

Admixtures.....	912.03
Castings	910.05
Cast Iron Soil Pipe.....	908.10
Coarse Aggregate, Class A or Higher,	
Size No. 5*.....	904
Curing Materials.....	912.01
Fabric For Waterproofing.....	913.16
Fine Aggregate, Size No. 23*.....	904
Fly Ash.....	901.02
Permanent Metal Forms.....	910.03
Portland Cement.....	901.01
Reinforcing Steel, Epoxy Coated.....	910.01
Steel Drain Pipe.....	910.07
Silica Fume.....	901.04
Utility Asphalt, UA-1.....	902.01 (d)
Water.....	913.01

* Or gradation as identified in the QCP

If the contract requires stay-in-place metal forms for the superstructure or if the Contractor elects to use such forms, the coarse aggregate shall be Class AP. Shipping and storage of cement shall be in accordance with 702.04.

Concrete Mix Design

The concrete shall be designed utilizing 3 cementitious materials as part of the binder systems. Portland cement shall be combined with silica fume & fly ash and proportioned in accordance with CONCRETE MIX CRITERIA. A concrete mix design, CMD, and trial batch shall be in accordance with requirements detailed elsewhere in this special provision. The CMD shall be submitted in a format acceptable to the Engineer and include the following:

- (a) a list of all ingredients
- (b) the source of all materials
- (c) the gradation of the aggregates
- (d) the absorption of the aggregates
- (e) the SSD bulk specific gravity of the aggregates
- (f) the specific gravity of each pozzolan
- (g) the batch weights (mass)
- (h) the names of all admixtures
- (i) the range of admixture dosage rates as recommended by the manufacturer
- (j) the linear equation of unit weight (mass) vs. air content
[$UW = m(\text{Air}) + b$]

A change in material source, class or type requires a new CMD.

Concrete Mix Criteria

The CMD shall produce workable high performance concrete mixtures having the following properties:

- (a) The paste volume of total cementitious material and water shall not exceed 26.5 % of the concrete volume design value (e.g 7.16 ft³ maximum paste volume per cubic yard concrete). Each cementitious material shall be batched within a tolerance not to exceed 1.0% in accordance with 702.06.
- (b) The cement content in the ternary binder system shall be at least 390 lbs per cubic yard (231 kg per cubic meter) of concrete. Air-entraining cements will not be permitted.
- (c) Class F or C fly ash shall be used as part of the total cementitious content in the ternary binder system. Fly ash shall constitute 20.0% to 25.0% by weight (mass) of the total cementitious content in the mix design. Fly ash shall not be used in conjunction with type IP cement.
- (d) Silica fume shall constitute 5.0% to 7.0% of the total cementitious content in the mix design.
- (e) The water-cementitious ratio shall be no less than 0.380 and not exceed a maximum of 0.420.
- (f) The CMD target air content shall be set at 6.5%.
- (g) The slump shall be within a range of 4 in. to 7.5 in. (100 mm to 190 mm).
- (h) The target compressive strength at 28-days shall be 5000 psi (34.47 MPa).
- (i) The CMD target resistance to chloride ion penetration at 56 days shall be no greater than 1200 Coulombs.

The Contractor may elect to use fine and coarse aggregate gradations in accordance with 904 or may propose the use of alternate gradations. If alternate gradations are proposed, the tolerances shall be as stated in the QCP. In either case, 100% of the coarse aggregate shall pass the 1.5 in. (37.5 mm) sieve. The combined amount of fine and coarse aggregates passing the No. 200 (75 μ m) sieve shall be from 0.0 to 2.0% for sand and gravel, and from 0.0 to 2.5% for sand and crushed stone, or crushed slag.

Proportions will be based upon SSD saturated surface dry aggregates. The fine aggregate shall be at least 35% but not more than 50% of the total volume of the aggregate in each cubic yard (cubic meter).

Absorption and bulk specific gravity tests shall be performed on the fine aggregate in accordance with AASHTO T 84 and on the coarse aggregate in accordance with AASHTO T 85, by procedures 8.1 and 8.2. When the SSD bulk specific gravity or absorption test result differs from the Department's most recent value for the source by more than the multi-laboratory precision defined within the appropriate test method, the discrepancy will be investigated. Values agreed upon by the Contractor and Engineer shall apply when calculating target batch mass (weights) and determining water/cementitious ratio.

There will be no calendar date restrictions as to the use of high performance concrete with a ternary binder system.

The high performance concrete shall contain an air entraining agent and either a water reducing, high range, admixture (type F) or a water-reducing, high range, and retarding admixture (type G) as identified in the Department's list of approved PCC Admixture and Admixture Systems. The type admixture used shall not be changed during any individual contiguous pour. The type admixture to be used shall be selected based on the expected concrete temperature, ambient temperature, initial set time and rate of placement. When temperature is expected to be 65°F (18°C) or above; type G admixture shall be used. The dosage of type D or type G may be lowered to an amount as recommended in writing by the manufacturer of the admixture. A type F admixture shall be used when temperatures are expected to be below 65°F (18°C). Retardation may be required due to the structure. A higher temperature restriction regulating the need to retard the concrete initial set time may be requested in writing and shall substantiate the effects of concrete initial set time and rate of placement.

The admixture addition rate shall not be reduced below the minimum, or exceed the maximum rate recommended by the manufacturer, regardless of the temperature of the concrete or ambient temperature.

The CMD by absolute volume method shall be submitted to the Engineer for verification at least 7 days prior to the trial batch demonstration. An explanation of intended use for each mix design shall be provided.

Mass Concrete

Mass Concrete is defined as: any large volume of cast-in-place concrete with dimensions large enough to require that measures be taken to cope with the generation of heat and attendant volume change to minimize cracking. Elements with a minimum dimension of 4 feet will be considered mass concrete. Pier caps for the Milton Madison Piers 2 through 6 are anticipated to qualify as mass concrete elements.

Mass concrete temperature and crack control methods may include: refining concrete mix proportions, protecting exposed surfaces and formwork from environmental extremes, using aggregate with desirable thermal properties, pre-cooling the concrete constituent materials, using internal pipes to cool the concrete itself, and placing the concrete in several lifts or pours. Thermal stresses in the concrete shall be limited to avoid cracking resulting from the tensile stress exceeding the tensile strength of the concrete.

The Design Builder shall develop and provide a thermal control plan based on models and test results for the specific properties of the mass concrete placements and the ambient temperatures possible during the curing period. The plan shall be prepared by a licensed professional engineer with successful experience developing and executing at least two (2) prior performance based temperature differential limit (PBTDL) plans for mass concrete. Provide Owner references where a PBTDL plans were used in the past.

Concrete temperature shall be limited to 160 degrees F maximum.

Differential Temperature from core to surface of mass concrete elements shall be predicted and thermal stresses in the concrete shall be limited to avoid cracking resulting from the tensile stress exceeding the tensile strength of the concrete.

The PBTDL Plan shall include the following:

- Identification of mass concrete placements
- Concrete mix design
- Thermal modeling to predict concrete temperatures and temperature differences in each mass concrete placement as a function of time. Assumptions for variables used in modeling shall be clearly defined and shall include:
 - o concrete properties
 - o ambient temperature
 - o insulation
 - o forms
 - o curing
- Maximum temperature limiting methods
- Differential temperature controlling methods
- Curing methods
- Temperature monitoring
- Verification of Thermal control
- Corrective measures

Submit the PBTDL Thermal Control Plan for review and approval of the Department.

Remote sensors measuring maturity and temperature at hourly intervals shall be used to monitor the concrete. Remote monitoring data shall be collected and provided promptly to the Department during the monitoring of curing. Planned action shall be taken as necessary to control maximum core temperatures and surface-to-core temperature differentials of mass concrete. Concrete shall be protected from experiencing thermal shock at all times. The Engineer will determine the end period for monitoring. The end period will not be less than 28 days.

The Engineer reserves the right to direct the Contractor to revise the thermal control plan if thermal cracking of the concrete occurs. The Department shall have 21 days to review the revised plan.

Trial Batch

A trial batch shall be produced and tested by the Contractor's certified technician and the Engineer's qualified technician to verify that the CMD meets the concrete mix criteria. Sufficient concrete shall be batched to accurately represent the CMD and provide an amount of concrete to perform all tests from the same batch. The concrete shall be batched and mixed in accordance with 702.06 and 702.07. The Engineer will test the trial batch and provide the Contractor with the results. Trial batch concrete shall not be used for more than 1 test, except the concrete used for the unit weight (mass) may be used to conduct the air content test. The concrete shall be agitated at least 15 min before testing and not exceeding 45 min.

The Contractor's test results will be used to validate CMD compliance with the required concrete properties. The air content for the trial batch concrete shall measure a minimum of 5.0%. Four 6 in. x 12 in. (150 mm x 300 mm) cylinders shall be cast for the purpose of compressive strength determination. Two of the cylinders shall be tested at an age of 7 days and 2 cylinders tested at an age of 28 days. Compressive strength shall be reported as the average of the 2 cylinders tested at the appropriate age.

The Department will cast six 6 in. x 12 in. (150 mm x 300 mm) cylinders. Two cylinders will be tested for compressive strength at 7 days and averaged for a result. Two cylinders will be tested for compressive strength at 28 days and averaged for a result. Two cylinders will be tested for resistance to chloride ion penetration at 56 days and averaged for a result.

Additional cylinders may be cast and tested at another age. An average compressive strength by the Contractor, which achieves the minimum requirement at an earlier age, will be considered as validating the compressive strength requirement for the CMD; however, strengths at 28 days are still required.

All molds, facilities, and materials necessary to prepare and initially cure cylinders shall be provided. Gradations shall be determined to validate the fine and coarse aggregates used.

The Engineer's qualified technician will measure the concrete properties and verify compliance to the Contractor's results within the following tolerances

Aggregate Correction Factor	±0.1% Pt.
Air Content	±1.5% Pt.
Unit Mass (Weight)	±1.9 lb/ft ³ (30 kg/m ³)
Slump	±1.0 in. (25 mm)
28 day Compressive Strength	±8.5%
Water/Cementitious Ratio	±0.015

Unit weight (mass) is not to exceed a tolerance of ± 0.5% of the CMD's predicted value at the air content measured.

All test results not within tolerance are to be investigated by the Contractor and Engineer as to the cause and determine corrective actions needed to resolve the discrepancy.

The CMD batch weights (mass) may be adjusted by the amount of over, or under yielding. The aggregates may need a re-test for SSD bulk specific gravities and absorption as part of the investigation. The final CMD shall be established for the concrete after all discrepancies are resolved. Following the trial batch demonstration all required test results, final CMD, and the linear equation shall be submitted to the Engineer for approval.

Except for adjustments to compensate for routine aggregate moisture fluctuations, changes in target aggregate (SSD) batch weights (mass) shall be documented and submitted to the Engineer for approval, prior to implementing. A maximum adjustment of ±3% of fine to total aggregate ratio by volume will be permitted. Changes to the dosage amounts of admixtures will be permitted. A new CMD shall be prepared and successfully tested for changes in the source, type or class of a material, the amounts of cementitious materials, increase in water/cementitious ratio, adjustments of greater than ±3% of fine to total aggregate ratio, or the addition or deletion of admixtures.

Test Methods and Procedures

The following test methods and procedures apply with exceptions as listed below.

Air Test	AASHTO T 152 or T 196*
Compressive Strength	AASHTO T 22
Flexural Strength	AASHTO T 97
High Pressure Air Content of Hardened PCC	ITM 401
Making and Curing Specimens	AASHTO T 23
Moisture Content, Aggregate	AASHTO T 255
Obtaining and Testing of Drilled Cores	AASHTO T 24
Sampling Fresh Concrete	AASHTO T 141
Sampling Stockpiled Aggregates	ITM 207
Sieve Analysis of Aggregates	AASHTO T 27
Slump	AASHTO T 119
Specific Gravity and Absorption, Coarse Aggregate	AASHTO T 85**
Specific Gravity and Absorption, Fine Aggregate.	AASHTO T 84
Resistance to Chloride Ion Penetration	AASHTO T 277
Unit Weight (Mass)	AASHTO T 121
Water-Cementitious Ratio	ITM 403

* If slag aggregate is used, the method and procedure for the test shall be in accordance with AASHTO T 196.

** Sections 8.1 and 8.2

(a) Exceptions to AASHTO T 23

The exceptions to AASHTO T 23 for making and curing specimens in the field shall be as follows.

1. Initial curing of cylinders shall be no less than 16 h or more than 48 h.
2. Non-watertight beam forms (molds) will be permitted.
3. After 24 h, the molded beam specimens shall be taken to the storage location and removed from the molds.
4. Field stored beams will not require 24 ± 4 h immersion in water saturated with calcium hydroxide prior to the time of testing.

(b) Exceptions to AASHTO T 27

The exceptions to AASHTO T 27 for conducting a sieve analysis are in accordance with 904.06.

(c) Exception to AASHTO T 84

The exceptions to AASHTO T 84 for determining SSD specific gravity and absorption for the fine aggregate shall be as follows:

1. The SSD bulk specific gravity shall be reported to the nearest 0.001 and the absorption reported to the nearest and 0.01%.

(d) Exception to AASHTO T 85

The exceptions to AASHTO T 85 for determining SSD specific gravity and absorption for the coarse aggregate shall be as follows:

1. The 15 h soak period shall not be eliminated.
2. The in-water weight (mass) shall be determined following the 15 h soaking period prior to determining the SSD weight (mass).
3. The SSD bulk specific gravity shall be reported to the nearest 0.001 and the absorption reported to the nearest 0.01%.

(e) Exceptions to AASHTO T 97

The exceptions to AASHTO T 97 for conducting a flexural test shall be as follows:

1. The beam size shall be measured to the nearest 1/16 in. (1.0 mm).
2. The test result shall be discarded when the break occurs outside the middle third of the beam.

(f) Exceptions to AASHTO T 121

The exceptions to AASHTO T 121 for determining the unit weight (mass) of concrete shall be as follows:

1. Weight (mass) shall be determined to the nearest 0.01 lb (0.005 kg).

(g) Exceptions to AASHTO T 141

The exceptions to AASHTO T 141 for sampling fresh concrete in the field shall be as follows:

1. The entire sample may be obtained from one portion of the load after at least 0.25 yd³ (0.25 m³) of concrete has been discharged.

(h) Exceptions to AASHTO T 152

The exceptions to AASHTO T 152 for determining the air content in PCC shall be as follows:

1. The aggregate correction factor shall be determined in accordance with 6.4.3 except that the volume of water shall not be removed from the assembled and filled apparatus.
2. The aggregate correction factor test shall be re-run for confirmation if the test results for gravel is greater than 0.4% or if the test results for crushed stone is greater than 0.6%.

Testing Facilities and Equipment

An easily accessible means of obtaining concrete samples at the point of placement and transporting the samples from the piers for testing shall be provided. All molds, facilities, and materials necessary to prepare and initially cure quality control and acceptance cylinders shall be provided at the work site.

CONSTRUCTION

General

Construction operations as applicable shall be in accordance with 702 and 703.

Falsework and Centering

Falsework and arch centering for structural elements shall be in accordance with 702.14.

Finishing

The concrete shall be finished in accordance with 702.21.

Cold Weather Concrete

Cold weather concrete operations shall be in accordance with 702.11, except that immediately after a pour is completed, the freshly poured concrete and forms shall be covered so as to form a protective enclosure and the air in the enclosure kept at a temperature above 50 °F (10 °C) for at least 240 hours.

Removal and Re-use of Forms

The forms for any portion of the structure shall not be removed until concrete is strong enough to withstand damage.

Substandard Work

General problems and procedures, which cause an obviously substandard product, shall be promptly corrected. The Engineer and Contractor will jointly review the operations to ensure compliance with the QCP. Continuous violations of compliance with the QCP will result in suspension of operations.

The option to remove and replace the completed pier concrete, or to leave it in place will be as directed. Material in this category will be adjudicated as a failed material in accordance with 105.03.

Sealing

The concrete surface shall not be sealed.

Frequency of Testing

Sampling and testing of the concrete properties for acceptance will be performed on random cubic yard (cubic meter) of concrete every 40.0 cubic yards. One set of acceptance samples shall represent concrete placed at only one pier. Additional sampling and testing will be performed for each different pier.

Acceptance Testing and Approval

The Engineer will randomly select the quantity for sampling sublots of concrete in accordance with the Frequency of Testing defined above, and ITM 802. The air content, plastic unit weight (mass), and compressive strength tests will be determined for each subplot sample during concrete production. Samples of concrete will be obtained at the work site at the point of placement. When calculations are performed, rounding will be in accordance with 109.01(a). Acceptance test results will be shared with the Contractor in a timely manner.

(a) Slump Test

For any load of concrete, the slump may be visually estimated. If it is suspected that the slump is not within the allowable limits at the point of placement, the Contractor's certified concrete technician will be informed. The truck in question shall discontinue placement until a slump test is conducted to verify compliance. If the slump is outside compliance, the technician shall test for air content and unit weight (mass). The truck shall not resume discharge in the structure until quality control test results substantiate compliance.

(b) Air Content and Unit Weight (Mass) Tests

The air content and unit weight (mass) will be measured once in each acceptance sample.

Lines parallel to the CMD Linear Equation will be established to represent a decrease in water/cementitious ratio from the CMD target to a value of 0.380 and an increase in water/cementitious ratio from the CMD target to a value of 0.420. An individual job control sample having a unit weight (mass), for the air content measured, at or below the value representing the maximum allowable water/cementitious ratio, will have 4 additional cylinders cast. A test specimen will be extracted from each cylinder. Two specimens will be tested by the Department using experimental accelerated durability testing for information only. Two specimens will be tested by the Department in accordance with AASHTO T 277 at an age of 56 days. The value will be the average of the 2 specimens. A value exceeding the result determined from the trial batch demonstration concrete for the CMD, by more than 200 coulombs, will be adjudicated as a failed material in accordance with 105.03.

Calculations for air content percentage will be made and reported to the nearest figure in the first decimal place. Calculations for unit weight (mass) will be made and reported to the nearest 0.1 lb/ ft³ (1 kg/m³). Calculations for resistance to chloride ion penetration will be made and reported to the nearest 10 coulombs.

(c) Compressive Strength Test

Two cylinders will be cast from each job control sample. Initial curing of cylinders shall be completed by submerging the specimens in water saturated with calcium hydroxide at a temperature range between 60 to 80°F (16 to 27°C) for no less than 16 h or more than 48 h. Each cylinder will be tested for 28 day compressive strength and the values averaged to determine the 28 day compressive strength

Calculations for job control compressive strength will be made to the nearest figure in the second decimal place for whole psi unit (MPa units).

Air Content Acceptance

An individual job control sample having an air content of less than 5.0% or more than 8.0%, will be adjudicated as a failed material in accordance with 105.03.

Compressive Strength Acceptance A subplot test value for concrete, having a compressive strength value less than 4400 psi (30.30 MPa), will be adjudicated as a failed material in accordance 105.03.

Appeal Procedures

If the Contractor does not agree with the air content or compressive strength acceptance test results for a job control sample, an appeal may be submitted. The Department will be the final authority regarding acceptance for air content and compressive strength test results for the represented concrete. An appeal resulting in a failed material will be adjudicated in accordance with 105.03. Appeals shall satisfy the following criteria:

- (a) Appeals shall be submitted in writing to the Engineer within 5 calendar days of receipt of the Engineer's written results.
- (b) The submission shall contain applicable quality control test results that equals or exceeds the number of tests required.
- (c) The difference between the acceptance air content test result and the nearest quality control test result shall be at least 0.5%.
- (d) The difference between the acceptance compressive strength test result and the nearest quality control test result shall be at least 100 psi (0.70 MPa).

Appeals will be adjudicated by evaluation of cores taken by the Contractor. The diameter of the cores shall be 3.75 or 4.00 in. (95 or 100 mm). Appeal coring shall be completed within 30 days of acceptance of the appeal unless traffic restrictions prevent the coring. All core holes shall be filled with PCC within 24 h of drilling. If the Engineer's cores are subsequently damaged, additional coring within the represented concrete placed will be the responsibility of the Department.

The Engineer will determine the location of the cores that most closely approximates the appropriate acceptance sample location. Cores shall be obtained in accordance with AASHTO T 24 and in the presence of the Engineer. The Engineer will take immediate possession of the cores.

The Engineer will identify and mark each core as to its location and submit the cores to the Office of Materials Management for analysis.

(a) Air Content

Four cores, 3.75 or 4.00 in. (95 or 100 mm) in diameter, shall be taken for each sample. The hardened concrete air content will be determined and converted to a value representing air content in the plastic concrete in accordance with ITM 401.

The average air content from the 4 cores will be determined for the job control testing in question. This value will be used to determine all subsequent actions involving the concrete in question.

(b) Compressive Strength

Four cores, 3.75 or 4.00 in. (95 or 100 mm) in diameter, shall be obtained. Each core will be tested for compressive strength in accordance with AASHTO T 24.

The average core compressive strength will be determined for the concrete in question. This value will be used to determine all subsequent actions involving the concrete in question.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Cubic Yard as the unit of measurement.

Basis of Payment

The cost of preparing a QCP, conducting trial batch demonstrations, performing quality control testing, and similar requirements included herein will not be paid for directly but shall be included in the cost of the lump sum bid price for the design/build.

The cost of coring and refilling of the holes for appeals shall be supplied with no additional payment.

Traffic control for appeal coring shall be supplied with no additional payment.

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

LADDERS AND PLATFORMS

Description

This item shall consist of design, coordination with the Department, preparing shop drawings, furnishing, fabricating, nondestructive testing, cleaning, shop painting, galvanizing, field painting and erecting all structural metals and hardware for the ladders and platforms to provide inspection and maintenance access for the bridge superstructure.

This work shall comply with Section 910 and the following.

Design

The Contractor (Design/Builder) shall coordinate with the Department for appropriate access points and features. At a minimum, the system shall include, but not be limited to, the following features:

- Galvanized steel inspection walkway.
- Galvanized steel handrail at waist height along each diagonal bracing member at the lower chord level.
- A cable attached to the bottom of the stringers to facilitate overhead connection
- Heavy duty ladders
- Access provided via caged ladder over the barrier at pier 4 to the pier cap.
- Caged ladder extending up the truss from L24 to U24 over Pier 4 to access the top chord.
- Steel bar on each side of the floorbeam webs for inspection safety equipment
- Galvanized steel handrails around the perimeter of piers 2-6.
- All galvanized inspection access members sealed and painted as per the Special provision AESTHETIC REQUIREMENTS / ENVIRONMENTAL MITIGATION

The Contractor shall design and prepare construction plans, specifications, calculations and details for the ladders, platforms and access security system. All design documents shall be stamped by a registered professional engineer. All design documents shall be submitted to the Engineer for review and approval. Designer shall use minimum design loads and other Criteria defined in OSHA CFR 1926 Specification.

Materials

1. Ladders, grating support materials and other miscellaneous metals shall conform to the requirements of Section 910 for ASTM A 709 Grade 50 material. All ladders, grating supports, sections of grating, bolts, nuts, and washers shall be galvanized. After galvanizing, all components shall also be painted. The final top coat shall be color 35526 in accordance with the Federal standard 595. The railings shall conform to the specifications of ASTM A53 Grade B, "Steel Pipe for Railings."
2. Grating: Grating materials shall be an open bearing bar welded steel grating with sizes as designed by the Contractor. The surfaces shall be serrated for slip resistance. The crossbars shall be connected to the bearing bars by arc welding.

- 3) All access ladders shall be rated to meet minimum OSHA requirements, including OSHA 1910.27 and 1926.1053, and ANSI A14.3 requirements, except where these minimum requirements are directed to be exceeded (that is, more conservative) on the Plans and in these special provisions.
- 4) The material for all access ladder components shall be ASTM A 709 Grade 36, galvanized (Paint faying surfaces between unpainted weathering steel and galvanized steel with 1 coat of inorganic zinc prime coat). After galvanizing, all components shall also be painted. The final top coat shall be color 35526 in accordance with the Federal standard 595. All access ladders shall be rated for a minimum capacity of 350 pounds. The tread width shall be a minimum of 18 inches, with a minimum 3/4 in slip-resistant rungs.
- 5) There shall be an access ladder at Piers 2 and 6, or as otherwise coordinated and directed by the Engineer, to provide access to the inspection walkway. The access ladders shall have a guarded walk-thru top exit. The guardrails on the walk-thru top exit shall be 1.5 in OD pipe. All material shall be galvanized steel. The access ladder shall be surrounded by a safety cage for its descent, leaving the access open at the bottom.
- 6) The access ladders shall be provided with a fall protection system per OSHA requirements. The Contractor is especially directed to Title 29 Code of Federal Regulations, Subpart M, Fall Protection, 1926.500(a), 1926.501, 1926.502, and 1926.503; as well as the OSHA Publication 3146, "Fall Protection in Construction".
- 7) A type C material certification shall be submitted by the manufacturer stating that all materials comply with this special provision and INDOT's Standard Specifications.
- 8) Furnish galvanize steel according to ASTM A 123 after cutting, bending, and welding. At the discretion of the Engineer, replace, re-galvanize, or repair damaged galvanized material. If a repair is authorized, perform work according to ASTM A 780 except the Department will not allow aerosol spray applications of paints containing zinc dust.
- 9) Furnish bolts, nuts, washers, and similar threaded fasteners that are galvanized according to ASTM A 153 or F2329. These items may be mechanically zinc coated according to ASTM B 695, Class 50. Except for ASTM A 325 (ASTM A 325M) bolts, electrogalvanizing may also be used if the coated item meets the thickness coating requirements of ASTM A 153 or F2329.

Security

Security devices to limit access shall be provided at the following locations:

1. All ladders shall have a security device at the ladder entry point.

Location of caged access ladders shall be coordinated and approved by the Engineer. The security device shall be a metal gate affixed at the top of the cage to prevent unauthorized entry into the ladder cage. The gate, when closed, shall be horizontal, covering the access entry formed by the cage around the access ladder. The gate shall be hinged at the attachment point on the backside of the access cage, and rotate around that hinge to a vertical position allowing access. When the gate is open and swung back, the rungs of the access ladder are accessible, and the ladder can be descended. When the gate is open and swung back, a positive locking mechanism shall prevent the gate from inadvertent closure. When the gate is closed and locked, the ladder rungs are blocked, and the ladder cannot be descended. The door is secured by a padlock that locks the handle on the gate to a hasp bolted to the ladder frame.

All material for the security devices shall be ASTM A 709 Grade 36, galvanized (Paint faying surfaces between unpainted weathering steel and galvanized steel with 1 coat of inorganic zinc prime coat). Stainless steel may be substituted upon approval of the Engineer. Aluminum is not allowed.

Alternative security devices shall be approved by the Engineer.

The security devices shall be provided with a lockable hasp and padlock. All padlocks shall be keyed alike.

The security devices can be fabricated by the Contractor or provided through commercial providers. Security devices are provided by:

- **Tri-Arc Manufacturing Company,** 390 Fountain St, Pittsburgh, PA 15238 (412)-826-8531
- **Nail & Company Inc,** P.O. Box 77061, San Francisco, CA 94107 (415) 865-9700
- **RB Industries,** P.O. Box 4734, Greensboro, North Carolina 27404 (336)852-6276
- **Brock Manufacturing,** 611 N. Higbee St., PO Box 2000, Milford, Indiana 46542, (574)658-4191
- **Serrmi Products, Inc.,** PO Box 43346, 5290 Tulane Rd., Atlanta, Georgia 30336, (404)691-8033
- **Carbis, Inc.,** 1430 West Darlington St., Florence, South Carolina 29501, (800)948-7750
- **Cotterman Company,** Croswell, Michigan. (800)-552-3337
- **Southwest Scaffolding,** 505 Millers Run Road, Morgan, PA. 15064. (412)221-4020.

Whether fabricated by the Contractor or provided from vendors, complete plans and a list of materials shall be provided to the Engineer at least 30 days before scheduled installation of the security devices. The security devices shall not be installed until approved by the Engineer.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals shall be included in the cost of the lump sum pay item.

MODULAR EXPANSION JOINT DEVICE

Description

This work consists of fabricating, furnishing and installing waterproof modular expansion joint devices. This work shall be performed in accordance with the Plans and the following special provisions.

Materials

Materials for the devices shall meet the physical and chemical properties given in the manufacturer's technical data, except as modified by these special provisions and Plan details.

- A. Aluminum components or hardware shall not be used.
- B. Sliding surfaces of the support bars shall be stainless steel sheet made of ASTM A240, Type 304 material that meets the following requirements:
 - 1. No. 8 polish finish.
 - 2. Stainless steel surfaces shall be descaled and cleaned in accordance with ASTM A380.
 - 3. Limit carbon content to 0.03% maximum if the stainless steel is welded.
- C. Elastomeric sealing element shall conform with the following:

Single diaphragm unreinforced neoprene glands shall be used. Polychloroprene seal shall be supplied and installed in 1 continuous length. The shape of the seal shall be designed to promote self-removal of foreign material during normal joint operation. Basic physical and chemical properties of the elastomer shall be in accordance with the table below:

<u>PHYSICAL PROPERTY</u>	<u>ASTM TEST</u>	<u>REQUIREMENTS</u>
Tensile Strength	D412	2,000 psi (14 Mpa) minimum
Elongation @ Break	D412	250%
Hardness, Type A Durometer	D2240 Modified	60±5 points
Oven Aging 70 hrs. @ 212°F	D573	
Tensile Strength Loss		20% maximum
Elongation Loss		20% maximum
Hardness, Type A Durometer	D2240	0 to +10 point change
Aging 70 hrs. @ 140°F	D2240	0 to +15 point change
Oil Swell, ASTM Oil No. 3 70 hrs. @ 212°F	D471	45% max. weight change
Ozone Resistance, 20% Strain	D1149	
300 pphm in air 70 hrs @ 140°F *		No Cracks
Compression Set 70 hrs. @ 212°F	D395 Method B	40% maximum

* Note: Wipe specimens with toluene before test to remove surface contamination.

Seals shall be preformed from vulcanized elastomeric compound using polymerized chloroprene as the only polymer. Provide the size, shape and dimensional tolerances of the seals shown in the approved shop drawings. Alternate shapes may be used upon approval of the Engineer.

Glands that are a minimum of ¼ in. thick shall be provided. Provide a maximum of 3-1/4 in. of movement between beams for each gland.

D. Polytetrafluoroethylene (PTFE) shall conform with the following:

<u>PHYSICAL PROPERTY</u>	<u>ASTM TEST</u>	<u>REQUIREMENTS</u>
Min. Ultimate Tensile Strength	D638	2,800 psi (19.3 Mpa)
Min. Elongation	D638	200%
Min. Specific Gravity	D792	2.13

E. Lubricant adhesive shall be in conformance with ASTM D4070. The following brands are acceptable:

1. Delastibond Part No. 1520, as supplied by D.S Brown Co.
2. Prima-Lub, as supplied by Harris Specialty Chemicals, Inc.
3. Lube Plus 4070, as manufactured by Spray Cure Co.
4. Neoprene Adhesive D4070-81, as manufactured by Pacific Polymers, Inc.
5. Equal, as approved by the Engineer.

Submittals

Type A Certificates of compliance shall be furnished, including the following information:

- A. Certified test reports confirming that the PTFE and stainless steel coefficient of friction requirements are met.
- B. Certified test reports that system meets the design load requirements.
- C. Fatigue test results and certification that fatigue testing requirements of the system to be supplied have been met.

Impact and fatigue design calculations signed and sealed by a registered professional engineer shall be submitted.

Test 1 ft of seal material from each lot of material furnished and samples of the PTFE sheet, size 2 in. x 3 in. x 1/8 in. from the production material.

Shop drawings shall be submitted, including, but not be limited to, the following:

- A. Complete details of all components and sections showing all materials used in the expansion joints.
- B. A listing of all applicable INDOT, ASTM and AASHTO specifications.
- C. Live loading and impact factor utilized.
- D. Name and address of the manufacturer, and location of the fabrication plant.
- E. Name and telephone number of the manufacturer's representative who will be responsible for coordination of production, inspection, sampling and testing.
- F. Welding procedures used in the expansion joint assembly manufacture clearly described and detailed.
- G. Table of longitudinal offsets for installation at varying temperatures. Use 60°F as the mean temperature.
- H. Procedure, if necessary, to splice in the field, including repair of galvanization and galvanization across the spliced connection (note: avoid field splices).

The Contractor shall be responsible for coordinating the proper fit of reinforcing steel and post-tensioning steel as applicable with the expansion joint.

Supplemental to the shop drawings, design calculations shall be furnished which indicate that the joint devices furnished by the manufacturer are adequate for the requirements of the Contract. Include in the calculations rotation and horizontal movement capacity; and compression stresses on all elastomeric and sliding surfaces.

The Engineer reserves the right to visit the manufacturer's fabrication shop for purposes of inspecting the manufacturing, assembly, testing and painting of the joint device or its components.

Submit an installation procedure

A written maintenance and part replacement plan shall be prepared by the joint device manufacturer for the Engineer's approval.

Acceptable Systems

Acceptable systems shall conform to the following:

- A. The expansion joint manufacturer shall have at least 5 years recent experience in manufacturing modular expansion joints for bridges similar to this contract. The same manufacturer is to furnish all modular expansion joints under this contract.
- B. Only manufacturers who have successfully completed the fatigue testing, as described herein, will be permitted to supply modular expansion joint devices and only after the fatigue test results have been approved by the Engineer.

General Design Requirements

- A. The expansion joint devices shall be designed for AASHTO HL-93 live loading with 75% dynamic load allowance. The expansion joint shall seal the deck surface to prevent water from passing through to below the deck. The expansion joint system shall be continuous across the full width of the roadway and turned up into the traffic barriers. Transverse joints in the seals and/or seal retaining elements will not be permitted. The neoprene seal elements shall be recessed and designed to be self-cleaning. They shall be positively gripped by the transverse support beams throughout the range of the anticipated movement and provided with end plugs. Mean temperature for design shall be 60°F. The device shall be designed so there will be no physical contact of any beams at the minimum opening, and the opening between beams shall be limited to 3-¼ inches maximum-measured perpendicular to the beams under any conditions. The expansion joint seals shall accommodate movements without binding or debonding.
- B. Support bars shall be designed to provide for the full range of design movement so that bearing contact is maintained over the entire sliding surface. Groups of support bars shall be placed parallel to the centerline of the bridge at a maximum spacing of 4 feet unless otherwise supported by fatigue testing. The connections of the center beams shall be welded to the support bars with full-penetration welds. Bolted connections will not be allowed. A stainless steel face shall be provided for the ends of support bars in contact with the support bearings. A polytetrafluoroethylene (PTFE) surface bonded to the substrate shall be provided for the bearing faces in contact with the urethane bearings.
- C. The elastomeric support bar bearings shall be positively locked into the support boxes with a dowel or pin. The connection shall permit removal and replacement of the bearing components.
- D. The devices shall be designed to allow removal and replacement of the support bearings, elastomeric seal elements and control buffers. A procedure for removal and replacement of these elements shall be shown on the shop drawings.

- E. Buffers for the equidistance control mechanism shall be situated on the expansion joint device so that the direction of resistance will be parallel to the direction of movement, and the full range of design movement will be accommodated without distress.
- F. Concrete anchorages supplied for the devices shall be compatible with the devices furnished.
- G. Replacement of parts subject to wear shall be provided for in the design. A written maintenance and part replacement plan prepared by the joint device manufacturer shall be submitted for the Engineer's approval. A list of parts and instructions for maintenance inspection, acceptable wear tolerances, methods for determining wear, and procedures for replacing worn parts shall be included in this plan.

Fatigue Design Requirements

The modular bridge expansion joint systems shall be designed and tested for fatigue in accordance with NCHRP Report 402 "Fatigue Design of Modular Bridge Expansion Joints" (1997) Appendix A and Appendix B, Chapter 14 of the 4th edition of the AASHTO LRFD Bridge Design Specifications and as modified herein.

Fatigue Testing

Fatigue testing shall be completed prior to manufacturing and test results shall be submitted certifying that the system to be supplied has been positively tested in accordance with the following requirements:

- A. Fatigue testing shall be performed by an independent test laboratory in compliance with these specifications.
- B. Amplitude fatigue testing on multiple spans of 1 or more full-scale separation beams with load applied near the center of the spans and the support bars supported only at the ends. The test will determine the lower-bound AASHTO Category for all expansion joint structural steel members, connections, shop splices, field splices, and attachments. All data points shall be above the AASHTO category. Welded joints shall not have a detail category worse than Category C, and bolted joints shall not have a detail worse than Category D.
- C. Test loading applied so that vertical and horizontal loadings are applied simultaneously. Testing shall be performed so that the horizontal load is 20% of the vertical load.
- D. The expansion joint device structural steel members, welded connections and other steel components shall remain free of cracks after 100 million cycles, which represents the endurance limit.

Fabrication Requirements

Fabrication shall be performed in accordance with the following:

- A. All modular expansion joint devices for the Contract shall be fabricated by the same manufacturer.
- B. All structural steel surfaces of the expansion joint devices shall be galvanized after fabrication, except those made of stainless steel or coated with PTFE. The material to be galvanized shall be free of paint, lacquer, grease, crayon markings, etc. Any material that has been rejected due to improper galvanizing shall be replaced or stripped and re-galvanized at no cost to the Department.

Furnish galvanize steel according to ASTM A 123 after cutting, bending, and welding. At the discretion of the Engineer, replace, re-galvanize, or repair damaged galvanized material. If a repair is authorized, perform work according to ASTM A 780 except the Department will not allow aerosol spray applications of paints containing zinc dust.

- C. All edges of stainless steel sheet shall be welded to the steel substrate by the tungsten-arc welding process in accordance with the current AWS specification. Clamp down the stainless steel sheet to have full contact with the substrate during welding. Welds that protrude beyond the sliding surface of the stainless steel will not be acceptable.
- D. The fabricator will be permitted to shop-weld pre-galvanized sections, complete with anchorages, of the expansion joint device steel beams. If the steel beams are pre-galvanized, the fabricator shall:
 - 1. Provide roadway sections that are not less than 10 ft long.
 - 2. Bevel abutting ends $\frac{1}{4}$ in. and deburr the edges.
 - 3. Groove weld sections with care taken to prevent weld metal from entering the gland groove. Completely remove all galvanizing from the weld area. Grind smooth the weld across the top of the beams. Repair all areas of galvanizing damaged by welding operations in accordance with the following:
 - a. ASTM A780, Annex A1. Apply materials used for repair according the manufacturer's instructions.
 - b. Straighten to fabrication tolerances galvanized items that have undergone warping or distortion unless otherwise specified or directed by the Engineer.
 - 4. An anchorage shall be provided within 9 in. of each end of each pre-galvanized section.
- E. Seal elements shall be 1 piece for the full length of the device including curb and traffic barrier projections.
- F. Lubricant adhesive shall be applied to all elastomer-to-steel contact areas.
- G. The full penetration weld that connects the center beam to the support bar shall be inspected ultrasonically in accordance with AWS D1.5. Twenty-five percent of the center beam to support bar welds shall be tested, or as directed by the Engineer.

If ultrasonic inspection reveals at least 1 rejectable weld defect, the fabricator shall then ultrasonically inspect another 25% of the center beam to support welds. If at least 1 rejectable defect is found in the second 25% set of welds, all remaining non-inspected welds shall then be inspected. Each weld that is rejected by ultrasonic inspection shall be repaired using a welding procedure approved by the Engineer. The repaired welds shall be retested by ultrasonic inspection in accordance with the original requirements.

- H. To the extent feasible, design, fabricate, and deliver assemblies to the job site as a continuous unit whenever possible. The maximum length of completed expansion joint assembly shall be determined by practical shipping limitations. At the site, the expansion joint system shall be stored in accordance with the manufacturer's written recommendations and as approved by the Engineer.

Shipping and Installation

Conform with the following:

A. An installation procedure shall be submitted for the specific expansion joints to be installed. This plan shall be in accordance with the recommendation from the joint manufacturer. This plan shall include at a minimum:

1. Step-by-step installation procedures.
2. Method for securing the joint along with lifting locations and lifting mechanism.
3. Method for adjusting the joint for temperature considerations.
4. Method for insuring rideability.
5. Method for placing surrounding concrete, reinforcing and/or post-tensioning.
6. Method for attaching the barrier rail cover plates.
7. Method for repairing damage to corrosion protection systems.

To aid in assuring proper installation of each modular expansion joint device, the modular expansion joint manufacturer shall furnish technical assistance to the Contractor and Engineer through a full-time employee of the manufacturer who is technically knowledgeable regarding the modular expansion joint device. The manufacturer's full time employee shall be accessible to the Engineer and shall be at the site during the work, which involves the setting of all parts of at least 2 devices. Advance notice shall be given with sufficient time for proper coordination and scheduling of operations.

Written certification shall be obtained from the manufacturer certifying that each joint was assembled and installed properly. Submit this written certification to the Engineer.

B. The modular expansion joint devices shall be installed at the adjusted joint openings for the temperature at time of installation. Concrete for any device shall not be placed until the joint opening for the time of the concrete placement has been approved by the Engineer.

Damage to the joint system during shipping, handling or construction will be cause for rejection of the joint system. Damage to the corrosion protection system shall be repaired to the satisfaction of the Engineer. Do not cut or modify any element of the joint device except as recommended by the manufacturer and approved by the Engineer.

The complete, installed expansion devices shall be tested for water tightness by filling the joint opening, or portions thereof designated by the Engineer, with a 3 in. minimum depth of water for a period of not less than 6 hours. Leaking seals shall be removed, the bonding surfaces cleaned of all adhesive, and the seals replaced and retested. The water tightness test shall be performed again after joint installation in the field.

Construction equipment shall not be allowed to drive on the expansion joint devices during construction. If the joints are installed before construction is complete the Contractor shall provide a temporary bridging system, approved by the Engineer, over the joints for protection during construction.

Method of Measurement:

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Linear Foot as the unit of measurement.

Basis of Payment:

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

NAVIGABLE WATERWAYS AND COAST GUARD REQUIREMENTS

Description

All work on navigable waters shall be performed in accordance with project specifications and the following:

The United States Coast Guard regulates all work on or in navigable waters.

Bidders are advised that there is river traffic on this portion of the Ohio River throughout the year. The present navigational channel shall not be blocked to navigation, except as permitted below, and in accordance with any of the permit requirements.

All work shall be conducted so that unimpeded passage through the navigational channel is maintained and so that the present navigable depths do not decrease. The necessary navigational lights shall be maintained in good working condition at all times.

Any floating plant in the channel span shall not be permanently moored without first obtaining prior approval from the Coast Guard. Any floating plant working temporarily in the channel span shall be moved for passage of river traffic. If any operations require blocking the channel to through river traffic, prior approval shall be obtained from the Coast Guard. Any temporary reduction to the navigational clearance shall be as minimal as possible. At certain river stages determined by the Coast Guard, a helper boat may be required on-site 24 hours a day 7 days a week to assist vessels with safe passage through the bridge span. A helper boat is anticipated to be required when a rise in the river stage to 28 feet measured on the lower gage of the Markland Lock and Dam. While the new superstructure is being erected, there will be restrictions on how often and for how long the channel can be blocked.

Plans showing the location and dimensions of any temporary construction or removals which may directly or indirectly affect navigation clearances or impede or divert stream flow shall be prepared and submitted to the Engineer with written description of the proposed method of furnishing, installing, operating and maintaining any temporary navigation lights required. The Engineer will provide this information to the Coast Guard for approval.

Coast Guard approval shall be required for any and all temporary structures that will be placed in the river to facilitate the work. The decision as to whether the temporary structures plans will be approved by the Coast Guard will be based principally on the effect of the proposed structures on navigation. Reproducible drawings (8-1/2" X 11") and 3 copies of the plans shall be prepared and submitted to the Engineer for approval. Also, a contingency plan, including the names and phone numbers of personnel and equipment that will be available to correct any unforeseen navigational problems that may arise during non-working hours shall be prepared and submitted.

A minimum of 4 submittals shall be required for Coast Guard Approval:

The Cofferdam Plan,
The Causeway Plan,
The Demolition Plan, and
The Superstructure Construction Plan, including Falsework Plan and Sequential Construction Schematics,
Each submittal shall include both plan and elevation drawings and include dimensions of related construction to the navigational channel.

For each required approval, 1 electronic set and 2 hard copy sets shall be made and submitted to the Engineer. The Engineer will forward the prints to the Coast Guard for approval. When approval has been obtained from the Coast Guard, an approval letter will be furnished to the Engineer. No work shall be started on any removals or construction, which requires approval of the Coast Guard until notice of approval has been furnished the Engineer.

All temporary structures shall be marked with lights, reflective material and buoys as prescribed by the US Coast Guard. Lights and other signals shall be displayed on any floating plant as required by "Inland Navigational Rules of 1980".

All falsework, cofferdams or other structures placed in the river or caused by the work of the bridge shall be promptly cleared from the river, to the satisfaction of the Commander, Eighth Coast Guard District, when in his judgment work has reached a point where such action must be taken.

Temporary structures and bridge piers shall be kept free of unreasonable accumulations of drift and debris. Such materials shall be disposed of in an acceptable manner and place.

The Contractor shall keep the Engineer informed, and the Engineer will keep the Commander, Eighth Coast Guard District, informed of the schedule of work and give advance notice of any restrictions or events that may affect navigation.

Positive precautions shall be taken to prevent the dropping of spark-producing, flame-producing, lighted and other damaging objects onto barges or vessels passing beneath the bridge. All flame-cutting, welding, and similar spark-producing operations over the channel shall be ceased when vessels are approaching and passing beneath the bridge.

All correspondence on this project shall be transmitted to the Engineer, who will forward it to the Commander, Eighth Coast Guard District 1222 Spruce Street, St. Louis, Missouri 63103-2832, Attention: Bridge Branch. The Coast Guard will coordinate all matters with appropriate state and federal agencies and invite their comments on the proposal to the extent that it affects matters under their jurisdiction. Allow 30 days for review by the Coast Guard and other agencies and an additional 10 days for processing by the Engineer.

The Commander, Eighth Coast Guard District, shall be notified in advance of commencement of work in or over the navigation span and whenever there is a change of action that will impede navigation. Notification shall be updated by telephone if necessary to assure navigation interests are aware of the work and its effect on the movement of river traffic. Such notification must be directed to the Bridge Branch, Eighth Coast Guard District, telephone no. 314-269-2381 during office hours and 502-779-5422 during nights, holidays, and weekends.

Blocking Navigation - The contractor may be permitted, on a date approved by the Engineer and Coast Guard, to block the navigation channel in accordance with any of the project permits. The Contractor shall remove any debris resulting from his operations, restore the channel to the satisfaction of the United States Army Corps of Engineers and the Coast Guard, and reopen the channel to navigation within 24 hours of the time the navigation channel is restricted to barge traffic as determined by the Engineer and as advised by the United States Army Corps of Engineers.

No additional time will be allowed for compliance with this special provision.

Costs associated with maintaining barge traffic and complying with Coast Guard requirements are incidental to the project.

Method of Measurement:

Helper boat will be measured by the day.
All other work will not be measured for payment.

Basis of Payment:

Helper boat will be paid per day on days a helper boat is required by the United States Coast Guard. Separate payment for mobilization and demobilization of the helper boat will not be made.

All other work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

POST-TENSIONING

General.**Description**

This work consists of furnishing and installing all post-tensioning systems (PT) and any other pertinent items necessary for the particular prestressing system used, including but not limited to ducts, anchorage assemblies and local zone reinforcement. Both temporary and permanent post-tensioning shall comply with the requirements of this section. All components of a post-tensioning system shall be furnished, including steel pipes, from a single supplier. Prestressing steel may be obtained from any supplier provided they comply with Section 106.01(c).

Prestressing steel, which may be strands or bars, shall be installed through ducts in the concrete. Stress to a predetermined load and anchor directly against the hardened concrete. Ducts shall be grouted to fill all voids and protection at end anchorages shall be installed.

Submit shop and working drawings and manuals in accordance with the special provisions. The Contractor's professional engineer shall produce, sign and seal all shop drawings related to post-tensioning.

Qualifications and Inspection

All post-tensioning field operations shall be performed under the direct supervision of a qualified Level 1/2 Bonded PT - Field Installation/Field Specialist, with qualifications as issued by the American Segmental Bridge Institute (ASBI) or the Post-Tensioning Institute (PTI) certification program. All stressing and grouting operations shall be conducted in the presence of the Engineer and in accordance with the approved post-tensioning system manufacturer's recommendations and the approved Grouting Operations Plan.

Shop Drawings

Shop drawings shall be prepared to address all requirements stated in the plans and the requirements stated herein. At a minimum, the shop drawings shall: indicate the post-tensioning systems to be used; show tendon geometry and locations complying with the plans and the limitations of the selected post-tensioning system; show all inlets, outlets, high point outlet inspection details, anchorage inspection details and permanent grout caps, protection system materials and application limits.

Material Storage

All materials shall be stored in a weatherproof building, shed or container until time of installation.

Certification of Post-Tensioning Systems

Only post-tensioning systems that are approved by the Engineer shall be used. Manufacturers seeking evaluation of their post-tensioning systems shall submit test results to the Engineer and include certified test reports from an independent laboratory audited by AASHTO Materials Reference Laboratory (AMRL) which shows the post-tensioning system meets all the requirements specified herein.

Plastic components shall be tested in a certified independent laboratory accredited through the laboratory accreditation program of the Geosynthetic Accreditation Institute (GAI) or the American Association for Laboratory Accreditation (A2LA). If any component of the post-tensioning system is modified or replaced, the appropriate component test and entire system test, if needed, shall be retested in accordance with the requirements herein and an updated application made to the Engineer containing the test reports and revised system drawings. The Engineer shall be contacted for direction before attempting to change post-tensioning system components contact

A certification test for the plastic shall be performed on a sample formed or cut from the finished product. Provide the Engineer with certification that the plastic from the duct sample complies with all requirements of the specified cell class, stress crack rating and the specified amount of antioxidant.

All components of a system shall be stamped with the suppliers name, trademark, model number and size corresponding to catalog designation. Post-tensioning systems consist of an assembly of components for various sizes of strand or bars assembled and pressure tested. Post-tensioning systems shall be developed and tested, both internal (corrugated duct) and external (smooth duct) applications, as applicable, for each of the following:

Standard tendon sizes for designing and detailing shall consist of 0.6 in. diameter strand in anchorages containing 4, 7, 12, 15, 19 or 27 strands; standard bar sizes from 5/8 to 1 3/4 in. diameter. Systems using alternate anchorage sizes or strands utilizing 1/2 in. strand and providing equivalent force to these standard sizes may be submitted for approval.

Prior to installing any post-tensioning hardware, the Engineer shall be furnished with a certification from the PT supplier that the PT system chosen for the project meets the requirements of this Special Provision. Upon completion of post-tensioning installation, the Engineer shall be provided a certification that the PT system supplied was installed without modification and met the requirements of the contract documents.

~~Definitions~~

Anchorage Assembly: An assembly of various hardware components which secures a tendon at its ends after it has been stressed and imparts the tendon force into the concrete.

Anticipated Set: The wedge set assumed to occur in the design calculation of the post-tensioning forces at the time of load transfer.

Bar: Post-tensioning bars are high strength steel bars, normally available from 5/8 to 1-3/4 in. diameter and usually threaded with very coarse thread.

Bearing Plate: Any hardware that transfers the tendon force directly into a structure or the ground.

Bleed: The autogenous flow of mixing water within or its emergence from, newly placed grout, caused by the settlement of the solid materials within the mass.

Coupler: A device used to transfer the prestressing force from 1 partial length prestressing tendon to another. Strand couplers shall not be permitted.

Duct: Material forming a conduit to accommodate prestressing steel installation and provide an annular space for the grout which protects the prestressing steel.

Family of Systems: Group of post-tensioning tendon assemblies of various sizes which use common anchorage devices and design. All components within the family of systems shall be furnished by a single supplier and shall have a common design with varying sizes.

Fluidity: A measure of time, expressed in seconds necessary for a stated quantity of grout to pass through the orifice of a flow cone.

Grout: A mixture of cementitious materials and water with or without mineral additives or admixtures, proportioned to produce a pumpable consistency without segregation of the constituents, when injected into the duct to fill the space around the prestressing steel.

Grout Cap: A device that contains the grout and forms a protective cover sealing the post-tensioning steel at the anchorage.

Inlet: Tubing or duct used for injection of the grout into the duct.

Outlet: Tubing or duct to allow the escape of air, water, grout and bleed water from the duct.

Post-tensioning: A method of prestressing where tensioning of the tendons occurs after the concrete has reached a specified strength.

Prestressing Steel: The steel element of a post-tensioning tendon, which is elongated and anchored to provide the necessary permanent prestressing force.

Post-Tensioning Scheme or Layout: The pattern, size and locations of post-tensioning tendons provided by the Contractor's Designer on the Shop Drawings.

Post-tensioning System: An assembly of specific models of hardware, including but not limited to anchorage assembly, local zone reinforcement, wedge plate, wedges, inlet, outlet, couplers, duct, duct connections and grout cap, used to construct a tendon of a particular size and type. The entire assembly must meet the system pressure testing requirement. Internal and external systems are considered independent of one another.

Pressure Rating: The estimated maximum pressure that water in a duct or in a duct component can exert continuously with a high degree of certainty that failure of the duct or duct component will not occur (commonly referred to as working pressure).

Set (Also Anchor Set or Wedge Set): The total movement of a point on the strand just behind the anchoring wedges during load transfer from the jack to the permanent anchorages. Set movement is the sum of slippage of the wedges with respect to the anchorage head and the elastic deformation of the anchor components. For bars, set is the total movement of a point on the bar just behind the anchor nut at transfer and is the sum of slippage of the bar and the elastic deformation of the anchorage components.

Strand: An assembly of several high strength steel wires wound together. Strands usually have 6 outer wires helically wound around a single straight wire of a similar diameter.

Tendon: A single or group of prestressing steel elements and their anchorage assemblies imparting prestress forces to a structural member or the ground. Also included are ducts, grouting attachments, and grout and corrosion protection filler materials or coatings.

Tendon Size: The number of individual strands of a certain strand diameter or the diameter of a bar.

Thixotropic: The property of a material that enables it to stiffen in a short time while at rest, but to acquire a lower viscosity when mechanically agitated.

Wedge Plate: The hardware that holds the wedges of a multi-strand tendon and transfers the tendon force to the anchorage assembly. (Commonly referred to as anchor head)

Wedge: A conically shaped device that anchors the strand in the wedge plate.

Materials

Materials provided shall meet the following requirements :

- Wire Strand⁺.....ASTM A 416
- Bar⁺⁺ASTM A 722
- Grout.....(1)
- Magnesium Ammonium Phosphate Concrete.....(2)
- Epoxy Grout/Epoxy.....(3a/3b)
- Elastomeric Coating System.....(4)
- Methacrylate.....(5)
- Epoxy Penetrating Sealer.....(6)

⁺ Strand: Unless otherwise noted on the plans, Grade 270, low relaxation 7-wire strand meeting the requirements of ASTM A 416.

⁺⁺ Bar: Unless otherwise noted on the plans, uncoated Grade 150, high strength, coarse thread bar meeting the requirements of ASTM A 722, Type II.

(1) Class C grout meeting the requirements of Section 3 of "Guide Specification for Grouting of Post-Tensioned Structures," PTI, Second Edition, 2003.

Grout Physical Properties:

Gas Generation: The grout shall not contain aluminum or other components which produce hydrogen, carbon dioxide or oxygen gas.

Laboratory Test: The grout shall meet or exceed the specified physical properties stated herein as determined by the following standard and modified ASTM test methods conducted at normal laboratory temperature (65-78°F) and conditions. Conduct all grout tests with grout mixed to produce the minimum time of efflux. Establish the water content to produce the minimum and maximum time of efflux.

Physical Property	Requirement	Test Method
Total Chloride Ions	Max. 0.08% by weight of cementitious material	ASTM C 1152
Fine Aggregate (if used)	99% passing the No. 50 Sieve (300 micron)	ASTM C 136*
Hardened Height Change @ 24 hours and 28 days	0.0% to + 0.2%	ASTM C 1090**
Expansion	≤ 2.0% for up to 3 hours	ASTM C 940
Wet Density - Laboratory	Report maximum and minimum obtained test value lb/ft ³ (kg/l)	ASTM C 185
Wet Density - Field	Report maximum and minimum obtained test value lb/ft ³ (kg/l)	ASTM C 138
Compressive Strength 28 day (Average of 3 cubes)	≥7,000 psi [48.3 MPa]	ASTM C 942
Initial Set of Grout	Min. 3 hours Max. 12 hours	ASTM C 953
Fluidity Test*** Efflux Time from Flow Cone: Immediately after mixing:	Min. 20 Sec. Max. 30 Sec. Or Min. 9 Sec. Max. 20 Sec.	ASTM C 939 ASTM C 939****
Fluidity Test*** Efflux Time from Flow Cone: 30 minutes after mixing with remixing for 30 sec:	Max. 30 Sec. Or Max. 30 Sec.	ASTM C 939 ASTM C 939****
Bleed @ 3 hours	Max. 0.0%	ASTM C 940*****
Permeability @ 28 days	Max. 2500 coulombs at 30 V for 6 hours	ASTM C 1202*****

*Modify ASTM C117 procedure to use a #50 sieve. Determine the percent passing the #50 sieve after washing the sieve.

**Modify ASTM C1090 to include verification at both 24 hours and 28 days.

***Achieve adjustments to flow rates by strict compliance with the manufacturer's recommendations.

****Grout fluidity meets either the standard ASTM C939 flow cone test or the modified test, as follows. Modify the ASTM C939 flow cone test by filling the cone to the top instead of to the standard level. The efflux time is the time to fill a 1 liter container placed directly under the flow cone.

*****Modify ASTM C940 to conform with the wick induced bleed test as follows:

- a. The wick is a 20 in. length of ASTM A416 7 wire 1/2 in. diameter strand. Degrease the strand with acetone or hexane solvent and a wire brush to remove all surface rust on the strand before temperature conditioning. Wrap the strand with 2 in. wide duct or electrical tape at each end before cutting to avoid splaying of the wires when it is cut.
 - b. Condition overnight all the dry ingredients, mixing water, prestressing strand and test apparatus at 65 to 75°F.
 - c. Mix the conditioned dry ingredients with conditioned mixing water and 800 ml of the resulting grout placed into a 1,000 ml graduate cylinder. Record the level of the top of the grout.
 - d. Insert the strand into the graduated cylinder, centered and fastened so it remains essentially parallel to the vertical axis of the cylinder. Record the level of the top of the grout.
 - e. Store the mixed specimen at the temperature range in (b) above.
 - f. Measure the level of the bleed water every 15 minutes for the first hour and hourly for 2 successive readings thereafter.
 - g. Calculate the amount of bleed water, if any, at the end of the 3 hour test period and the resulting expansion per the procedures outlined in ASTM C940, expressing the quantity of bleed water as a percent of the initial grout volume. Note if the bleed water remains above or below the top of the original grout height. Note if any bleed water is absorbed into the specimen during the test.
- *****When evaluating grouts, modify the ASTM C1202 procedure to perform the test at 30 volts rather than 60 volts. Perform testing on grout samples at 28 days of age. For grouts containing pozzolanic mineral admixtures, perform testing on grout samples at 90 days of age.

(2) Magnesium Ammonium Phosphate Concrete (MAPC)

MAPC shall be used to repair block-outs and holes in post-tensioned elements. The manufacturers' recommendations for preparing the surfaces and for mixing, placing and curing the concrete shall be followed. Accurate control of the quantity of water used for mixing this material is required. The MAPC material shall meet or exceed the specified physical properties stated herein as determined by the following standard ASTM test methods.

Property	Test Value	Test Method
Compressive Strength at 28 days	> 8,500 psi	ASTM C 109* [ASTM C 109M]
Flexural Strength at 28 days, Specimen 1 9/16 x 1 9/16 x 6 5/16 in. [40 x 40 x 160 mm]	> 600 psi	ASTM C 348*
Slant Shear Bond at 14 days	> 2,500 psi	ASTM C 882*
Freeze Thaw Resistance	RDF 80%	ASTM C 666**
Initial Set Time	15 min at 95°F min.	ASTM C 266
Scaling Resistance	No scaling	ASTM C 672*** [ASTM C 672M]
Shrinkage at 28 days	≤0.03%	ASTM C 596
Sulfate Resistance after 52 weeks of immersion	≤ 0.1%	ASTM C 1012
Chloride Absorption, Weight Change At 21 days, Specimen 4 in cubes [102 mm]	≤ 1.5 %	NCHRP T-244

* Modified test methods for air curing instead of moist curing.

** 300 Cycles

*** 25 Cycles

(3a) Epoxy Compound Type Q for Anchorage Pour-Backs

These epoxy materials shall be used to protect the anchorages of post-tensioning tendons or bars and other uses. The material produces a low exothermic reaction and has flow and fill characteristics suitable for machine base plate applications. Extend the material with the aggregate supplied by the manufacturer. Mix with the full aggregate loading unless the use of less aggregate is approved.

The material shall be pre-proportioned in the factory, including factory supplied aggregate. Deliver products in original containers with manufacturer's name, date of manufacture, product identification label and batch numbers. Materials shall be within the manufacturer's recommended shelf life. The product shall be stored and conditioned in full compliance with manufacturer's recommendations.

The epoxy grout plus aggregate mix shall meet or exceed the specified physical properties stated herein as determined by the following standard ASTM test methods.

Property	Test Value	Test Method
Compressive Strength Cubes 7 day Cure @ 77°F	> 10,000 psi	ASTM C 579B
Tensile Strength @ 7 day	> 2100 psi	ASTM C 307
Flexural Strength @ 7 day Cure @ 77°F	> 3600 psi	ASTM C 580
Modulus of Elasticity 7 day Cure @ 77°F	< 2,100,000 psi	ASTM C 580
Coefficient of Thermal Expansion @ 74 to 210°F	< 20 x 10 ⁻⁶ in/in/°F	ASTM C 531
Peak Exotherm, Specimen 12 x 12 x 3 in.	< 150°F	ASTM D 2471
Slant Shear @ 7 days (Bond Strength to Concrete)	> 3000 psi (20.7 MPa)	ASTM C 882
Thermal Compatibility	5 Cycles Passed	ASTM C 884
Linear Shrinkage @ 7 days	0.025%	ASTM C 531
Flowability and Bearing Area	90% Contact area	ASTM C 1339
Gel Time, Specimen 12 x 12 x 3 in.	< 4:00 (hr.)	ASTM D 2471

(3b) Specific Requirements for Type F-1 Epoxy Compound

Type F-1 epoxy for filling voids and repairing vertical and other surfaces shall be a trowelable low modulus, non-sagging gel epoxy compound capable of bonding to wet surfaces with the following properties:

Color	Match gray color No. 36622 of Federal Standard No. 595a
Viscosity	Gel
Maximum sand loading	2.25 parts sand to 1 part mixed epoxy by volume
Elongation in tension, minimum	10% by ASTM D 638, 7 day cure
Wet bond to Steel and Concrete, minimum	250 psi by Florida Test Method FM 5-23, or approved equal test

(4) Elastomeric Coating System

General Requirements:

This section defines the requirements for an elastomeric polyurethane waterproof coating system (prime and subsequent coats). This system shall be used to provide an elastomeric coating (waterproof barrier) over post-tensioning anchorages or other areas as necessary that are not visible from the exterior of the structure. A single manufacturer shall supply the components of the coating system and sold as a waterproof coating system. Apply the surface preparation and application of the coating system in strict accordance with the manufacturer's specifications.

Certification:

A written certification from the manufacturer that the product meets the requirements of this Provision shall be provided. The manufacturer shall have quality control standards conforming to ISO 9000 Standards.

Physical Properties:

The elastomeric coating system is composed of several coats. The use of an epoxy prime coat is dependent upon the requirements of the manufacturer's waterproofing system. The polyurethane chemistry may be either waterborne aromatic (moisture-curing) or aromatic (moisture-sensitive). The minimum thickness of the system shall not be less than 30 mils, and the cured coating system shall meet the following requirements:

Property	Test Value	Test Method
Hardness, Shore A	Between 60 and 90	ASTM D 2240
Tensile Strength	> 750 psi	ASTM D 412
Elongation	> 400 %	ASTM D 412
Tear Strength	> 70 pli	ASTM C 957
Abrasion Resistance H-18 wheels 1000 gm/wheel	≤ 350 mg loss / 1000 revs.	ASTM C 957
Crack Bridging 1000 Cycles	System Passes	ASTM C 957
Elongation Recovery	> 94%	ASTM C 957

(5) High Molecular Weight Methacrylate (HMWM)

Materials:

The methacrylate system shall be a 3 component system consisting of: a) methacrylate monomer, b) cumene hydroperoxide (CHP) initiator, and c) cobalt promoter. A HMWM monomer that is approved by the Engineer shall be used. Use initiator and promoter approved by the monomer manufacturer. Manufacturers seeking evaluation of their products shall submit the following documentation:

1. Manufacturer's material installation instructions showing the product can be installed in accordance with this Provision.
2. Independent laboratory test data and results showing the product has been tested in accordance with the requirements of this Provision and meets the requirements.

Properties:

A methacrylate material that meets the following physical and performance requirements shall be used:

Physical Properties of Methacrylate Resin	
Viscosity (Brookfield RVT)	14-20 cps at 50 rpm
Density (ASTM D1481)	8.5 - 9.0 lb/gl at 77° F
Flash Point (ASTM D93)	> 200°F (Pensky Martens CC)
Odor	Low
Bulk Cure Speed	3 Hours @ 73°F (max.)
Surface Cure	8 Hours @ 73°F (max.)
Gel Time (ASTM 2471)	60 minutes (max.)
Tack Free Time	5 Hours (max.) (at 72°F and 50% Relative Humidity)
Compressive Strength (AASHTO T106)	6,500 psi (min)
Tensile Strength (ASTM C307)	1,300 psi (min)
Shear Bond Adhesion (ASTM C882)	600 psi (min)
Wax Content	0

The monomer shall have a shelf life of no less than 12 months and shall be no more than 8 months old at the time of application. Each container shipped to the job site shall have the following information on a manufacturer's label: manufacturer's name, product name, lot or batch number, date of production, and drum serial number. Identify the catalysts by their generic classification and provide the date of manufacture.

(6) Epoxy Penetrating Sealers

General Requirements:

This section defines the requirements for an epoxy penetrating seal coating. This coating shall be used to provide a barrier over pour back material at blockouts for post-tensioning anchorages or other areas as necessary that are visible from the exterior of the structure. Apply the surface preparation and application of the coating system in strict accordance with the manufacturer's specifications.

Materials:

Epoxy Penetrating Sealers shall meet the requirements of INDOT section 909.09 or 909.10.

Post-Tensioning System

Approved post-tensioning systems of the proper size and type to construct tendons shown on the Contract Documents shall be used. Substitution of components of approved post-tensioning systems is not permitted. For permanent applications, the use and location of bar couplers is subject to approval by the Engineer. Only post-tensioning systems that utilize tendons fully encapsulated in anchorages and ducts shall be used. Systems which transfer prestress force by bonding the prestress steel strand directly to concrete are not permitted. Embedded anchors for bars are permitted. Systems utilizing formed, ungrouted voids or "Diablos" are not permitted. Strand or tendon couplers are not permitted.

Post-Tensioning Anchorages

The anchorages shall develop at least 95% of the actual ultimate tensile strength of the prestressing steel, when tested in an unbonded state, without exceeding the anticipated set.

Anchorage shall be designed so that the average concrete bearing stress is in compliance with the AASHTO LRFD Bridge Design Specifications. Testing and written certification that anchorages meet or exceed the testing requirements in the AASHTO LRFD Bridge Construction Specifications shall be provided.

The embedded body of the anchorage shall be galvanized in accordance with ASTM A123. Other components of the anchorage including wedges, wedge plate and local zone reinforcement are not required to be galvanized. The bearing surface and wedge plate shall be constructed from ferrous metal. All anchorages shall be equipped with a permanent grout cap that is vented and bolted to the anchorage.

Wedge plates with centering lugs or shoulders shall be provided to facilitate alignment with the bearing plate.

Anchorage with grout outlets suitable for inspection shall be cast from either the top or front of the anchorage. The grout outlet shall serve a dual function of grout outlet and post-grouting inspection access. The geometry of the grout outlets shall facilitate being drilled using a 3/8 in. diameter straight bit to allow endoscope inspection directly behind the anchor plate. Anchorages may be fabricated to facilitate both inspection locations or may be 2 separate anchorages of the same type each providing singular inspection entry locations.

Trumpets associated with anchorages shall be made of either ferrous metal or polypropylene plastic material conforming to the requirements stated in the subsection CORRUGATED PLASTIC DUCT. The thickness of the trumpet at the transition location (choke point) shall not be less than the thickness of the duct as established in the subsection CORRUGATED PLASTIC DUCT. Alternately, the trumpet material may be polyolefin containing antioxidant(s) with a minimum oxidation induction time (OIT) according to ASTM D 3895 of not less than 20 minutes. An OIT test shall be performed on samples taken from the finished product. The remolded finished polyolefin material shall be tested for stress crack resistance using ASTM F 2136 at an applied stress of 348 psi resulting in a minimum failure time of 3 hours.

Bar Couplers

Couplers meeting the requirements of AASHTO LRFD Bridge Design Specifications and Bridge Construction Specifications shall be used. Testing and written certification that the couplers meet or exceed the testing requirements in the AASHTO LRFD Bridge Construction Specifications shall be provided.

Inlets, Outlets, Valves and Plugs

Permanent grout inlets, outlets, and threaded plugs made of ASTM A 240 Type 316 stainless steel, nylon or polyolefin materials shall be provided. For products made from nylon, the cell class of the nylon according to ASTM D5989 shall be S-PA0141, S-PA0231 or S-PA0401. Products made from polyolefin shall contain antioxidant(s) with a minimum OIT according to ASTM D 3895 of not less than 20 minutes. An OIT test on samples taken from the finished product shall be performed. Test the remolded finished polyolefin material for stress crack resistance using ASTM F 2136 at an applied stress of 348 psi resulting in a minimum failure time of 3 hours. All inlets and outlets shall be equipped with pressure rated mechanical shut-off valves or plugs. Inlets, outlets, valves and plugs shall be rated for a minimum pressure rating of 150 psi. Inlets and outlets with a minimum inside diameter of 3/4 in. for strand and 3/8 in. for single bar tendons and 4 strand duct shall be used.

Dual mechanical shutoff valves shall be provided when performing vertical grouting. Specifically designate temporary items, not part of the permanent structure, on the PT System drawings. Temporary items may be made of any suitable material.

Permanent Grout Caps

Permanent grout caps made from approved polymer or ASTM A 240 Type 316L stainless steel shall be used. The approved resins used in the polymer shall be nylon, acrylonitrile butadiene styrene (ABS) or polyester. For products made from nylon, the cell class of the nylon according to ASTM D5989 shall be S-PA0141, S-PA0231 or S-PA0401. Seal the cap with O ring seals or precision fitted flat gaskets placed against the bearing plate. Place a grout vent on the top of the cap. Grout caps shall be rated for a minimum pressure rating of 150 psi. Type 316L stainless steel bolts shall be used to attach the cap to the anchorage. When stainless steel grout caps are supplied, certified test reports documenting the chemical analysis of the steel shall be provided.

Duct and Pipe

General:

Only plastic duct, steel pipe or a combination of plastic duct and steel pipe shall be used. All connectors, connections and components of post-tensioning system hardware shall be air and water tight and pass the pressure test requirements herein. Smooth plastic duct shall be used in all post-tensioning systems used for external tendons. Corrugated plastic duct in all post-tensioning systems used for all internal tendons shall be used except where steel pipe is required.

Duct or Pipe Minimum Diameter:

For prestressing bars, Duct with a minimum internal diameter of at least 1/2 in. larger than the outside diameter, measured across the deformations, shall be provided. For prestressing bars with couplers, the duct shall be sized to be 1/2 in. larger than the diameter of the bar and/or coupler.

For multi-strand tendons, Ducts with a minimum cross-sectional area 2 1/2 times the cross-sectional area of the prestressing steel shall be provided.

Connection Tolerance between Pipe and Duct:

Steel pipe and plastic duct may be connected directly to each other when the outside diameters do not vary more than ± 0.08 in. A reducer shall be used when the diameters of the steel pipe and the plastic duct are outside of this tolerance.

Steel Pipes:

Galvanized schedule 40 steel pipes shall be used where shown and in all deviation blocks and diaphragms.

Corrugated Plastic Duct:

Do not use ducts manufactured from recycled material. Seamless fabrication methods shall be used to manufacture ducts.

Corrugated duct manufactured from non-colored, unfilled polypropylene meeting the requirements of ASTM D4101 "Standard Specification for Polypropylene Plastic Injection and Extrusion Materials" with a cell classification range of PP0340B14541 to PP0340B67884 shall be used. The duct shall be white in color containing antioxidant(s) with a minimum OIT according to ASTM D 3895 of 20 minutes and containing a non-yellowing light stabilizer. An OIT test shall be performed on samples from the finished product.

Duct with a minimum thickness as defined in the following table shall be furnished:

Duct Shape	Duct Diameter	Duct Thickness
Flat	any size	0.08 inch
Round	0.9 inch	0.08 inch
Round	2.375 inches	0.08 inch
Round	3.0 inches	0.10 inch
Round	3.35 inches	0.10 inch
Round	4.0 inches	0.12 inch
Round	4.5 inches	0.14 inch
Round	5.125 inches	0.16 inch
Round	5.71 inches	0.16 inch

Testing Requirements for Corrugated Plastic Duct:

The duct system components and accessories shall meet the requirements of Chapter 4, Articles 4.1 through 4.1.8 of International Federation of Structural Concrete (FIB) Technical Report, Bulletin 7, titled "Corrugated Plastic Duct for Internal Bonded Post-Tensioning" as modified herein.

The requirements in FIB Technical Report, Bulletin 7, are modified as follows: Conduct the lateral load resistance test (FIB 4.1.4), without the use of a duct stiffener plate, using a load of 150 lbs. for all sizes; Wear resistance of duct (FIB 4.1.7) shall not be less than 0.06 in. for duct up to 3.35 in. in diameter and not less than 0.08 in. for duct greater than 3.35 in. in diameter; Bond length test (FIB 4.1.8) shall achieve 40% GUTS in a maximum length of 16 duct diameters.

Minimum Bending Radius for Corrugated Plastic Duct:

In addition to the component testing stated herein, the manufacturer shall establish, through testing, the minimum bending radius for the duct. The test consists of a modified duct wear test as described in Chapter 4, Article 4.1.7 of FIB Technical Report, Bulletin 7, titled "Corrugated Plastic Duct for Internal Bonded Post-Tensioning".

The test apparatus shall be identical to the wear test apparatus with the same clamping force as a function of the number of strands in the duct; however, modify the procedure as follows: do not move the sample along the strand to simulate wear; the test duration shall be 7 days. Upon completion of the test duration, remove the duct and the minimum wall thickness along the strand path shall not be less than 0.06 in. for duct up to 3.35 in. diameter and not less than 0.08 in. for duct greater than 3.35 in. in diameter.

Corrugated Duct Connections and Fittings:

All splices, joints, couplings and connections to anchorages shall be made with devices or methods, such as mechanical couplers or plastic sleeves in conjunction with shrink sleeve, producing a smooth interior alignment with no lips or kinks. All connections and fittings shall be designed to be airtight. Duct tape is not permitted to join or repair duct connections.

Connections and fittings shall be constructed from polyolefin materials containing antioxidant stabilizer(s) meeting the requirements established in the subsections INLETS, OUTLETS, VALVES AND PLUGS or CORRUGATED PLASTIC DUCT.

For post-tensioned systems intended for use with segmental constructed box girder bridges, the post-tensioning system shall include duct couplers at the segment joints. The tendon duct coupler located at the segment joint shall be mounted perpendicular to the bulkhead and designed to receive a duct at an angle of 6 degrees deviation from perpendicular. The coupler shall be able to accommodate angular deviation of the duct without the tendon strands touching the duct or coupler on either side of the segment joint.

Smooth Duct:

Smooth duct manufactured from 100% virgin polyethylene resin meeting the requirements of ASTM D 3350 with a minimum cell class of 344464C shall be used. Resin containing antioxidant(s) shall be used. OIT tests on samples taken from the finished product shall be performed resulting in a minimum OIT according to ASTM D 3895 of 40 minutes. Duct shall be manufactured with a dimension ratio (DR) of 17.0 or less as established by either ASTM D 3055 or ASTM F 714 as appropriate for the manufacturing process used.

Smooth duct meeting the minimum working pressure rating of 100 psi and manufactured to either of the following Specifications: ASTM D 3035 "Standard Specifications for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter" or ASTM F 714 "Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter" shall be used.

External Smooth Duct Connections:

Heat welding techniques shall be used to make splices between sections of plastic duct, in accordance with the duct manufacturers instructions or connections may be made with electrofusion coupler or other mechanical couplers meeting the material requirements of this Provision. All connections shall have a minimum working pressure rating of 100 psi, produce a smooth interior alignment and a connection with no lips or kinks.

All connections between steel pipe embedded in concrete and plastic duct shall be made by using a mechanical coupler or a circular sleeve made of Ethylene Propylene Diene Monomer (EPDM), having a minimum working pressure rating of 100 psi. EPDM materials having 100% quality retention as defined by ASTM D 1171 Ozone Chamber Exposure Method B shall be used.

EPDM sleeves shall have a minimum wall thickness of 3/8 in. and be reinforced with a minimum of 4 ply polyester reinforcement. A 3/8 in. wide power seated band and clamps constructed from ASTM A316 stainless steel shall be used on each end of the boot to seal against leakage of grout. Install the band with an 80 to 120 lb seating force.

Corrugated Ferrous Metal Ducts:

Corrugated ferrous metal ducts shall not be used in any location.

Shipping and Storage of Ducts:

Duct with end caps shall be furnished to seal the duct interior from contamination. Ship in bundles which are capped and covered during shipping and storage. Ducts shall be protected against ultraviolet degradation, crushing, excessive bending, dirt contamination and corrosive elements during transportation, storage and handling. Do not remove end caps supplied with the duct until the duct is incorporated into the bridge component. Store duct in a location that is dry and protected from the sun. Storage shall be on a raised platform and completely covered to prevent contamination. If necessary, wash duct before use to remove any contamination.

Internal Duct Mechanical Couplers, O-Rings, Segment Seal Assemblies and Heat Shrink Sleeve Requirements:

Ducts for prestressing bars used exclusively for temporary post-tensioning are not required to be coupled across segment joints.

Mechanical Couplers:

Mechanical internal duct couplers shall be constructed with stainless steel, plastic or a combination of these materials. Plastic resins meeting the requirements of the subsections INLETS, OUTLETS, VALVES AND PLUGS or CORRUGATED PLASTIC DUCT shall be used to construct plastic couplers. ASTM A 240 Type 316 stainless steel shall be used to make metallic components.

O-rings:

O-ring duct coupling assemblies and segment seal mounting assemblies made from plastic resins meeting the requirements of the subsections INLETS, OUTLETS, VALVES AND PLUGS or CORRUGATED PLASTIC DUCT shall be provided.

Standard O-ring material with a diameter less than 0.25 in. conforming with the following requirements shall be furnished:

Mechanical Properties

Shore hardness, A ASTM D2240.....50-75
Ultimate elongation %, ASTM D412.....250 % Min.
Tensile strength, ASTM D412.....1400 psi Min.

Accelerated Testing

Thermal Deterioration 70 hours @ 257° F, ASTM D573
Change in tensile strength.....± 30 %
Change of elongation.....-50 %
Change of hardness.....± 15 points
Compression Set Method B 22 hours @257° F, ASTM D395.....50 %
Volume change due to absorption of H₂O, Method D, for 70 hours @ 212° F, ASTM D471.....+ 10 %

Environmental Resistance

Ozone Resistance Exposure Method B, ASTM D1171.....Pass
Low Temp. Non-brittle after 3 Min. @ -40°F, ASTM D2137.....Pass

Segment seal assemblies for large diameter compression seals, used to couple ducts at segment joints, which conform with the requirements stated above and with the following additions and changes shall be furnished:

Mechanical Properties

Shore hardness, A ASTM D2240.....30-40
Tensile strength, ASTM D412.....600 psi Min.
Compression Set Method B 22 hours @257° F, ASTM D395.....60 %

Compression Force - The maximum force to compress the O-ring to its final compressed position shall not be greater than 25 psi times the area encircled by the O-ring.

Voided Area - The seal shall be designed to accommodate the material flow within its own cross sectional area by using a hollow or voided design.

Mounting Assemblies - Assemblies holding the O-ring shall mount to the form bulkhead and provide for duct alignment.

Heat Shrink Sleeves:

Heat shrink sleeves having unidirectional circumferential recovery manufactured specifically for the size of the duct being coupled consisting of an irradiated and cross linked high density polyethylene backing for external applications and linear-density polyethylene for internal applications shall be furnished. Furnish adhesive having the same bond value to steel and polyolefin plastic materials. Heat shrink sleeves shall have an adhesive layer that will withstand 150°F operating temperature and meet the requirements of the following table:

Property	Test Method	Minimum Requirements	
		Internal Application	External Application
Minimum Fully Recovered Thickness		92 mils	111 mils
Peel Strength	ASTM D 1000	29 pli	46 pli
Softening Point	ASTM E 28	162°F	216°F
Lap Shear	DIN 30 672M	87 psi	58 psi
Tensile Strength	ASTM D 638	2,900 psi	3,480 psi
Hardness	ASTM D 2240	46 Shore D	52 Shore D
Water Absorption	ASTM D 570	Less than 0.05%	Less than 0.05%
Color		Yellow	Black
Minimum Recovery	Heat Recovery Test	33%	23%

Heat shrink sleeves shall be installed using procedures and methods in accordance with the manufacturer's recommendations.

System Test Requirements For each family of post-tensioning systems, systems shall be assembled and the pressure test defined herein shall be performed. For each family of post-tensioning systems test 2 assemblies, one being the largest and the other the smallest, from the family. The post-tensioning assembly includes at least 1 of each component required to make a tendon from grout cap to grout cap. If applicable, include plastic duct to steel pipe connections and segment duct couplers.

Grouting Component Assembly Pressure Test: Anchorage and grout cap shall be assembled with all required grouting attachments including but not limited to grout tube, valves, and plugs. Seal the opening in the anchorage where the duct connects. Condition the assembly by maintaining a pressure of 150 psi in the system for 3 hours. After conditioning, the assembly shall sustain a 150 psi internal pressure for 5 minutes with no more than 15 psi reduction in pressure. For systems using the same anchorages, grout caps and grouting attachments as a previously approved system, the grouting component assembly pressure test may include documentation from a previous submittal with written certification that the same components are being utilized in both anchorages.

External Duct Systems: System testing for external duct requires 2 additional tests. (1) The anchorage and its connection to the duct/pipe assembly shall be tested in accordance with and meet the requirements for internal duct systems. The duct/pipe assembly consists of all components internal to the diaphragm concrete.

Test the assembly at 1.5 psi. (2) The duct and pipe assembly consisting of all external duct connections including but not limited to welded duct splices, duct-pipe and a grout vent shall comply with the following test. Condition the assembly by maintaining a pressure of 150 psi in the system for 3 hours. After conditioning, the assembly must sustain a 150 psi internal pressure for 5 minutes with no more than 15 psi reduction in pressure. The length of the test pipe assembly for the second test is 15 feet.

Internal Duct Systems: A system test of the assembly shall be performed for compliance with the requirements of Chapter 4, Article 4.2, Stage 1 and Stage 2 Testing contained in FIB Technical Report, Bulletin 7, titled "Corrugated Plastic Duct for Internal Bonded Post-tensioning". For bar systems modify the system test length to 15 ft. For systems being tested for use in precast segmental construction, modify this test to include one duct coupler (or O-ring assembly) which is to be used at the segment joint.

The coupler shall be tested for proper function by casting the coupler into a 2 part concrete test block using match cast techniques. Use blocks that are at least 12 in. x 12 in. x 12 in.. After the concrete has hardened, pull the blocks apart and clean the surface of any bond breaker materials. Using an external apparatus clamp the blocks together and maintain 40 psi pressure on the block cross-section during the pressure test. Do not apply epoxy between the blocks for this portion of the test. Pressurize the duct within the test block to 5 psi and lock-off the outside air source. The assembly shall sustain a 5 psi internal pressure for 5 minutes with no more than a 0.5 psi reduction in pressure. Separate the duct coupler blocks from the duct system remove the clamping device and place a 1/16 in. layer of epoxy on the face of both blocks, clamp the blocks together and maintain a pressure of 40 psi on the block cross-section for 24 hours. Upon removal of the clamping force, demolish the blocks. The coupler and the attached ducts shall be intact and free of epoxy, and properly attached without crushing, tearing or other signs of failure.

Grout: Only grouts that meet the requirements of Section 3, Class B or C, of "Guide Specification for Grouting of Post-Tensioned Structures," PTI, Second Edition, 2003 shall be used. Select the post-tensioning grout for use by the proper application either repair, horizontal or vertical. Grout shall be mixed with potable water. Maintain grout fluidity in strict compliance with the grout manufacturer's recommendations and test with a flow cone.

Grout Storage: Grout shall be stored in a location that is both dry and convenient to the work. Storage in the open shall be on a raised platform and with adequate waterproof covering to protect the material. On site storage of grout is limited to a maximum period of 1 month.

Samples for Testing and Identification:

General: Testing shall conform to the applicable ASTM Specifications for the prestressing material used.

Consider the job site or site referred to herein, as the location where the prestressing steel is to be installed, whether at the bridge site or at the casting yard.

Prestressing Steel: Samples for testing as described below shall be furnished for each manufacturer of prestressing strand and bar to be used on the project.

With each sample of prestressing steel strand or bar furnished for testing, submit a certification stating the manufacturer's minimum guaranteed ultimate tensile strength of the sample furnished.

The Engineer may sample the following materials, at the plant or jobsite, from the prestressing steel used for post-tensioning operations:

(a) For strand: 3 randomly selected samples, 5 feet long, per manufacturer, per size of strand, per shipment, with a minimum of 1 sample for every 10 reels delivered.

(b) For bars: 3 randomly selected samples, 5 feet long, per manufacturer, per size of bar, per heat of steel, with a minimum of 1 sample per shipment.

One of each of the samples furnished to represent a lot, may be tested. The remaining sample(s), properly identified and tagged, may be stored by the Engineer for future testing. In the event of loss or failure of the component the stored sample will be utilized to evaluate for minimum strength requirements. For acceptance of the lot represented, test results shall show 100% of the guaranteed ultimate tensile strength.

Lots and Identification: A lot is that parcel of components as described herein. All bars, of each size from each mill heat of steel, and all strand from each manufactured reel to be shipped to the site shall be assigned an individual lot number and must be tagged in such a manner that each such lot can be accurately identified at the job site. Records shall be submitted to the Engineer identifying assigned lot numbers with the heat, or reel of material represented. All unidentified prestressing steel, or bars received at the site will be rejected. Also, loss of positive identification of these items at any time will be cause for rejection.

A copy of the grout quality control data sheet shall be provided to the Engineer, from the manufacturer, for each lot number and shipment sent to the job site. Materials with a total time from manufacturer, in excess of 6 months, shall be retested and certified by the supplier before use or be removed from the project and replaced.

Approval of Materials: The approval of any material by the Engineer will not preclude subsequent rejection if the material is damaged in transit or later damaged or found to be defective.

Testing by the Contractor: (Not Required on Post-tensioned, Precast Flat Slab Bridges and Double Tee Bridges).

Tendon Modulus of Elasticity Test: If ordered by the Engineer, perform a tendon modulus of elasticity test in accordance with the following procedure.

For the purpose of accurately determining the tendon elongations while stressing, bench test 2 samples of each size of tendon to determine the modulus of elasticity prior to stressing the initial tendon.

For the purpose of this test, the bench length between anchorages shall be at least 40 ft and the tendon duct at least 2 in. clear of the tendon all around. The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell at the dead end. Tension the test specimen to 80% of ultimate in 10 increments and then detention from 80% of ultimate to zero in 10 decrements. For each increment and decrement, record the gauge pressure, elongations and load cell force. Note elongations of the tendon for both ends and the central 30 ft, measured to an accuracy of $\pm 1/32$ in. Correct the elongations for the actual anchorage set of the dead end.

Calculate the modulus as follows:

$$E = PL/Adl$$

where;

P= force in tendon,

L= distance between pulling wedges and dead end wedges or exact length in center 30 ft of the tendon.

A= cross sectional area of the tendon based on nominal area.

dl= strand elongation for load P.

If the bench test varies from the modulus of elasticity used for the shop or working drawings by more than 1%, submit revisions to the theoretical elongations to the Engineer for approval.

When the observed elongations of the tendons in the erected structure fall outside the acceptable tolerances, or to otherwise settle disputes, additional tendon modulus of elasticity tests shall be required to the satisfaction of the Engineer.

If the source of prestressing steel changes during the project, additional test series or substantiation from previous projects, not to exceed 2 per source will be required.

The apparatus and methods used to perform the test shall be submitted to the Engineer for approval. Tests shall be conducted in the Engineer's presence.

In-Place Friction Test: For tendons in excess of 100 ft long, a minimum of 1 tendon in tendon group performing the same function shall be tested in place. Functional tendon groups are cantilever tendons, continuity tendons, draped external tendons or continuous profiled tendons passing through 1 or more spans. The selected tendon shall represent the size and length of the group of tendons being tested. The in-place friction test is not required with straight tendons used in flat slabs or precast voided slabs.

The test procedure shall consist of stressing the tendon at an anchor assembly with a load cell or a second certified jack at the dead end. Stress the test specimen to 80% of ultimate tendon strength in eight equal increments. For each increment, record the gauge pressure, elongations and load cell force. Take into account any wedge seating in both the live end, or back of jack, and the dead end, or back of load cell, and any friction within the anchorages, wedge plates and jack as a result of slight deviations of the strands through these assemblies. For long tendons requiring multiple jack pulls with intermediate temporary anchoring, keep an accurate account of the elongation at the jacking end allowing for intermediate wedge seating and slip of the jack's wedges.

If the elongation's fall outside the $\pm 5\%$ range compared to the anticipated elongations, investigate the reason and make detailed calculations confirming the final tendon forces are in agreement with the requirements of the approved Plans.

In reconciling theoretical and actual elongations, do not vary the value of the expected friction and wobble coefficients by more than $\pm 10\%$. Significant shortfall in elongations is indicative of poor duct alignments or obstructions. Correct or compensate for such elongations in a manner proposed by the Contractor and reviewed and approved by the Engineer at no additional cost to the Department.

The Engineer will require 1 successful friction test for each tendon group for the project.

If there are irreconcilable differences between forces and elongations, or other difficulties during the course of routine stressing operations, the Engineer may require additional in place friction tests.

The apparatus and methods used to perform the test shall be submitted to the Engineer for approval. Tests shall be conducted in the Engineer's presence.

Tests Reports Required: Submit 2 test reports of the "Tendon Modulus of Elasticity Test" to the Engineer at least 30 days before installing the tendon.

Submit 2 test reports of the "In Place Friction Test" to the Engineer within 2 weeks after successful installation of the tested tendon.

Application of Test Results: Reevaluate the theoretical elongations shown on the post-tensioning shop or working drawings using the results of the tests for tendon modulus of elasticity and in place friction as appropriate and correct as necessary. Submit revisions to the theoretical elongations to the Engineer for approval.

Protection of Prestressing Steel.

Shipping, Handling and Storage: All prestressing steel shall be protected against physical damage and corrosion at all times, from manufacturer to final grouting or encasing in the concrete. The Engineer will reject prestressing steel that has sustained physical damage. Carefully inspect any reel that is found to contain broken wires during use and remove and discard lengths of strand containing broken wires. The wire shall be bright and uniformly colored, having no foreign matter or pitting on its surface.

Prestressing steel shall be packaged in containers for protection of the steel against physical damage and corrosion during shipping and storage. A corrosion inhibitor, which prevents rust, shall be placed in the package, or be incorporated in a corrosion inhibitor carrier type packaging material. The corrosion inhibitor shall have no deleterious effect on the steel or the concrete or bond strength of steel to concrete. Inhibitor carrier type packaging material shall conform to the provisions of Federal Specification MIL-P-3420. Immediately replace or restore packaging damaged from any cause, to the original condition.

The shipping package shall be clearly marked with a statement that the package contains high-strength prestressing steel, the care to be used in handling, and the type, kind and amount of corrosion inhibitor used, including the date when placed, safety orders and instructions for use. Specifically designate low relaxation, or stabilized, strands per requirements of ASTM A 416. Strands not so designated will be rejected.

During Installation in the Structure: The time between the first installation of the prestressing steel in the duct and the completion of the stressing and grouting operations shall not exceed 7 calendar days. Flushing of grout is not permitted and vacuum grouting shall be required to repair all voids and blockages as defined in the subsection POST-GROUTING OPERATIONS AND INSPECTION. Flushing of ducts is only permitted as defined in the section INSTALLING TENDONS. When flushing is permitted, flush water shall contain slack lime (calcium hydroxide) or quicklime (calcium oxide) in the amount of 0.17 lb/gal.

Except when waived by the Engineer in writing, failure to grout tendons within the 7 calendar days specified will result in stoppage of the affected work.

Fabrication.

General: All post-tensioning anchorages, ducts, inlet and outlet pipes, miscellaneous hardware, reinforcing bars, and other embedments shall be accurately and securely fastened at the locations shown on the plans or on the approved shop or working drawings or as otherwise approved by the Engineer. Tendons shall be constructed using the minimum number of duct splices possible.

Ducts: Ducts shall be accurately aligned and shall be positioned at the locations shown on the plans or according to the approved shop or working drawings or as otherwise approved by the Engineer. Securely fasten all internal ducts in position at regular intervals not exceeding 30 in. for steel pipes, 24 in. for round plastic duct and 12 in. for flat ducts to prevent movement, displacement or damage from concrete placement and consolidation operations. Show the method and spacing of duct supports on appropriate shop drawings. Ducts for external tendons shall be straight between connections to internal ducts at anchorages, diaphragms and deviation saddles and shall be supported at intermediate locations according to the plans or approved shop drawings.

All alignments, including curves and straight portions, shall be smooth and continuous with no lips, kinks or dents. This also applies to curves in pre-bent steel pipe.

All ducts shall be carefully checked and repaired as necessary before placing any concrete.

After installing the ducts and until grouting is complete, all ends of ducts, connections to anchorages, splices, inlets and outlets shall be sealed at all times. Provide an absolute seal of anchorage and duct termination locations by using plumber's plugs or equal. Grout inlets and outlets shall be installed with plugs or valves in the closed position. Leave low point outlets open. The use of duct tape is not permitted.

Splices and Joints: All splices, joints, couplings, inlet and outlet connections and valves shall be part of the approved post-tensioning system. Approved shrink-sleeve material may be used to repair duct. The use of any tape to repair or seal duct is not permitted.

Location of Grout Inlets and Outlets: Grout inlets and outlets shall be placed at locations as shown on the plans and shop drawings. Equip all grout inlets and outlets with positive shut-off devices. At a minimum, grout inlets and outlets shall be placed in the following positions:

- (a) Top of the tendon anchorage;
- (b) Top of the grout cap;
- (c) At the high points of the duct when the vertical distance between the highest and lowest point is more than 20 in.;
- (d) At a location 3 ft past high points of the duct on the down stream side opposite the direction of grouting;
- (e) At all low points;
- (f) At major changes in the cross section of the duct;
- (g) At other locations required by the Engineer.

Extend grout tubes a sufficient distance out of the concrete member to allow for proper closing of the valves.

Tolerances: Post-tensioning ducts in their final position shall be within the following tolerances:

Table of Duct Position Tolerances		
Tolerances	Vertical position Inches	Lateral position Inches
Horizontal tendons in slabs or in slab regions of larger members:	±1/4 [±6]	± 1/2
Longitudinal draped super-Structure tendons in webs: Tendon over supports or in middle third of span	±1/4	±1/4
Tendon in middle half of web depth	±1/2	±1/4
Longitudinal, generally horizontal, superstructure tendons usually in top or bottom of member:	±1/4	±1/4
Horizontal tendons in substructures and foundations:	± 1/2	± 1/2
Vertical tendons in webs	Longitudinal position ±1	Transverse position ±1/4
Vertical tendons in pier shafts	±1/2	±1/4

In all other cases, tendons shall not be out of position by more than ± 1/4 in. in any direction.

Entrance and exit angles of tendon paths at anchorages and/or at faces of concrete shall be within ± 3 degrees of desired angle measured in any direction and any deviations in the alignment shall be accomplished with smooth transitions without any kinks.

Angle changes at duct joints shall not be greater than ± 3 degrees in any direction and shall be accomplished with smooth transitions without any kinks.

Locate anchorages within $\pm 1/4$ in. of desired position laterally and ± 1 in. along the tendon except that minimum cover requirements shall be maintained.

Position anchorage confinement reinforcement in the form of spirals, multiple U shaped bars or links, to be properly centered around the duct and to start within $1/2$ in. of the back of the main anchor plate.

If conflicts exist between the reinforcement and post-tensioning duct, the position of the post-tensioning duct shall prevail and the reinforcement shall be adjusted locally with the Engineer's approval.

Internal Duct Pressure Test: Each different type and size of duct assembly shall be pressure tested at the sight of casting before its first time use on the project. Pressure test all assemblies used in a single component constructed for the first time on the project, and thereafter, in groups of not more than 50 components, the Engineer shall randomly select 1 component per group, but not less than a total of 2 per project, for testing. Types of components include all post-tensioned components including but not limited to transversely post-tensioned slabs, longitudinally post-tensioned girders, post-tensioned box girder segments, pier and bent caps, and columns. Longitudinal tendons in box segments are exempt from this testing. Test the assemblies in their final position just prior to concrete placement by sealing them at their anchorage or construction joint termini and then by applying compressed air to determine if the assembly connections are pressure tight. In the presence of the Engineer, pressurize the duct to 1.5 psi and lock-off the outside air source then record the pressure loss for a duration of 1 minute. If the pressure loss exceeds 0.15 psi, find and repair the leaks in the duct assembly using repair methods approved by the Engineer and retest.

Placing Concrete.

Precautions: Use methods to place and consolidate concrete which will not displace or damage any of the post-tensioning ducts, anchorage assemblies, splices and connections, reinforcement or other embedments. All duct splices shall be fabricated to prevent duct kinks during concrete placement. Use mandrels as needed to maintain duct alignment and shape.

Proving of Post-Tensioning Ducts: Upon completion of concrete placement, prove that the post-tensioning ducts are free and clear of any obstructions or damage and are able to accept the intended post-tensioning tendons by passing a torpedo through the ducts. Use a torpedo having the same cross-sectional shape as the duct and that is $1/4$ in. smaller all around than the clear, nominal inside dimensions of the duct. Make no deductions to the torpedo section dimensions for tolerances allowed in the manufacture or fixing of the ducts. For straight ducts, use a torpedo at least 2 ft long. For curved ducts, determine the length so that when both ends touch the outermost wall of the duct, the torpedo is $1/4$ in. clear of the innermost wall.

If the torpedo will not travel completely through the duct, the Engineer will reject the member, unless a workable repair can be made to clear the duct. The torpedo shall pass through the duct easily, by hand, without resorting to excessive effort or mechanical assistance.

Problems and Remedies: The Engineer will reject ducts or any part of the work found to be deficient. No remedial or repair work shall be performed without the Engineer's approval.

Installing Tendons.

Push or pull post-tensioning strands through the ducts to make up a tendon using methods which will not snag on any lips or joints in the ducts. Strands which are pushed shall be rounded off the end of the strand or fitted with a smooth protective cap. During the installation of the post-tensioning strand into the duct, the strand shall not be intentionally rotated by any mechanical device.

Alternatively, strands may be assembled to form the tendon and pulled through the duct using a special steel wire sock or other device attached to the end. The ends of the strands shall not be electric arc welded together for this purpose. Strands may be brazed together for pulling as long as 1 ft of strand from the brazed end is removed after installation. Round the end of the pre-assembled tendon for smooth passage through the duct. Cut strands using an abrasive saw or equal. Flame cutting is not allowed.

Do not install permanent tendons before the completion of testing as required by these specifications or plans. As a sole exception, the tendon to be tested in the in place friction test" may be installed for the test.

Post-Tensioning Operations.

General: Post-tensioning forces shall not be applied until the concrete has attained the specified compressive strength as determined by cylinder tests. Conduct all stressing operations in the presence of the Engineer.

Stressing Tendons: All post-tensioning steel shall be tensioned with hydraulic jacks so that the post-tensioning force is not less than that required by the plans or approved shop drawings, or as otherwise approved by the Engineer. Do not utilize monostrand jacks to stress tendons with 5 or more strands.

Maximum Stress at Jacking: The maximum temporary stress (jacking stress) in the post-tensioning steel shall not exceed 80% of its specified minimum ultimate tensile strength. Do not overstress tendons to achieve the expected elongation.

Initial and Permanent Stresses: The post-tensioning steel shall be anchored at initial stresses that will result in the long term retention of permanent stresses or forces of no less than those shown on the plans or the approved shop drawings. Unless otherwise approved by the Engineer, the initial stress after anchor set shall not exceed 70% of the specified ultimate tensile strength of the post-tensioning steel.

Permanent stress and permanent force are the stress and force remaining in the post-tensioning steel after all losses, including long term creep and shrinkage of concrete, elastic shortening of concrete, relaxation of steel, losses in the post-tensioning steel from the sequence of stressing, friction and unintentional wobble of the ducts, anchor set, friction in the anchorages and all other losses peculiar to the post-tensioning system.

Stressing Sequence: Except as noted on the plans or the approved shop drawings, permanent post-tensioning tendons shall be stressed from both ends. The required force may be applied at 1 end and subsequently at the other end or simultaneously at both ends.

Single end stressing is permitted when the following are satisfied:

- (a) Space limitations prohibit double end stressing.
- (b) The calculated elongation of the post-tensioning steel at the second end is 1/2 in. or less and wedges are power seated.
- (c) Single end stressing applied at alternate ends of paired adjacent post-tensioning tendons is required to produce a symmetrical force distribution in agreement with the plan design.

For construction in stages where some tendons are required to be stressed before others, install and stress in accordance with the plans or approved shop drawings or as otherwise approved by the Engineer.

Stressing Equipment: Only equipment furnished by the supplier of the post-tensioning system which includes, but it not limited to the tendons, hardware, and anchorages, shall be used.

Stressing Jacks and Gauges: Each jack shall be equipped with a pressure gauge for determining the jacking pressure. The pressure gauge shall have an accurate reading gauge with a dial at least 6 in. in diameter.

Calibration of Jacks and Gauges: Calibrate each jack and its gauge(s) as a unit. The calibration shall consist of 3 test cycles with the cylinder extension of the jack in various positions. For example, 2 inch, 4 inch, 8 inch stroke. At each pressure increment, average the forces from each test cycle to obtain an average force. Perform the calibration with the equipment setup in the same configuration that is intended to be used at the job site. The post-tensioning supplier or an independent laboratory shall perform initial calibration of jacks and gauge(s). Use load cells calibrated within the past 12 months to calibrate stressing equipment. For each jack and gauge unit used on the project, furnish certified calibration charts and curves to the Engineer prior to stressing. Supply documentation denoting the load cell(s) calibration date and tractability to National Institute of Standards and Technology along with the jack/gauge calibration.

Provide the Engineer with certified calibration charts and curves prior to the start of the work and every 6 months thereafter, or as requested by the Engineer. Calibrations subsequent to the initial calibration with a load cell may be accomplished by the use of a master gauge. Supply the master gauge to the Engineer in a protective waterproof container capable of protecting the calibration of the master gauge during shipment to a laboratory. Provide a quick-attach hydraulic manifold to enable quick and easy installation of the master gauge to verify the permanent gauge readings. The master gauge shall be calibrated and provided to the Engineer. The master gauge will remain in the possession of the Engineer for the duration of the project.

Any jack repair, such as replacing seals or changing the length of the hydraulic lines, is cause for recalibration using a load cell.

Elongations and Agreement with Forces: Forces being applied to the tendon and the elongation of the post-tensioning tendon shall be measured at all times.

Elongations shall be measured to the nearest 1/16 in.

For the required tendon force, the observed elongation shall agree within 7% of the theoretical elongation or the entire operation shall be checked and the source of error determined and remedied to the satisfaction of the Engineer before proceeding further. Do not overstress the tendon to achieve the theoretical elongation.

In the event that agreement between the observed and theoretical elongations at the required force falls outside the acceptable tolerances, the Engineer may, at his discretion, require additional tests for tendon modulus of elasticity and/or in-place friction in accordance with this special provision.

Friction: Calculations and a typical tendon force diagram shall be submitted, after friction, wobble and anchor set losses, on the shop drawings based upon the expected actual coefficients and values for the post-tensioning system to be used. Show these coefficients and values on the shop drawings.

If, in the opinion of the Engineer, the actual friction significantly varies from the expected friction, revise post-tensioning operations so the final tendon force is in agreement with the plans.

When friction must be reduced, graphite may be used as a lubricant, subject to the approval of the Engineer.

Wire Failures in Post-Tensioning Tendons: Multi-strand post-tensioning tendons, having wires which fail, by breaking or slippage during stressing, may be accepted provided the following conditions are met:

(a) The completed structure shall have a final post-tensioning force of at least 98% of the design total post-tensioning force.

(b) For precast or cast-in-place segmental construction and for any similar construction that has members post-tensioned together across a common joint face, at any stage of erection, the post-tensioning force across a mating joint shall be at least 98% of the post-tensioning required for that mating joint for that stage of erection.

(c) Any single tendon shall have no more than a 5% reduction in cross-sectional area of post-tensioning steel due to wire failure.

Any of the above conditions may be waived with approval of the Engineer, when conditions permit the Contractor to propose acceptable alternative means of restoring the post-tensioning force lost due to wire failure.

Cutting of Post-Tensioning Steel: Post-tensioning steel shall be cut with an abrasive saw or plasma torch within 3/4 to 1 1/2 in. away from the anchoring device. Flame cutting of post-tensioning steel is not allowed.

Record of Stressing Operations: A record of the following post-tensioning operations for each tendon installed shall be kept:

- (a) Project name, Financial Project ID;
- (b) Contractor and/or subcontractor;
- (c) Tendon location, size and type;
- (d) Date tendon was first installed in ducts;
- (e) Reel number for strands and heat number for bars;
- (f) Tendon cross-sectional area;
- (g) Modulus of elasticity;

- (h) Date Stressed;
- (i) Jack and Gauge numbers per end of tendon;
- (j) Required jacking force;
- (k) Gauge pressures;
- (l) Elongations (theoretical and actual);
- (m) Anchor sets (anticipated and actual);
- (n) Stressing sequence (i.e. tendons to be stressed before and after;
- (o) Stressing mode (1 end/ 2 ends/ simultaneous);
- (p) Witnesses to stressing operation (Contractor and inspector);
- (q) Date grouted

Record any other relevant information. Provide the Engineer with a complete copy of all stressing and grouting operations.

Duct Pressure Field Test: After stressing and before grouting internal or external tendons, all grout caps, inlets and outlets shall be installed and the tendon shall be tested with compressed air to determine if duct connections require repair. In the presence of the Engineer, pressurize the tendon to 50 psi and lock-off the outside air source. Record pressure loss for 1 minute. A pressure loss of 25 psi is acceptable for tendons having a length of equal to or less than 150 ft and a pressure loss of 15 psi is acceptable for tendons longer than 150 ft. If the pressure loss exceeds the allowable, repair leaking connections using methods approved by the Engineer and retest.

Tendon Protection: Within 4 hours after stressing, grout caps shall be installed and all other tendon openings shall be sealed. If acceptance of the tendon is delayed, seal all tendon openings and temporarily weatherproof the open ends of the anchorage. If tendon contamination occurs, remove and replace the tendon.

Grouting Operations.

Grouting Operations Plan: A grouting operations plan shall be submitted for approval at least 6 weeks in advance of any scheduled grouting operations. Written approval of the grouting operations plan by the Engineer is required before any grouting of the permanent structure takes place.

At a minimum, the plan shall address and provide procedures for the following items:

- (a) Names and proof of training for the grouting crew and the crew supervisor in conformance with this specification;
- (b) Type, quantity, and brand of materials used in grouting including all certifications required;
- (c) Type of equipment furnished, including capacity in relation to demand and working condition, as well as back-up equipment and spare parts;
- (d) General grouting procedure;
- (e) Duct pressure test and repair procedures;
- (f) Method to be used to control the rate of flow within ducts;
- (g) Theoretical grout volume calculations;
- (h) Mixing and pumping procedures;
- (i) Direction of grouting;
- (j) Sequence of use of the inlets and outlet pipes;
- (k) Procedures for handling blockages;
- (l) Procedures for possible post grouting repair.

Before grouting operations begin, a joint meeting of the Contractor, grouting crew and the Engineer shall be conducted. At the meeting the grouting operation plan, required testing, corrective procedures and any other relevant issues shall be discussed.

Grout Inlets and Outlets: Connections from the grout pump hose to inlets shall be free of dirt and air-tight. Inspect valves to be sure that they can be opened and closed properly.

Supplies: Before grouting operations start, provide an adequate supply of water and compressed air for clearing and testing the ducts, mixing and pumping the grout. Where water is not supplied through the public water supply system, a water storage tank of sufficient capacity shall be provided.

Equipment:

General: Grouting equipment consisting of measuring devices for water, a high-speed shear colloidal mixer, a storage hopper and a pump with all the necessary connecting hoses, valves, and pressure gauge shall be provided. Provide pumping equipment with sufficient capacity to ensure that the post-tensioning ducts to be grouted can be filled and vented without interruption at the required rate of injection in not more than 30 minutes.

Provide an air compressor and hoses with sufficient output to perform the required functions.

Provide vacuum grouting equipment (volumetric measuring type) and experienced operators within 48 hours notice.

Mixer, Storage Hopper: A high speed shear colloidal mixer capable of continuous mechanical mixing producing a homogeneous and stable grout free of lumps and undispersed cement shall be provided. The colloidal grout machinery shall have a charging tank for blending and a holding tank. The blending tank shall be equipped with a high shear colloidal mixer. The holding tank shall be kept agitated and at least partially full at all times during the pumping operation to prevent air from being drawn into the post-tensioning duct.

Add water during the initial mixing by use of a flow meter or calibrated water reservoir with a measuring accuracy equal to 1% of the total water volume.

Grout Pumping Equipment: Pumping equipment capable of continuous operation, which will include a system for circulating the grout when actual grouting is not in progress, shall be provided.

The equipment shall be capable of maintaining pressure on completely grouted ducts and shall be fitted with a valve that can be closed off without loss of pressure in the duct.

Grout pumps shall be positive displacement type, shall provide a continuous flow of grout and shall be able to maintain a discharge pressure of at least 145 psi.

Pumps shall be constructed to have seals adequate to prevent oil, air or other foreign substances entering the grout and to prevent loss of grout or water. The capacity shall be such that an optimal rate of grouting can be achieved.

A pressure gauge having a full scale reading of no more than 300 psi shall be placed at the duct inlet. If long hoses (in excess of 100 ft) are used, place 2 gauges, 1 at the pump and 1 at the inlet.

The diameter and rated pressure capacity of the grout hoses shall be compatible with the pump output.

Vacuum Grouting Equipment: Vacuum grouting equipment consisting of the following shall be provided:

- (a) Volumeter for the measurement of void volume.
- (b) Vacuum pump with a minimum capacity of 10 cfm and equipped with flow-meter capable of measuring amount of grout being injected.
- (c) Manual colloidal mixers or dissolvers (manual high speed shear mixers), for voids less than 5.28 gal. in volume.
- (d) Standard colloidal mixers, for voids 5.28 gal. and greater in volume.

Stand-by Equipment: During grouting operations, a stand-by colloidal grout mixer and pump shall be provided.

Grouting:

General: A test shall be performed to confirm the accuracy of the volume-measuring component of the vacuum grouting equipment each day when in use before performing any grouting operations. Use either water or grout for testing using standard testing devices with volumes of 0.5 gal and 6.5 gal and an accuracy of equal to or less than 4 oz. Perform test with each device. The results shall verify the accuracy of the void volume-measuring component of the vacuum grouting equipment within 1% of the test device volume and shall verify the accuracy of the grout volume component of the vacuum grouting equipment within 5% of the test device volume. Ensure the Engineer is present when any test are performed.

Grout tendons in accordance with the procedures set forth in the approved grouting operation plan. Grout all empty ducts.

Temperature Considerations: Maximum grout temperature shall not exceed 90°F at the grout inlet. Use chilled water and/or pre-cooling of the bagged material to maintain mixed grout temperature below the maximum allowed temperature. Grouting operations are prohibited when the ambient temperature is below 40°F or is 40°F and falling. Postpone grouting operations if freezing temperatures are forecasted for the 2 days after the scheduled grouting operation and it is expected the concrete temperature surrounding the duct will fall below 40° F.

Mixing and Pumping: Mix the grout with a metered amount of water. The materials shall be mixed to produce a homogeneous grout. Continuously agitate the grout until grouting is complete.

Grout Production Test: During grouting operations the fluidity of the grout shall be strictly maintained within the limits established by the grout manufacturer. A target fluidity rate shall be established by the manufacturer's representative, based on ambient weather conditions. Determine grout fluidity by use of either test method found in "Guide Specification for Grouting of Post-Tensioned Structures," PTI, Second Edition, 2003. Perform fluidity test for each tendon to be grouted and maintain the correct water to cementitious ratio. Do not use grout which tests outside the allowable flow rates.

Prior to grouting empty ducts condition the grout materials as required to limit the grout temperature at the inlet end of the grout hose to 90°F. Prior to performing repair grouting operations with vacuum grouting, condition the grout materials to limit the grout temperature at the inlet end of the grout hose to 85°F. Check the temperature of the grout at the inlet end of the grout hose hourly.

At the beginning of each day's grouting operation, obtain a representative sample of grout from the first production batch of grout and perform a wick induced bleed test in accordance with "Guide Specification for Grouting of Post-Tensioned Structures," PTI, Second Edition, 2003 using this sample. Begin grouting operations after the sample is obtained. If zero bleed is not achieved in the wick induced bleed test at any time during the required test time period, complete the grouting of any partially grouted tendons and do not begin grouting of any new or additional tendons until the grouting operations have been adjusted and further testing shows the grout meets the specified requirements.

Grout Operations: All grout outlets shall be opened before starting the grouting operation. Grout tendons in accordance with the grouting operations plan.

Unless approved otherwise by the Engineer, pump grout at a rate of 16 feet to 50 feet of duct per minute. Conduct normal grouting operations at a pressure range of 10 psi to 50 psi measured at the grout inlet. Do not exceed the maximum pumping pressure of 145 psi at the grout inlet for round ducts and 75 psi for flat ducts in deck slabs.

Use grout pumping methods which will ensure complete filling of the ducts and complete encasement of the steel. Grout shall flow from the first and subsequent outlets until any residual water or entrapped air has been removed prior to closing the outlet.

Pump grout through the duct and continuously discharge it at the anchorage and grout cap outlets until all free water and air are discharged and the consistency of the grout is equivalent to that of the grout being pumped into the inlet. Close the anchorage outlet and discharge a minimum of 2 gal. of grout from the grout cap into a clean receptacle. Close the grout cap outlet.

For each tendon, immediately after uncontaminated uniform discharge begins, perform a fluidity test using the flow cone on the grout discharged from the anchorage outlet. The measured grout efflux time shall not be less than the efflux time measured at the pump or minimum acceptable efflux time as established for GROUT PHYSICAL PROPERTIES, previously defined herein. Alternately, check the grout fluidity using the wet density method contained in the MATERIALS section. The measured density shall fall within the values established for "Grout Physical Properties," previously defined herein. The density at the final outlet shall not be less than the grout density at the inlet. If the grout fluidity is not acceptable, discharge additional grout from the anchorage outlet and test the grout fluidity. Continue this cycle until an acceptable grout fluidity is achieved. Discard grout used for testing fluidity. After all outlets have been bled and sealed, elevate the grout pressure to ±75 psi seal the inlet valve and wait two minutes to determine if any leaks exist.

If leaks are present, fix the leaks using methods approved by the Engineer. Repeat the above stated process until no leaks are present. If no leaks are present, bleed the pressure to 5 psi and wait a minimum of 10 minutes for any entrapped air to flow to the high points. After the minimum 10 minutes period has expired, increase the pressure as needed and discharge grout at each high point outlet to eliminate any entrapped air or water. Complete the process by locking a pressure of 30 psi into the tendon.

If the actual grouting pressure exceeds the maximum allowed, the inlet shall be closed and the grout shall be pumped at the next outlet, which has just been, or is ready to be closed as long as a 1 way flow is maintained. Grout shall not be pumped into a succeeding outlet from which grout has not yet flowed. If this procedure is used, the outlet/inlet, which is to be used for pumping shall be fitted with a positive shut-off and pressure gage.

The entire length of a tendon shall be completely grouted before 2 hours have elapsed.

When complete grouting of the tendon cannot be achieved by the steps stated herein, stop the grouting operation. After waiting 48 hours, drill into the duct and explore with an endoscope to determine the location and extent of all voided areas. Install supplemental grout vents as needed and fill the voids using volumetric measuring vacuum grouting equipment.

Vertical Grouting: For all vertical tendons, A standpipe at the upper end of the tendon shall be provided to store bleed water and grout, maintain the grout level above the level of the prestressing plate and anchorage. This device shall be designed and sized to maintain the level of the grout at an elevation which will assure that bleeding will at no time cause the level of the grout to drop below the highest point of the upper anchorage device. Design the standpipe to allow all bleed water to rise into the standpipe, not into the uppermost part of the tendon and anchorage device.

Discharge grout and check grout fluidity as described in the GROUT OPERATIONS subsection. As grouting is completed, the standpipe will be filled with grout to a level which assures that, as settlement of the grout occurs, the level of the grout shall not drop below the highest point in the upper anchorage device. If the level of the grout drops below the highest point in the anchorage device, immediately add grout to the standpipe. After the grout has hardened, the standpipe shall be removed. In the presence of the Engineer, visually inspect for voids using an endoscope or probe. Fill all voids found in the duct using volumetric measuring vacuum grouting processes.

For vertical tendons in excess of 100 ft or if the grouting pressure exceeds the maximum recommended pumping pressure, then grout shall be pumped at increasingly higher outlets which have been or are ready to be closed as long as a 1 way flow of grout is maintained. Grout shall be allowed to flow from each outlet until all air and water have been purged prior to using that outlet for pumping.

Construction Traffic and Operations Causing Vibrations:

During grouting and for a period of 4 hours upon completion of grouting, vibrations shall be eliminated from all sources such as moving vehicles, jackhammers, compressors, generators, pile driving operations, soil compaction, etc., that are operating within 300 ft down-station and 300 ft up-station of the ends of the span in which grouting is taking place.

Post-Grouting Operations and Inspection: Outlets shall not be removed nor inlets opened until the grout has cured for 24 to 48 hours. Remove all outlets located at anchorages and high points along the tendon to facilitate inspection and perform inspections within 1 hour after the removal of the inlet/outlet. Drill and inspect all high points along the tendon as well as the inlets or outlets located at the anchorages. Depending on the geometry of the grout inlets, drilling may be required to penetrate to the inner surface of the trumpet or duct. Use drilling equipment that will automatically shut-off when steel is encountered. Unless grout caps are determined to have voids by sounding, do not drill into the cap. Perform inspections in the presence of the Engineer using endoscopes or probes. If voids are detected in tendon ducts or anchorages during inspection, fill voids using the volumetric measuring vacuum grouting process within 48 hours. If no voids are detected in tendon ducts or anchorages, seal and repair all anchorage and inlet/outlet voids that are produced by drilling for inspection purposes as specified in the subsection REPAIR OF GROUT INLETS AND OUTLETS within 4 hours of completion of the inspections. Remove the inlet/outlet to a minimum depth of 2 in. Use an injection tube to extend to the bottom of the drilled holes for backfilling with epoxy.

Post grouting inspection of tendons having a length of less than 150 ft may utilize the following statistical frequency for inspection:

1. For the first 20 tendons, inspect all outlets located at anchors and tendon high points by drilling and probing with an endoscope or probe. If 1 or more of the inspection locations are found to contain a defect, or void, continue testing all tendons until 20 consecutive tendons have been inspected and no voids have been found.

2. When no defects are detected as defined in No. 1 above, the frequency of inspection can be reduced to inspect every other tendon. If a defect is located, inspect the last 5 tendons grouted and return to step 1 above

If tendon grouting operations were prematurely terminated prior to completely filling the tendon, drill into the duct and explore the voided areas with an endoscope. Probing is not allowed. Determine the location and extent of all voided areas. Install grout inlets as needed and fill the voids using volumetric measuring vacuum grouting equipment.

Grouting Report: Provide a grouting report signed by the Contractor within 72 hours of each grouting operation for review by the Engineer.

Report the theoretical quantity of grout anticipated as compared to the actual quantity of grout used to fill the duct. Notify the Engineer immediately of shortages or overages.

Information to be noted in the records must include but not necessarily be limited to the following:

- a) identification of the tendon;
- b) date grouted;
- c) number of days from tendon installation to grouting;
- d) type of grout;
- e) injection end and applied grouting pressure;
- f) ratio of actual to theoretical grout quantity;
- g) summary of any problems encountered and corrective action taken.

Forming and Repairs of Holes and Block-Outs.

Repair of Lifting and Access Holes: All holes shall be repaired with magnesium ammonium phosphate concrete. Within 24 hours of casting the concrete, mechanically clean and roughen the mating concrete surfaces to remove any laitance and expose the small aggregate. Grit blasting or water blasting using a minimum 10,000 psi nozzle pressure is required. Flush surface with water and blow dry. Form, mix, place and cure the material in strict compliance with the manufacturer's recommendations.

Coat the repaired holes, block-outs and an area extending 6 in. outside the perimeter of the repair with an epoxy penetrating seal coating. Prepare the surface to be coated and apply the epoxy penetrating seal coating in accordance with section 709.

Alternately, a type Q epoxy grout may be used for the repair material.

Repair of Grout Inlets and Outlets: Threaded plastic caps shall be placed in all inlet/outlet locations. Repair inlets/outlets as shown on the plans using an epoxy grout or type F-1 epoxy. Prepare the surface to receive the epoxy material in strict compliance with the manufacturer's recommendations.

Protection of Post-Tensioning Anchorages.

Within 7 days upon completion of the grouting, anchorage of post-tensioning bars and tendons shall be protected. The application of the elastomeric coating may be delayed up to 90 days after grouting. Use plastic or stainless steel threaded caps to plug all grout inlets/outlets. Use type Q epoxy grout to construct all pour-backs located at anchorages.

Remove all laitance, grease, curing compounds, surface treatments, coatings and oils by grit blasting or water blasting using a minimum 10,000 psi nozzle pressure. Flush surface with water and blow dry. Surfaces shall be clean, sound and without any standing water. In case of dispute, use ACI 503 for substrate testing and develop a minimum of 175 psi tension.

Mix and apply epoxy as per manufacturer's current standard technical guidelines. Construct all pour-backs in leak proof forms creating neat lines. The epoxy grout may require pumping for proper installation. Construct forms to maintain a liquid head to insure intimate contact with the concrete surface. Use vents as needed to provide for the escape of air to insure complete filling of the forms.

Coat the exposed surfaces of all pour-backs and grout caps with an elastomeric coating system having a thickness of 30 to 45 mils. Concrete, grout caps or other substrates shall be structurally sound, clean and dry. Concrete shall be a minimum of 28 days old.

Remove all laitance, grease, curing compounds, surface treatments, coatings and oils by grit blasting or water blasting using a minimum 10,000 psi nozzle pressure to establish the anchor pattern. Blow the surface with compressed air to remove the dust or water. For elastomeric coated pour-backs which are to receive a class V coating, apply a manufacture's approved primer over the elastomeric coating before applying the class V coating.

Construct a 2 ft x 4 ft concrete test block with a similar surface texture to the surfaces to be coated and coat a vertical face with the elastomeric coating system chosen. Determine the number of coats required to achieve a coating thickness between 30 to 45 mils without runs and drips. Mix and apply elastomeric coating as per manufacturer's current standard technical specifications. Spray or roller application is permitted, but spray application is preferred. Have the coating manufacturer representative on site to supervise and comment on the application of the elastomeric coating onto the test block. Apply coatings using approved and experienced personnel with a minimum of years experience applying similar polyurethane systems. Submit the credentials of these persons to the Engineer for review and consideration for approval.

Method of Measurement.

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Pounds as the unit of measurement.

Basis of Payment.

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

REMOVAL OF EXISTING BRIDGE

The Standard Specifications are revised as follows:

SECTION 202, BEGIN LINE 108, INSERT AS FOLLOWS:

The existing bridge superstructure and substructure for Bridge Structure File No. 421-3-6003 (US 421 over the Ohio River including approaches in Kentucky and Indiana) shall be completely removed in accordance with this Section 202 except for the following:

Portions of the existing piers 6, 7, 8 and 9 shall be removed to limits determined by the Designer/Builder for pier strengthening and pier cap widening.

Portions of the existing abutments may remain in place and be buried and or encapsulated. Portions of the existing abutments may be removed to limits determined by the Designer/Builder.

River Flow Restrictions

Demolition involving in-river work shall not be initiated if the river flows during the following 96 hours are predicted to exceed a flow with corresponding velocity which the Contractor determines would be unsafe for the scrap recovery divers. Predictions of river flow have been available in the past at the Advanced Hydrologic Prediction Service Weather Forecast Office.

For the navigable channel, all material temporarily placed onto the river bottom shall be removed within 24 hours. Immediately after the navigable channel has been cleared the Contractor shall commence working and continue during regular working hours without interruption to clear the side channel. The Contractor shall coordinate with the United States Coast Guard, the United States Army Corps of Engineers and the Engineer to satisfactorily and promptly remove all demolition materials from the river.

SECTION 202, BEGIN LINE 119, DELETE AND INSERT AS FOLLOWS:

~~Unless otherwise specified, structural steel and salvageable material shall become the property of the Contractor. It shall be removed from the site before completion of the work and proper allowance for its value shall be taken into account in the bid price of the item involved. If the structure is to remain the property of the Department, steel or wood bridges shall be carefully dismantled without unnecessary damage, steel members shall be match marked, and all salvaged material shall be stored in accordance with 202.02.~~

Blasting or other operations necessary for the removal of an existing structure or obstruction, which may damage new construction, shall be completed prior to placing the new work. *If the Contractor's schedule does not allow for removal operations prior to new construction, protection of new construction shall be required.*

SECTION 202, BEGIN LINE 144, INSERT AS FOLLOWS:

The bridge demolition plan will require approval by the Department and the United States Coast Guard. The bridge demolition plan shall provide for and describe methods for the protection and safety of local roads, navigational waterway, and recreational waterway traffic, the general public and public utilities. The bridge demolition plan shall describe and include a schedule of demolition operations in accordance with the construction phasing determined by the Contractor and approved by the Department. The bridge demolition plan shall describe the methods proposed to protect the new construction.

The Engineer will submit the Contractor's demolition plan to the United States Coast Guard for review and approval. The Contractor shall keep the Engineer informed of the demolition schedule. Any revision to the work schedule may require a 15 day delay for the Coast Guard to issue revised notice to mariners. Timing of the demolition may be delayed by the Coast Guard during high water. The Contractor shall coordinate with the Engineer to comply with requirements of the Coast Guard demolition approval letter. See also the special provision, NAVIGABLE WATERWAYS AND COAST GUARD REQUIREMENTS.

BASIS OF PAYMENT

Description

The intent of this specification is to delete all references to the basis for payment for customary pay items, except 109.04 and 628.05.

The Standard Specifications are revised as follows:

All references to basis of payment in the following sections of the specifications shall be deleted:

SECTION 105, 110, 111

SECTION 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216

SECTION 301, 302, 303, 304, 305, 306

SECTION 401, 402, 403, 404, 405, 406, 407, 408, 410, 411, 412

SECTION 501, 502, 503, 504, 506, 507

SECTION 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 619, 620, 621, 622, 625, 627

SECTION 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 729, 732, 734

SECTION 801, 802, 804, 805, 807, 808, 809

Unless a specific pay item appears in the Schedule of Pay Items in the Contract Information Book, any reference to payment in the special provisions shall be interpreted as payment at the contract lump sum price for design / build.

Method of Measurement

No measurements for payment will be made for the lump sum item. However, the Design/Builder shall provide final as built quantities in Estimator format.

Basis of Payment

Accepted quantities will be paid for at the contract lump sum price for design/build.

Payment will be made under:

<i>Pay Item</i>	<i>Pay Unit Symbol</i>
<i>Design/Build.....</i>	<i>LS</i>

The cost of design, construction, insurance, and any other cost that may be incurred for the duration of this design/build project shall be included in the cost of this work.

PARTIAL PAYMENTS

The Standard Specifications are revised as follows:

SECTION 109, BEGIN LINE 902, DELETE AND INSERT AS FOLLOWS:

109.07 Partial Payments.

~~The contract may contain more than one project. Partial payments may be made once each month as the work progresses or twice each month if it is determined that the amount of work performed is sufficient to warrant such payment.~~ These payments will be based on estimates, prepared by the ~~Engineer~~ *Design/Builder*, of the value of the work performed and materials complete in place in accordance with the contract *schedule of values*.

If satisfactory progress is being made, the Design/Builder will receive twice monthly payments in the amount of value of work and materials in place. These payments are approximate only, and all partial estimates and payments shall be subject to correction in the final estimate and payment.

The Engineer shall review each proposed current percentage completion and revise the percentage when appropriate. The agreed current percentage of completion of each item in the schedule of values multiplied by its associated value shall define the gross amount due the Design/Builder for that item of work. Allowance for materials on hand, previous payments and other reductions shall be applied to determine the current net amount due the Design/Builder.

Should any defective work or material or acceptable work that has been damaged by the Design/Builder's operations be discovered previous to the final acceptance or should a reasonable doubt arise previous to the final acceptance as to the integrity of any part of the completed work, the estimate and payment for such defective or questioned work shall not be allowed until the defect has been remedied and cause for doubt removed. No partial payment will be made or estimates will not be submitted when the total value of the work done since the last estimate amounts to less than \$500.

TEMPORARY FERRY STAGING AREAS

Description

This work shall consist of constructing a temporary ferry staging areas as outlined below.

Materials

All materials shall conform to the current edition of the Standard Specifications detailed in this contract. If the materials do not meet the testing requirements outlined in the Standard Specifications, the Design/Builder must replace the materials at no additional cost to the owner.

Construction Requirements

This work shall consist of constructing temporary ferry staging areas in Milton and Madison as shown in the plans described in the scope of services and herein.

All work shall conform to the current edition of the Standard Specifications detailed in this contract. In addition, the following shall be provided:

1. The Design/Builder shall provide a complete and detailed topographical survey provided by a professionally licensed surveyor in the state of the site in accordance with INDOT surveying requirements. The Design/Builder shall provide detailed plans and documents for the proposed temporary ferry staging areas sealed by a licensed professional engineer in the state of the site to the Engineer for approval. Prior to any work on either site the Design/Builder shall meet with the Engineer on each site and video tape the existing site to the satisfaction of the Engineer. The Engineer shall receive a copy of the video for his records before any construction occurs. The Design/Builder shall secure all regulatory and building permits from the various local, state, and regulatory agencies as necessary for the construction of the various components of the site. The parking lot layout referenced in the plan set will be considered an acceptable design if submitted.
2. All facilities shall be in compliance with ADA requirements.
3. A web camera shall be provided and maintained at each ferry site. The camera shall provide a live video feed of the queuing area that will be linked to the ferry website once the ferry service is operational. See special provision FERRY WEBSITE AND PUBLIC AWARENESS.
4. The Design/Builder shall develop an Erosion Control Plan and obtain necessary erosion control permits in Indiana (Rule 5) and Kentucky. The Design/Builder is required to minimize siltation and bank erosion during construction and to restore disturbed areas to present or better conditions in accordance with this contract.
5. The Design/Builder shall develop a Ferry Operations and Parking Management Plan that addresses signing, striping and personnel for channeling traffic and ensuring consistent wait times for vehicles using the ferry service, as described in the FERRY OPERATIONS special provision. The Engineer will review and comment. The Design/Builder shall not proceed until approval of the plan.
6. The Design/Builder shall provide the Project Engineer with a set of Engineering Plans for the proposed restoration of the Temporary Ferry Staging Areas. The Engineer will review and comment. The Design/Builder shall not proceed until approval of the plan.
7. The Temporary Ferry Staging Area must be operational 2 weeks before the bridge is closed to traffic.
8. Closure of the Madison public campground for the purposes of ferry parking area construction shall not begin until 6 weeks prior to the bridge closure.
9. Unless otherwise directed by the Engineer, the Contractor shall have the temporary boat ramp and access road open for operation two (2) weeks prior to the closure of the existing ramp at Ferry Street to public use.
10. The Design/Builder shall coordinate with the City of Madison, the City of Milton, and the utility companies to ensure all underground obstructions are relocated or taken out of service. No extra payment will be allowed for the removal, replacement, repair or possible increased cost caused by underground obstructions.

11. Excess topsoil shall be put into stockpiles at locations approved by the Project Engineer.
12. To protect archeological site 15M112, excavation shall not be deeper than 1 ft in the designated area as shown in the plans. A geotextile fabric shall be placed under new pavement and sidewalks in this area and shall remain in place after the site restoration.
13. Paved areas and sidewalks shall be maintained to the Project Engineer's satisfaction for the duration of the project. If they do not meet the Engineer's satisfaction, the Design/Builder shall fix the pavement or sidewalk at no additional cost to the Department.
14. The ferry staging areas shall provide a sidewalk connection from Ferry Street to the ferry loading zone in Milton and from Ferry Street/Vaughn Drive to the ferry loading zone in Madison.
15. Once the bridge reopens to traffic, the Design/Builder shall have 30 working days to return the staging area and boat ramp shall be returned to its existing condition or better. The ground shall be returned to its original elevation. Paved areas that were not there prior to construction shall be removed and the soil restored and re-seeded. The sidewalk connection in Kentucky to Ferry Street shall be left in place. The Design/Builder shall provide the Project Engineer with a set of Plans for the proposed restoration of the temporary ferry staging areas. The Engineer will review and comment. The Design/Builder shall not proceed until approval of the plan.
16. Upon completion or termination of the work, the Design/Builder shall, as directed by the Project Engineer, remove from the vicinity of the work all equipment and all temporary structures, waste materials, and rubbish from his operations, leaving the premises in a neat and presentable condition. In the event of the failure to do so, the same may be done by the Owner at the expense of the Design/Builder, and his surety shall be responsible therefore.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum per state as the unit of measurement.

Basis of Payment

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

FERRY WEB SITE AND PUBLIC AWARENESS

Description: This work shall consist of all work necessary to provide real time information of the ferry service at each temporary staging area.

Construction Requirements: The Design/Builder shall provide and maintain the following items at each temporary ferry staging area:

Web Camera

The Design /Builder shall provide, maintain, and update the following services to provide current wait times and ferry operational status information (open/closed):

Portable dynamic message sign (one outside each queuing area)
Advisory Radio Station
Telephone Hot Line
Internet website with live video fee showing the ferry queues
Social networking site, such as Twitter or Facebook, or equivalent.

The public information sources shall be accessible at all times while the bridge is closed to traffic, 24 hours a day, 7 days a week. The public information sources shall be fully functional 2 weeks prior to the bridge closure.

The Design/Builder shall coordinate with the local radio station to provide real-time ferry wait information for the public.

Method of Measurement:

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment: This work will be paid for at the contract lump sum price for the design/build and shall include all costs of material, labor and incidental necessary for this operation.

TEMPORARY RETENTION FOR DREDGING AND DEWATERING OPERATIONS

Description: Dredging operations and dewatering shall have return waters pass through a temporary sediment basin or floating barge retention system before discharging into the Ohio River.

Materials: Materials shall be in accordance with 205.

Construction Requirements: Temporary sediment basin may be constructed within permanent Right-of-Way along the river banks in accordance with 205.03 with details in general conformance with INDOT Design Manual Fig. 37-3H. If the Design/Builder requires the use of floating barge retention systems, the Design/Builder shall coordinate through the Department to secure United States Coast Guard and the United States Army Corps of Engineers approval for the systems.

The Design/Builder shall prepare computations for sizing of the sediment basin and/or floating barge retention system and outfall structures.

The Engineer shall approve the location and details of temporary sediment basin and floating barge retention system prior to construction.

Method of Measurement:

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment: This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

PUBLIC PARK - PARKING AREA RESTORATION

Description: The existing parking area remaining under the Indiana approach spans shall be reconstructed as described herein.

Materials: Compacted aggregate base shall be in accordance with 301. Subgrade shall be in accordance with 207.

Construction Requirements: Reconstructed parking area shall consist of compacted aggregate No.53 base, 6 in. deep over subgrade treatment type III.

Method of Measurement:

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format for compacted aggregate base measured by the ton in accordance with 109.01(b), and subgrade treatment measured by the square yard per type in accordance with 207.05..

Basis of Payment: This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

RIVER NAVIGATION LIGHTING SYSTEM

Description

The Contractor shall furnish and install navigation lighting for bridge structure no.2 and provide temporary lighting as required. The navigation lighting shall consist of conduit, cable, and junction boxes between the navigation lighting control panel or room, designed and furnished by the Contractor, located at a location approved by the Engineer, and the light fixtures; light units, electrical work, electrical tests and all other incidentals for a complete and operable system as called for in these Special Provisions.

The Contractor shall be required to provide the following:

1. 180 degree red margin lights mounted on upstream and downstream faces of the river piers adjacent to the navigational channel, with red retro-reflective material in accordance with the U. S. Coast Guard Permit.
2. 360 degree green mid-channel lights mounted below the low bridge steel elevation supported by superstructure on the downstream and upstream faces of the bridge and in accordance with the U.S. Coast Guard Permit.
3. Temporary lighting for cofferdams and/or falsework will be as prescribed by the U.S. Coast Guard, and is anticipated to include additional 180 degree Red Margin Lights with red retro-reflective material on each temporary structure or equipment located within the waterway.

The Contractor will be required to notify the Engineer, who will notify the U.S. Coast Guard District Commander, prior to commencement of work within the river. Temporary lights, signals or facilities where specifically required or otherwise so ordered, shall be provided and maintained throughout the life of the contract or until the obstruction for which the lights are furnished is removed. Lights, signals or facilities furnished temporarily for protecting permanent construction shall remain in-place and operational until the permanent navigation lighting system is installed made operational.

General

Design and construction of all electrical work shall be performed in accordance with applicable provisions in Section 920 .

Navigation lights shall be securely mounted to the bridge structure and shall show through a horizontal arc of 360 degree for green lights and show through a horizontal arc of 180 degree for red lights. They shall be pivot-swivel mounted as specified. The pivot mounted lights shall have a locking mechanism and service-retrieving chain made of corrosion resistant non-plastic. The temporary navigation lights attached to the bridge shall be mounted with the lamps located below the outermost edge of the bridge and low steel to be seen by approaching vessels. The Contractor shall provide a functioning temporary power source which will power all temporary lighting until such time that the permanent navigation lighting is installed and made operational.

The Contractor shall submit the proposed temporary navigation lighting details to the Engineer for submittal to Coast Guard for approval. Lights shall be installed as soon as construction work reaches the point where the new structure presents a hazard to navigation.

Materials

The navigation lighting fixtures shall be a suspended bridge light assembly consisting of: ML140 Maxlumina, or equivalent approved by the U.S. Coast Guard, marine lantern wll40mm 180 degree (red), or 360 degree (green) acrylic fresnel lens, six-point lens-to-base fastening, TF-3AC automatic 6 place flasher/lampchanger set for steady burn (fixed) code with nonarching contacts, accurate lamp positioning, end-of-lamp search shutdown feature, external sunswitch and six (12 volt, 0.77 ampere) lamps. Input voltage, 120 VAC, ML-140 lantern mounted on 63 in. hot-dipped galvanized swing pedestal assembly with locking rod and retrieval chain for servicing.

The hangar stem shall be 1 1/2 in. (40 mm) minimum galvanized steel pipe or 1 1/2 in. (40mm) minimum stainless steel pipe. The mounting bracket and hangar housing shall be cast silicon bronze with stainless steel pivot and shall be watertight.

The cable between the junction box and the light fixture shall be #16 SO Cord minimum, and all connections shall be watertight. Any other structural connections shall be watertight and of good quality non-corrosive construction.

Navigation lights shall be provided with supports constructed of steel meeting ASTM A36. Each fixture shall be individually protected by "in line" 5 amp fuses as manufactured by ESNA Corporation, Bussman Manufacturing Division of McGrawEdison Company, HOMAC, or approved equal. Fuses shall be located in the junction box. The photoelectric control for navigation lights shall provide automatic switching of circuits. The unit shall be oriented as nearly as possible to face the northern sky. Initial settings shall be 35 footcandles for "turn on" and 58 footcandles for "turn off". The unit shall be housed in a weatherproof enclosure of the twistlock type. The unit shall be "fail safe", i.e., failure of the electronic circuit will "turn on" the navigation lights. The unit shall be suitable for operation on 120 volt, single phase, 60 Hz. circuits. The photocell shall be designed to be located atop a pull box and detailed in the as-built drawings for future maintenance.

Power Service

The power system to the navigation lighting system shall be designed by the Design/Builder (Contractor). Power shall be 120/208 volt 3 phase, 60 Hz., 4 wire or 120/240 volt, single phase, 3 wire, as applicable. Navigation lighting fixtures shall be connected at 120 volt single phase. All materials shall be furnished and installed by the Contractor. The Contractor shall maintain all lighting for the life of this contract, and shall provide a functioning temporary power source, which will be capable of powering all lighting upon the installation of the first light.

Cable

Cable shall be single conductor, stranded copper, 600 Volt, Type XHHW. Cable for the final connection to swivel mounted navigation lights shall be 3 conductor stranded copper, 600 V, type SO cord. Cable splicing will be permitted in junction boxes only. Temporary navigation lights and other navigation signals or facilities that may be required by governmental authority on any temporary construction or vessels and on any partially or wholly finished permanent construction, shall be provided and maintained in accordance with the requirements of the U.S. Coast Guard.

Junction Boxes

Junction boxes shall be provided for concrete encasement in the bridge parapet and in accordance with Section 920. Provide junction box covers with the wording "Navigation Lighting", formed on the surface or displayed on an attached metal plate.

Method of Measurement -

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment -

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

RIPRAP SCOUR COUNTERMEASURE

Description: Existing bridge substructures shall be armored with riprap scour countermeasures as shown in the plan details attached with the Contract Information Book.

Materials: Riprap shall be in accordance with 904.04 "Riprap" except as noted herein.

The gradation for piers 3, 4 and 5 (existing piers 6, 7 and 8) shall adhere to the following table.

Minimum and Maximum Allowable Particle Size in Inches (from Table 5.1 of HEC-23)								
Nominal Riprap Class by Median Particle Diameter		d ₁₅		d ₅₀		d ₈₅		d ₁₀₀
<u>Class</u>	<u>Size (in)</u>	Min	Max	Min	Max	Min	Max	Max
Design	18	11	15.5	17	20.5	23.5	27.5	36

A well graded riprap installation is essential for scour countermeasure. It is important to assure that the riprap meets the gradation requirements. Contractor shall develop and implement a testing regimen that checks to assure the riprap meets the specification requirements. In addition, the contractor shall submit a type C certification stating that the materials provided meet the special provision and standard specification.

Gradation for pier 2 (existing pier 9) shall adhere to INDOT standards for class 2 riprap per 904.04(f).

A minimum riprap placement thickness of 12 ft for piers 3, 4 and 5 is required.

Geotextile filter shall be in accordance with 918.02 Also, the Contractor shall submit for approval their proposed method for placement and anchoring of the geotextile. Filling geotextile containers with sand to weigh down the filter or using 2 blankets sewn together with a sand layer between are examples of ways to reduce the blankets buoyancy during installation.

Construction Requirements: Riprap shall be of the size and thickness specified herein and in the plan details.

The method for excavation and placement of riprap shall be submitted to the Engineer for approval. All work shall be performed in accordance with all Federal and State requirements.

Placing riprap by dumping will not be allowed. Rock shall be placed by mechanical means, but not by end dump. Maximum height of drop for riprap shall be less than 2 ft per 616.11. The finished surface of both the riprap and excavation will not be permitted to vary from a true plane by more than 12 in. at piers 3, 4 and 5.

Storage and handling of geotextile filter shall be in accordance with manufacturer's recommendations. Installation of geotextile filter under riprap scour countermeasure shall be in accordance with 616.11. The blanket shall be attached to the pier by mechanical means capable of restraining the geotextile during riprap placement and shall be submitted for approval by the Engineer.

A pre-construction survey shall be performed by the Contractor to verify that the elevations used in the scour countermeasure design were correct. A riverbed general elevation for each pier is shown on the plans and used for design. If the elevation is found to be within +/- 1 ft of the listed elevation, the Contractor shall proceed with construction per current design. If the bed elevation is found to be outside of the allowable range, the top elevation of the scour countermeasure shall be adjusted accordingly.

A post construction survey shall be performed by the Contractor after completion of the scour countermeasure construction to insure that it satisfies the design criteria. Future inspections either annually or after significant rainfall events, performed by KYTC will be based on the findings of the post construction survey to insure that the riprap has remained in place.

Method of Measurement: Riprap scour countermeasure will be measured by the ton complete in place. Geotextile filter will be measured by square yard. Excavation will be measured by cubic yard.

Geotextile measurement will be based on surface area plan limit measured by neat lines shown on the Plans with no measurement for overlap or wrap-up along pier face.

Excavation measurement will be based on the difference in volume between the surveyed riverbed surface and the riprap subgrade surface illustrated on the design plans.

Basis of Payment: The accepted quantities of scour countermeasure riprap, geotextile filter and excavation will be paid for at the contract unit price per ton, square or cubic yard, complete in place. The cost of the pre and post construction survey, all other materials, labor, and necessary incidentals will be incidental to/included in the cost of their associated pay item.

Payment will be made under:

Pay Item	Pay Unit Symbol
Riprap, Scour Countermeasure, Special Gradation	TON
Riprap, Revetment, Scour Countermeasure	TON
Geotextiles, Scour Countermeasure, Filter Blanket	SYS
Excavation, Waterway, Scour Countermeasure	CYS
Excavation, Common, Scour Countermeasure	CYS

STRENGTHENING OF EXISTING PIERS

Description -

This work shall consist of design and construction for strengthening and widening the existing piers to support the replacement superstructure truss spans of Bridge No. 2 over the Ohio River, as shown on the contract plans. This work also includes any foundation strengthening required by the Design/Builder's design.

The design, materials and construction of the pier strengthening shall conform to the requirements stated in the special provision, STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO. 2, and this special provision. Design requirements not addressed herein or as part of the SPC shall be in accordance with AASHTO LRFD Bridge Design Specifications (LRFD).

A project specific report, "Pier Strengthening Report", is available and posted on the project FTP portal. The Pier Strengthening Report documents the preliminary engineering performed in evaluating a feasible design for pier strengthening. The Pier Strengthening Report is for the Design/Builder's information only. The Design/Builder shall design and construct any required strengthening of existing piers.

The results of a finite element analysis considering structure/soil interaction, which is described in the Pier Strengthening Report, revealed the need to strengthen all of the existing piers to meet net tension demands as described in the SPC special provision. The Contract Documents are based on the following general method for strengthening the existing piers:

- Dewater around the pier
- Drill vertical holes around the existing caisson perimeter to the required final design depth
- Install reinforcing bars in the vertical caisson holes and grout
- Reinforce, form and cast a concrete jacket to encapsulate and make composite the existing pier stem from the top of caisson to the bottom of finished pier cap, using dowels and a roughened surface to ensure composite action
- Reinforce, form, cast and transversely post-tension a new pier cap to accommodate the final superstructure replacement width. Except for existing Pier 9 (proposed Pier 2) it is permissible to construct the new pier cap around the existing pier stem. If this is done, the new cap shall encapsulate the existing pier stem from the top of concrete jacket to the top of finished pier elevation by roughening the existing stem surface and installing dowels to ensure composite action. Due to chloride exposure the top portion of the stem of existing Pier 9 must be removed before construction of the new cap.

Materials -

Concrete - Concrete for Pier Strengthening shall be in accordance with special provision, HIGH PERFORMANCE CONCRETE.

Post Tensioning - All post-tensioning materials shall be in accordance with special provision, POST-TENSIONING.

Reinforcement 910.01

Caisson Strengthening, Dewatering -

Cofferdams or other methods of dewatering around the pier shall be employed. All work pertaining to cofferdams shall be in accordance with special provision, COFFERDAMS. All construction activities shall be under dry conditions.

Caisson Strengthening, Vertical Drilling -

Vertical caisson reinforcement shall be spaced to accommodate Contractor's drilling tolerances in order to keep holes within the confines of the structure and to prevent intersection with other drilled holes. Vertical reinforcement shall be spaced such that the minimum clear distance between the edge of adjacent holes is 9 in.. Vertical reinforcement shall be located such that the minimum clear distance between the edge of a hole and the edge of caisson is 10 in.

Drilling operations involving vibration or blasting shall not be permitted. This includes pneumatic or percussion air hammer drilling. All vertical holes in caissons shall be drilled using rotary core drilling methods.

Holes shall be clean and have all foreign and loose material removed upon completion of drilling. Holes open for longer than 8 hours shall be re-cleaned prior to insertion of reinforcement and grouting. If holes are to be grouted prior to insertion of reinforcing bars, the depth of hole shall be verified to ensure that the reinforcement can be inserted to the required depth.

Holes shall be surface dry upon commencement of grout placement.

Caisson Strengthening, Reinforcement Placement -

Main vertical reinforcement shall not be spaced greater than 36 inches on center, in conjunction with intermediate #11 bars to maintain maximum spacing of 18 in. at the caisson/stem interface. The main vertical reinforcement shall extend into the caisson as prescribed by analysis for the tension region, but intermediate #11 bars need only be developed 7 ft into the caisson and extend 11 ft 6 in. into the stem. Main vertical reinforcement in the caisson may be bundled, but bundles shall not be spaced greater than 36 in. on center.

Caisson reinforcing steel shall be designed to meet the demands of all limit state load combinations and other requirements of the AASHTO LRFD bridge design specifications and structural performance criteria.

A minimum of 1.56 sq in. per ft of main vertical reinforcing steel shall be provided around the outside perimeter of all caissons except for existing Pier 9 (proposed Pier 2) which shall have a minimum of 1.27 sq in. per ft.

Caissons shall be required to meet the minimum steel provisions detailed in LRFD 5.7.4.2 (Compression Members: Limits for Reinforcement) except that that only 1% shall be required in lieu of equation 3 due to the absence of long term creep. Since the bridge is in Seismic Zone 1, it is permissible to use a reduced effective area (hollow cross-section). The minimum percentage of main vertical reinforcement shall be greater than 1% of the reduced effective area.

For holes greater than 5 in. in diameter, centralizers shall be used at regular intervals along the bar to hold the reinforcing steel at the center of the hole along its entire length.

Caisson Strengthening, Grouting -

Grout Material:

As prescribed in Section 702.03, grout for field drilled holes shall be either a high-strength, non-shrink, non-metallic, cementitious grout in accordance with U.S. Army Corps of Engineers Specification CRD-C 621 or an approved 100% solids chemical anchor system.

Grout Mixing and Placement:

Grout shall be mixed according to manufacturer recommendations, including requirements for expiration date, proportion, grout mix, outside air temperature, and mixing duration. Grout placement shall ensure that no air voids are introduced. Evidence of frothing, foaming, or segregation shall be cause for removal and recasting as deemed necessary by the Engineer.

Grouting equipment shall be provided that produces a grout free of lumps and undispersed cement. The mixer shall be capable of continuously agitating the grout. A positive displacement grout pump equipped with a pressure gauge shall be used to monitor grout pressures. The pressure gauge shall be capable of measuring pressures of at least twice the actual grout pressures used. The grouting equipment shall be sized to enable the grout to be pumped in 1 continuous operation. The entire length of a hole shall be completely grouted before 2 hours have elapsed.

The grout shall be injected from the lowest point of the drill hole. Grout may be pumped through grout tubes, casing, hollow-stem-augers or drill rods. The grout may be placed before or after insertion of the reinforcing bar. Control the grout pressures and grout takes to prevent damage to the existing concrete.

Record the following data concerning the grouting operation:

- (a) Type of mixer
- (b) Water/cement ratio
- (c) Types of additives (if any)
- (d) Grout pressure
- (e) Type of cement
- (f) Strength test samples (if any)
- (g) Volume of grout

If the grout level in the hole cannot be maintained, withdraw the bar and re-drill the hole after at least 24 hours have passed.

Caisson Strengthening, Pullout Testing -

Pullout testing shall be performed to demonstrate that required bonding has been achieved. Testing shall be performed no later than 4 weeks prior to the commencement of production drilling of caissons in the field.

Pullout testing may be conducted by 1 of 2 methods using the exact equipment, materials, core drilling procedures and grouting procedures to be used for caisson strengthening in the field. Both methods require that 2 tests be performed successfully by developing 90% of the full yield strength of the bar without excessive deformation or other indicators of bond failure. If either test fails to reach the target load, the equipment, materials or procedures shall be modified and 2 new specimens shall be tested. This process shall be repeated until a successful pair of tests have been achieved using the same method.

Method 1:

- a) Cast 2 test specimens using the concrete mix design approved for use in the stem strengthening jacket. Test specimens shall be a minimum of 30 in. in cross-section dimension and shall be of a minimum length given by the required development length of the bar to be used in the caisson strengthening plus 5 ft.
- b) When the specimen has reached the required minimum 28-day strength based on cylinder tests, core drill a hole of the appropriate diameter in the center of the specimen cross section and along the longitudinal axis of the specimen to within 12 in. of the bottom.
- c) With the specimen in the vertical position, insert the reinforcing bar into the bottom of the hole, ensuring that the bar is centered within the hole along its entire length. Note that steps c and d may be reversed if approved strengthening procedure calls for hole to be grouted prior to inserting the reinforcing bar.

d) Prepare the hole as required and grout the bar in place for a distance from the bottom of the hole of 90% of the bar development length using the manufacturer's recommended procedure or other procedure approved by the Materials Engineer, which shall be in accordance with the production procedure to be used in the field.

e) When grout has achieved the required strength based on cube tests, apply a pullout load at the top of bar. Increase the load incrementally, measuring both the load and elongation of the bar, until the target load has been achieved.

Method 2:

Method 2 utilizes in-situ testing on 1 of the existing caissons to be strengthened.

a) Core drill a single hole to the required strengthening depth, prepare the hole, insert bar and grout the bar in place for a distance from the bottom of the hole of 90% of the bar development length using the equipment, materials and procedures approved for field production.

b) When grout has achieved the required strength based on cube tests, apply a pullout load at the top of bar. Increase the load incrementally, measuring both the load and elongation of the bar, until the target load has been reached. Upon a successful test, the hole shall be grouted to its final level and the bar may be considered as contributing to the strength of the structure.

c) If the first test is successful, conduct a second test a minimum perimeter distance of 15 ft away from the first hole and repeat Steps a and b. Any additional tests required shall be conducted a minimum perimeter distance of 15 ft away from any previously drilled holes. Any bars that do not test successfully may remain in place and shall be grouted to their final level, but shall not be considered as contributing to the strength of the structure.

Stem Strengthening and Pier Cap, Limits of Interface Preparation

The entire surface area of the existing stem from top of caisson to bottom of final pier cap, or to top of final pier cap if existing stem is to remain in place above the bottom of final pier cap elevation, shall be repaired, prepared and encapsulated with new concrete in accordance with the following procedure.

Stem Strengthening and Pier Cap, Interface Preparation -

Repair and Roughening of Existing Stem Concrete:

All unsound concrete shall be identified and removed to provide a solid base to bond to new concrete. Concrete removal and repair shall be in accordance with Section 710.03.

All surfaces receiving new concrete shall be abrasive blast-cleaned and roughened to 0.25 in. amplitude.

The Design/Builder will inspect existing stem surfaces to identify any cracks greater than 0.017 in. in width. All cracks greater than 0.017 in. in width and all lift lines shall be sealed with an approved penetrant sealer to prevent crack reflection through the new concrete and to eliminate the direct transfer of water and chlorides into the new concrete.

Stem Strengthening and Pier Cap, Shear Connector Requirements.

The strengthened pier section requires the new concrete to act compositely with the existing stem section through shear friction. The shear connectors, herein referred to as dowels, are required to ensure that the existing and new concrete acts compositely. Bonding between new and existing concrete shall be accomplished through drilled and grouted dowels at a maximum spacing of 24 in. on center over all existing pier stem surfaces identified under LIMITS OF INTERFACE PREPARATION.

At elevations above the bottom of new pier cap, shear connectors shall be designed to provide adequate load transfer for the interface such that the structural need to bond the new concrete to the existing stem is not required, even though significant bond between existing and new concrete may exist. In other words, the cohesion factor, c , in LRFD 5.8.4 shall be taken as zero.

As prescribed in 702.03, grout for field drilled holes shall be either a high-strength, non-shrink, non-metallic, cementitious grout in accordance with U.S. Army Corps of Engineers Specification CRD-C 621 or an approved 100% solids chemical anchor system. The product used must be appropriate to anchor bars in a horizontal orientation.

Stem Strengthening and Pier Cap, Reinforcement -

A minimum clear cover of 4 in. shall be provided for all new reinforcing from both the exterior face and the existing stem face.

Stem reinforcing steel shall be designed to meet the demands of all Limit State load combinations and other requirements of the AASHTO LRFD Bridge Design Specifications and Structural Performance Criteria.

A minimum of 1.56 square in. per ft of vertical reinforcing steel shall be provided around the outside perimeter of pier stem encapsulation except for existing Pier 9 (pier 2) which shall have a minimum of 1.27 sq in. per ft. Pier stem encapsulation shall be required to meet the minimum steel provisions detailed in LRFD 5.7.4.2 (Compression Members: Limits for Reinforcement). Since the bridge is in Seismic Zone 1, it is permissible to use a reduced effective area (hollow cross-section). The minimum percentage of total longitudinal reinforcement shall be the greater of: 1 percent of the reduced effective area or the value obtained from Equation 3.

Pier stem encapsulation shall also be required to meet the minimum steel provisions detailed in LRFD 5.10.8 (Shrinkage and Temperature Reinforcement).

Maximum spacing of mild steel reinforcement in the pier stem shall be 18 inches for primary vertical reinforcing in the stem.

Stem Strengthening and Pier Cap, Concrete Placement -

The top of caisson surface outside the existing pier stem shall be thoroughly cleaned of all foreign materials by sandblasting prior to casting new concrete for encapsulation of the stem.

Prior to new concrete placement, thoroughly wet the existing concrete surface to be in contact with the new concrete for 12 hours. This may be accomplished by continuous wetting with soaker hoses. Remove all free standing water with compressed air and maintain a clear saturated surface dry condition until placement of new concrete. Prior to concrete placement and according to the Manufacturer's recommendations, an epoxy bonding agent shall be applied to the horizontal surface on the top of the caisson using a material from the Department's list of approved Non-Vapor Barrier Type Bonding Agents. All concrete placements, form removal and concrete curing shall be in accordance with Section 702, except as detailed herein under MATERIAL - CONCRETE.

Concrete encapsulation shall be a minimum of 24 in. thick from vertical face of existing stem to vertical face of new pier.

A coal tar epoxy waterproof coating system shall be applied 3 ft above and 3 ft below the interface of the caisson and the new stem encasement. This system shall be used to provide a waterproof barrier over the full perimeter.

Materials shall meet the requirements of Corps of Engineers formula C-200 or C-200a, from one of the following products, or approved equivalent:

"Permo-Tar" manufactured by Pilgrim Permocoat, Inc., 402 S. 22nd Street, Tampa FL 33605, (800) 637-3328

"Targuard" Corp Of Eng. C-200, manufactured by Sherwin Williams Co 1150 8th st., Cincinnati, OH 45203 (513)621-1630

"Bitumastic 300M COE", Corboline Co., 2150 Schultz Rd., Saint Louis, MO 63146 (314)644-1000

Pier Cap:

A new pier cap shall be constructed to accommodate the increased width of the new truss structure. The cap may replace the existing pier stem above the bottom of cap elevation or may encapsulate the existing pier stem. In the latter case the existing pier stem shall be removed to a maximum elevation of 4 inches below top of cap, and a minimum of 4 in. of new concrete meeting the requirements of this special provision shall encase the final top of existing stem.

For performance and durability reasons the pier cap shall be post-tensioned in the direction transverse to the longitudinal axis of the bridge. Post-tensioning shall be designed in accordance with LRFD with the following exception: The allowable tensile stresses given in LRFD Tables 5.9.4.1.2-1 and 5.9.4.2.2-1 are amended to require a minimum of 0.100 ksi residual compression at all times for the Service I Limit State combination defined in LRFD Table 3.4.1-1.

Post-tensioning shall be performed in accordance with special provision, POST-TENSIONING.

Drilling of holes in existing pier stem in a direction transverse to the longitudinal axis of the bridge to serve as conduits for post-tensioning bars or tendons shall not be permitted.

Method of Measurement -

This work will not be measured for payment.

Basis of Payment -

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO.2

1. Description

1.1 Intent of Special Provision

This special provision documents the structural performance criteria that shall be used to analyze, design and construct the main 4 span river bridge carrying Highway US-421 over the Ohio River between Milton, Kentucky and Madison, Indiana. These criteria define parameters for the Contractor's use when designing and constructing the steel truss superstructure replacement and the strengthening, widening and construction of 4 existing substructure piers and 1 new.

The design and performance criteria for the approach superstructure, approach piers and the abutments are defined in the Scope of Services and are not included in this special provision.

1.2 Structure Description

The proposed US-421 Bridge is a 4 span variable depth thru-truss bridge. The proposed bridge has span lengths of 599.5ft - 600ft - 727.25ft - 500ft (south to north) for a total length of 2426.75ft. All of the piers supporting the bridge are perpendicular to the alignment. The bridge typical section shall include two 12ft lanes, two 8ft shoulders and a pedestrian walkway on the west side. The configuration and limits of the bridge are based upon the re-use of existing river piers 6, 7, 8 and 9. Existing piers 6-9 shall remain in service and will be widened at the proposed bearing seat elevation to obtain the necessary width to support the new wider superstructure. Pier widening of existing piers 6 thru 8 has been assumed to occur while traffic occupies the existing bridge to reduce the overall closure duration. Existing Piers 6, 7, 8 & 9 (now designated Piers 5, 4, 3 & 2 respectively) shall be strengthened to resist the design loads. Proposed Pier 6 is a new pier and shall be constructed on land with deep foundation elements extending to bedrock.

The bridge deck shall be placed according to INDOT's standard specifications. Class C concrete, in accordance with INDOT standard specifications shall be used for the bridge deck. Empirical deck design shall be excluded. Reduced weight closed valley stay-in-place (SIP) forms can be used. The deck concrete shall be placed after the truss is erected.

Preliminary drawings of the truss and general pier configurations are included in the Contract Plans.

1.3 Functional Criteria

US-421 is classified as a Rural Highway. The facility carries commercial and commuter vehicular traffic and the proposed structure shall accommodate pedestrian.

Design Speed = 40 mph
Posted Speed = 35 mph (Proposed)
Posted Speed = 35 mph (Existing)

ADT and ADTT

ADT (2007) = 10,300 (2 Way)
ADTT (2007) = 412-824 (4-8% Trucks)
ADT (2030) = 12,900 (2 Way)
ADTT (2030) = 516-1,032 (4-8% Trucks)

Design life of the bridge shall be 75 years.

The following elements on the bridge shall be designed and constructed to be replaceable:

- cast in place deck,
- bearings,
- expansion joints.

2. Geometric Layout and Clearance Requirements

2.1 Truss Geometry and Panel Layout

The geometry and panel layout of the main truss panels shall be in general accordance with the Contract Plans. Tolerances are defined in the Construction Requirements of the Scope of Services.

2.2 Water Levels

Regulatory water levels are tabulated on the plans for the Contractor's information.

For historical river flow data, see the special provision, OHIO RIVER HYDROGRAPH. The Department makes no warranty of the accuracy of the information gathered. Historical data is not an indication of future river flow.

2.3 Navigation Channel Clearances

Navigational channel clearances shall comply with the United States Coast Guard Permit.

2.4 Roadway Clearances

The minimum vertical clearance over US-421 shall be 17'-0". The minimum horizontal clearance from a structural member to the back of an outside barrier shall be 1'-6" measured normal to the deck.

2.5 Horizontal Alignment

The 4 span truss structure shall be on a tangent horizontal alignment as shown on the Contract Plans.

2.6 Vertical Alignment

The data for vertical curves on US421 is shown on the Contract Plans.

3. Codes, Standards, Specifications, and References

All reference to the AASHTO Standard Specifications from INDOT Codes and Specifications shall be interpreted to reference the AASHTO LRFD Bridge Design Specifications or the AASHTO LRFD Bridge Construction Specifications.

3.1 Design Codes and Specifications

The following list is not exclusive; additional resources may be used as deemed appropriate by the Design/Builder, with the approval of the Engineer. Design specifications are listed in order of precedence relevant to the design of the 4 span truss and its supporting substructure. Should the requirements in 1 standard conflict with those in another, the standard highest on the list shall govern.

AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, Fourth Edition, 2007, Including Interims through 2009.

Load Rating Guidance and Examples for Bolted and Riveted Gusset Plates in Truss Bridges (Pub. No. FHWA-IF-09-014).

Indiana Department of Transportation, Design Manual, 2009.

3.2 Construction Specifications and Standards

Indiana Department of Transportation, Standard Specification 2010

AASHTO LRFD Bridge Construction Specifications, Second Edition, 2004, Including Interim revisions through 2009.

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 5th Edition 2009

AASHTO/AWS D1.5:2008, Bridge Welding Code.

AASHTO Guide Specifications for Highway Bridge Fabrication with HPS 70W Steel, 2nd Edition 2003.

AASHTO Guide Design Specifications for Bridge Temporary Works, 2008 Interim to 1995.

AASHTO Construction Handbook for Bridge Temporary Works, 2008 Interim to 1995.

AASHTO Manual for Bridge Evaluation, 1st Edition 2008, interim to 2010.

Guide Specifications for Grouting of Post-Tensioning Tendons, PTI, Second Ed., 2003.

Post-Tensioning Institute, Recommendations for Prestressed Rock and Soil Anchors, 4th Edition, 2004.

Indiana Department of Transportation, Standard Drawings, 2009. (<http://www.in.gov/dot/div/contracts/standards/drawings/sep09/sep.htm>).

3.3 Binding Contractual Documents for Contractor Use

The following project specific reports shall provide design loads and methodology to be incorporated into the structural analysis and design of the truss bridge structure.

FINAL REPORT - STUDY OF VESSEL COLLISION ON BRIDGE PIERS, MILTON MADISON BRIDGE, MARCH 2010 (BAKER)

WIND ENGINEERING STUDY - FINAL REPORT (RWDI)

MILTON-MADISON BRIDGE, GEOTECHNICAL OVERVIEW (KYTC/Baker)

3.4 Reference Documents for Contractor Information

The following project specific reports were prepared during project development and are available for the contractor's information only.

PIER STRENGTHENING REPORT FOR EXISTING PIERS 6-9

EXISTING PIERS SERVICE LIFE ASSESMENT (CTL)

FINAL ENVIRONMENT ASSESMENT REPORT FOR THE MILTON MADISION BRIDGE (WSA)

PRELIMINARY HYDRAULIC and SCOUR REPORT (WSA)

Additional reference material may be available on the INDOT website. The Contractor shall consider the available additional reference material in the preparation of the proposal bid.

4. Design Loadings

The following loads shall be considered in the design of the truss bridge including river piers:

4.1 Dead Loads

Unit weight of the materials shall be in accordance with Section 3.5.1 of the AASHTO LRFD with the following additions or modifications:

Normal Weight Concrete (NWC)	
Reinforced	150 PCF
w/o Reinforcement	145 PCF
Post-Tensioned Concrete (Pier Caps)	155 PCF
Closed Valley Stay in Place Forms (no concrete in valleys)	4 PSF
Type TF-2	490 PLF
Aluminum Pedestrian Railing	25 PLF
Future Wearing Surface (IDM Fig 60-2A)	35 PSF
Inspection Walkway	AS DESIGNED
Utilities	100 PLF

4.2 Live Loads for Highway Traffic

Live loads include vehicular and pedestrian live loads in accordance with AASHTO LRFD Specifications.

Highway traffic shall be placed in up to 3 12 ft. wide traffic lanes. The structure shall be designed for the HL-93 loading per AASHTO LRFD.

Longitudinal forces (longitudinal live load braking) shall be applied in accordance with AASHTO LRFD, Section 3.6.4. A maximum of 2 lanes will be considered for directional braking forces.

Dynamic load allowance shall be computed in accordance with AASHTO LRFD Section 3.6.2. Dynamic loads shall be applied to the superstructure design and shall be applied to the piers above the top of footing or caisson. Dynamic loads shall not be applied to the foundations, or to elastomeric bearings.

4.3 Wind Loads

Structural design shall be performed in accordance with the static and dynamic wind loads determined by the Wind Engineering Study Final Report, US 421 Milton Madison Bridge Replacement prepared by RWDI.

The Report calculates site specific wind loads for the Milton Madison Bridge. A summary of the calculated design forces is provided in the Report. The corresponding loads shall be applied to the structure in the design of the project by the Design/Builder. The report also contains other project specific information related to the application of these loads in conformance with this Special Provision.

Buffeting loads presented in the report were based on certain geometry, mass, and dynamic properties of the truss and supporting bearings as shown in the Wind Study appendix. The Design/Builder shall generate corresponding geometry, mass, and dynamic properties of the final bridge design that accounts for the stiffness of the truss and supporting bearings. A wind specialist shall be retained by the Design/Builder to review these in comparison with the Report to verify applicability.

4.4 Thermal Loads

Thermal forces shall be determined by Uniform Temperature Load: Procedure A as described in AASHTO. Structural design shall be performed in accordance with AASHTO 3.12.2 for a cold climate with the following parameters.

Median temperature = 60° F

Min/Max Effective Bridge Temperature = -30°F/120°F (90°F Fall/60°F Rise)

Superstructure shall be designed to handle a design temperature differential between the truss superstructure and the floor system (stringers and deck) of +/- 20° F.

4.5 Thermal Displacements

Displacements due to thermal loadings shall be based on load factors given in AASHTO LRFD Table 3.4.1-1 and IDM 60-4.02.

4.6 Seismic Loads

The Operational Classification of the Milton Madison bridge is designated as a normal structure. Seismic design shall be in accordance with the AASHTO LRFD Specifications, Fourth Edition, 2007, including interims through 2009. The proposed Milton-Madison Bridge is in Seismic Zone 1. The truss, piers and bearings shall be analyzed and designed for seismic forces. A response spectrum analysis shall be performed for the truss design and to reduce the seismic forces on the piers and bearings.

The mapped spectral response coefficients for the bridge are as follows, determined using the USGS/AASHTO Seismic Hazard Maps, from the AASHTO LRFD Specifications, depicting the probabilistic ground motion and spectral response for a seven percent probability of exceedance in 75 years:

$$\begin{aligned} \text{PGA} &= 5.4\% \text{ g} \\ S_s &= 13\% \text{ g} \\ S_1 &= 5.5\% \text{ g} \end{aligned}$$

For foundation elements founded on or in rock, including the existing caisson foundations that are to be reused, determine the seismic loading based on Site Class B per AASHTO 3.10.3. For foundation elements bearing in soil (to the extent they are permitted in the Geotechnical Report), determine the seismic loading based on Site Class D per AASHTO 3.10.3.

Seismic analysis shall consider the effects of permanent loads and a portion of the live loads as indicated in IDM 67-4.06(02), section 4.12.2.

A Response Modification Factor (R) of 1.0 shall be used for all existing substructures (Piers 2 thru 5) and 1.5 for all other substructures.

4.7 Barge Impact Loads

All piers shall be designed for the barge impact loads presented in the binding project report Final Report - Study of Vessel Collision on Bridge Piers, Milton Madison Bridge, prepared by Michael Baker Jr., Inc. dated March 2010.

The Department has assigned an operational classification to the structure of "typical" bridge for reference to AASHTO 3.14.3.

Where scour countermeasure has been prescribed for the existing piers 6 thru 9, scour in combination with barge impact will not be a required load case. Proposed Pier 6 (new pier) and all other new piers in the approaches shall be designed considering scour in combination with barge impact as defined in AASHTO LRFD 3.14.

4.8 Differential Support Settlement

Differential settlement is anticipated to be negligible with all truss supporting piers founded on rock. Differential settlement between piers shall be included in applicable load combinations per AASHTO LRFD 3.4.1. A nominal differential settlement of 1 in. between adjacent truss pier supports shall be used for analysis to account for bearing replacement.

4.9 Stream Flow

Stream pressure shall be considered according to AASHTO LRFD 3.7.3. Consideration of additional pressure on debris accumulation shall follow the more simplified recommendations given in the AASHTO LRFD C3.7.3.1.

4.10 Ice

Ice forces shall be determined according to AASHTO LRFD and Indiana Design Manual 60-3.07.

4.11 Scour

Scour analysis was performed during preliminary design and is documented in the PRELIMINARY HYDRAULIC AND SCOUR REPORT. Permanent scour countermeasures shall be constructed according to the Contract Book Plan Details and special provision, RIPRAP SCOUR COUNTERMEASURES, to prevent local scour at the existing piers 6, 7, 8 and 9, which are to remain (proposed piers 5, 4, 3 and 2).

Proposed Pier 6 must be designed considering scour in combination with barge impact as defined in AASHTO LRFD 3.14.

4.12 Load Factors and Combinations

Load combinations shall be in accordance with AASHTO LRFD, with the following additions and/or exceptions:

4.12.1 Scour (Only for new piers and excludes existing piers with scour riprap countermeasures)

For all new piers, scour shall be considered in accordance with AASHTO LRFD 2.6.4.4.2, 3.14.1 and 3.7.5. For strength and service load combinations, total scour (long-term, contraction, and local scour) shall be considered using the 100-yr scour design event.

For Extreme Event Load Combinations I, effects due to channel degradation (long-term scour) shall be considered using the 500-yr scour design event for all new piers.

For Extreme Event Load Combination II involving vessel collision, total scour (long-term, contraction, and local scour) shall be considered using the 100-yr scour design event for all new piers as described in AASHTO LRFD 3.14.1.

4.12.2 Earthquake

The load factor for live load in Extreme Event Load Combination I, γ_{EQ} , shall be taken equal to 0.5.

4.12.3 Bearing Longitudinal Friction Forces (FR)

Friction loads (FR) shall be applied to piers with sliding expansion bearings only. However, (FR) need not be considered for Extreme Event Load Combination II involving vessel collision with sliding bearings. Also (FR) shall not be utilized to provide additional support during vessel collision.

If elastomeric bearings are utilized, longitudinal braking forces (BR), thermal forces (TU), earthquake loads (EQ) and wind loads (WS & WL) shall be applied to piers in proportion to the stiffness of the bearing. No additional (FR) loads need be applied to piers utilizing elastomeric bearings.

5. Materials

5.1 Concrete

Concrete specifications shall be in accordance with INDOT Standard Specifications and as shown in the table below unless otherwise noted.

Minimum Concrete Classification by Component

Component	Concrete Class
Cast in Place Deck	Class C
Bridge Railing	Class C
Pier Caps and Stem Strengthening	HPC Concrete
New Piers of Bridge No. 2	HPC Concrete
Integral End Bent	Class C
Non Integral End Bent	Class A
Cantilever Abutments and Wingwalls	Class A
Spread Footings	Class B
Concrete Piles	Class A
Interior Bents Above Footings	Class A
Interior Bents Below Footings	Class B

All concrete in the pier caps and stem strengthening shall be high performance concrete (HPC) in accordance with the special provision, HIGH PERFORMANCE CONCRETE.

Concrete mixes shall be designed by the Contractor for each concrete component of the bridge structure in accordance with Section 702.

Concrete for existing river pier stem and caisson strengthening shall be designed to meet the special requirements in section 7.3 of these criteria.

Mass concrete specifications and design shall be in accordance with special provision, HIGH PERFORMANCE CONCRETE.

5.2 Reinforcing Steel

All mild reinforcing steel shall conform to ASTM A615, Grade 60 unless otherwise demonstrated by the Contractor to provide superior value to the Department.

All reinforcing steel in the strengthening and caps of existing piers 9, 8, 7, 6 (Pier 2 thru 5) shall be epoxy coated. In addition, epoxy coated and plain deformed bars shall be used as required in INDOT DM Chapter 62.

Bursting reinforcing for post-tensioning anchorages shall be galvanized per ASTM A767.

Mechanical couplers shall be capable of developing greater than 125% of the yield strength of the bar.

5.3 Post-Tensioning

Due to variable loading and serviceability of an encapsulated pier cap with a service life of 75 years, new pier caps on existing river piers shall utilize horizontal post tensioning to take tension in accordance with the special provisions STRENGTHENING OF EXISTING PIERS and POST TENSIONING.

5.4 Structural Steel

All structural steel shall be painted ASTM A709 Grade 50W or ASTM A709 Grade HPS-70W unless noted otherwise. All top and bottom chord truss members which are determined to be fracture critical shall be ASTM A709 Grade HPS-70W.

Exposed steel within expansion joints shall be ASTM A709, Grade 36 or 50 (Galvanized in accordance with ASTM A123).

Hatches, ladders, platforms, gratings and hardware shall be ASTM A709, Grade 36 or 50, and galvanized in accordance with ASTM A123 or A153 as applicable.

Steel in bearings shall be ASTM A709, Grade 50 or 50W and painted.

6. Design and Analysis Method

6.1 General

6.1.1 Load Modifiers

Unless otherwise stated, bridge members shall be designed in accordance with AASHTO LRFD, where the load modifier is taken as the product of $\eta_D \eta_R \eta_I$ where:

$\eta_D = 1.05$ for unconventional designs of Primary Truss Members,
 $\eta_D = 1.0$ for conventional designs of Secondary Members,
 floorbeams, stringers

$\eta_R = 1.05$ for fracture critical truss members and gussets
 $\eta_R = 1.00$ for all other steel components

$\eta_I = 1.05$ for Important Bridges

6.2 Truss Redundancy Analysis

A fracture critical member (FCM) is a steel component or connection which experiences tension and whose failure is expected to result in the collapse of the bridge or the inability of the bridge to perform its function.

6.2.1 Fracture Critical Members

There are 2 alternatives for the identification of FCM's:

- All primary main load carrying longitudinal superstructure components, connections, and transverse floor beams sustaining tensile forces shall be considered FCM.
- As an alternative, submit a refined analysis to identify FCM's for review and concurrence.

6.2.2 Refined Analysis for Fracture Critical Members

Consider the following criteria with the refined analysis for identifying FCM's. Any tension component or connection that does not meet these 2 criteria shall be identified on the drawings and fabricated as FCM.

- Use the load combination $(1.05/0.95)DC + (1.05/0.90)DW + 1.15(LL+IM)$ for all design lanes in a 3-D elastic analysis to assure that failure of any tension component or connection will not cause the collapse of the entire truss. Collapse is defined as a progressive failure in enough members to cause structural instability. Consider any remaining component or connection as failing and no longer effective when they reach first yield.
- Use the load combination $(1.05/0.95)DC + (1.05/0.90)DW + 1.15(LL+IM)$ as a strength limit state load for stripped lanes only in a 3-D elastic analysis to assure that failure of any tension component or connection will not cause the bridge to be unable to perform its function. The inability of the bridge to perform its function is defined as a performance ratio (capacity/demand) less than 1.0 in any remaining component and connection, including the deck and supporting floor system.

6.3 Reinforced Concrete

Reinforced concrete members and post-tensioned concrete members shall be designed in accordance with the AASHTO LRFD Specification, excepted as noted for the existing pier stem and caisson strengthening.

6.3.1 Placement of Reinforcing Steel

Minimum clear distance from face of concrete to bar shall be provided as shown in INDOT DM Fig. 62-2C or AASHTO 5.12.3: except for new concrete encasing existing concrete in which case the minimum clear shall be 4 in. including clearance with existing concrete.

6.3.2 Control of Cracking

The exposure factor, γ_e , for the spacing of flexural reinforcement shall be taken as 1.0 for the deck, and 0.75 except as noted for the existing pier stem and caisson strengthening.

6.4 Steel

6.4.1 Steel Members

All structural steel members shall be designed in accordance with AASHTO LRFD. All structural steel components, whether welded or bolted, sustaining tensile stresses under the Strength-I load combination shall meet the notch toughness requirements for Temperature Zone 2 as designated in AASHTO 6.6.2. Steel stringers shall be designed to act compositely with the concrete deck. Bolted steel connections shall have a class B coating on the faying surface and slip coefficient of 0.5.

6.4.2 Fatigue

The fatigue resistance shall be computed in accordance with Section 6.6 of the AASHTO LRFD Specifications.

6.4.3 Gusset Plates

In accordance with FHWA Technical Advisory T5140.29, gusset plates shall be designed and load rated in accordance with the provisions of the AASHTO LRFD Specifications stipulated herein, the INDOT Design Manual and as supplemented by Load Rating Guidance and Examples for Bolted and Riveted Gusset Plates in Truss Bridges (Pub. No. FHWA-IF-09-014). Gusset plates and all fasteners shall be so proportioned to meet all of the applicable limit states for load combinations of fatigue, service and strength. The loss of a gusset may precipitate the loss of adjoining members. Gusset plates shall be designed with a redundancy, η_r , of 1.05. To ensure maximum redundancy in the system, members shall be kept continuous through the joint where possible. All fasteners shall be proportioned according to the elastic-vector method. The instantaneous center of rotation method shall not be utilized. All fasteners shall be A325 Type 1 high-strength galvanized bolts for painted steel structures.

6.4.4 Truss Geometry

The truss joint coordinates shown on the Contract Plans are premised on vertical members and floorbeam webs being so oriented to be perpendicular to the instantaneous grade of the bridge alignment after the application of all dead load exclusive of future wearing surfaces. If vertical members or vertical members and floorbeam webs are plumb, adjustments to the top chord joint coordinates will be permitted.

6.5 Truss Erection Analysis

The structure shall resist all loads including erection loads on all truss members.

6.6 Truss Floor System

There are 2 acceptable floor systems for the truss: An integral floor system where the stringers and floorbeams are both composite and a floating floor system where the stringers are composite and supported on top of the floorbeams with low friction sliding bearings. Both floor systems shall consider the requirement that no expansion joints or stress relief joints are allowed between the beginning and end of the continuous truss.

Also for both systems the floorbeam connection shall be designed with a direct longitudinally restrained connection between the floorbeam flanges and the truss to ensure compatibility between the floor system and the truss. The design of this connection shall be submitted for review and approval of the Department's Engineer prior to any fabrication.

6.6.1 Integral Floor System

The design of the stringers and their connections to floorbeams shall consider the structural interaction of the floor system with the overall behavior of the truss. Specific details as to the forces and/or displacements of the deck/stringer system relative to the trusses and how such are resisted or accommodated by the truss members and floorbeam connection shall be submitted for approval prior to fabrication. Also the design of the deck shall maintain the requirement of no joints and no cracking for all serviceability checks.

6.6.2 Floating Floor System

The bearings between the stringers and the floorbeams shall be a low friction sliding elastomeric type. Bearings shall be submitted for approval prior to fabrication. Provisions shall be made for ease of future replacement of the bearings. To account for reduced durability of the sliding surface over time, the longitudinal demands between the bearing and the top flange of the floorbeams shall assume a 10% friction coefficient. Consideration shall be given to bracing the top flange of the floorbeam for these demands. Specific details as to the forces and/or displacements of the deck/stringer system relative to the trusses and how such are resisted or accommodated by the truss members and floorbeam connection shall be submitted for approval prior to fabrication. Also the design of the deck shall maintain the requirement of no joints and no cracking for all serviceability checks.

7.0 Foundations and Piers

7.1 New Pier 6

Proposed Pier 6 shall be constructed on land with deep foundation elements extending to bedrock.

Foundation resistance at the strength, service and extreme event limit state shall be evaluated using procedures and resistance factors as provided in the AASHTO LRFD specification.

7.2 Existing Piers

Foundation design for the 4 existing piers to be reused shall be designed with consideration of soil structure interaction to account for the difference in response between the bearing rock and the soil surrounding the existing unreinforced caisson. A 3-D finite element analysis shall be used to model the pier/soil/rock system including the rock sockets. Applicable soil and rock parameters as defined in the Geotechnical Overview shall be used in this analysis. Factored loads shall be applied to the model per AASHTO LRFD specifications for load combinations. Response in the finite element model shall not be factored. Final stresses and bearing pressures shall be compared to factored resistances per AASHTO LRFD specification. Preliminary design calculations are included in the Pier Strengthening Report.

7.3 Strengthening of Existing Pier Stems and Caissons

7.3.1 Existing Pier Stem and Caisson Capacity

A service life evaluation of the existing river piers was performed. Due to non-existing or limited reinforcement of unknown yield capacity, the existing pier stems and caissons shall be considered as non-reinforced concrete members and shall be required to meet the following minimum criteria.

Concrete for existing concrete in pier stem and caisson shall be assumed to have a 28 day compressive strength, $F'_c = 7$ ksi and an elastic modulus, $E_c = 4,810$ ksi.

No tension shall be permitted for any SERVICE load combination including Service-IV in the existing concrete. Service-IV is used specifically to assure a zero tension in concrete for a combination with a 0.70 factor on wind.

Tension in the existing concrete shall be limited to 95 psi, or approximately 15% of concrete modulus of rupture for all strength and extreme event load combinations.

Where either or both of these tension criteria are not met, strengthening shall be performed in accordance with the special provision STRENGTHENING OF EXISTING PIERS. Strengthening in the caisson shall be continued over the length of the tension area plus development length for service load combinations or to the point of 95 psi tension plus development length for strength and extreme event load combinations, whichever is greater. Strengthening in the stem shall be continued over the entire length of the stem.

If no strengthening of the caisson is required according to this criteria, then the stem reinforcement must be fully developed into the caisson to strengthen the intersection between the caisson and stem.

7.3.2 Strengthening Existing Pier Stems

Pier Cap and Stem Configuration -

- (a) The configuration of the pier cap and stem encasement shall follow the general outline as shown on the Contract Plans.
- (b) The perimeter of concrete encasement shall not encroach into navigational channel required by the USCG.
- (c) All portions of the existing stem above the top of the caisson which are not removed shall be encapsulated by a minimum thickness of 24 in. of concrete.

Design pier strengthening in accordance with the special provision, STRENGTHENING OF EXISTING PIERS.

8. MISCELLANEOUS

8.1 Bearings

8.1.1 Truss bearings shall be either pot bearings or laminated elastomeric bearing pads of 50 or 60 durometer hardness.

8.1.2 All bearings and shall be designed in accordance with Section 14 of the AASHTO LRFD Specification.

8.1.3 For floating floor systems, the bearings supporting the stringers shall consist of elastomeric laminated bearing pads of 50 or 60 durometer hardness. Except for the fixed pier at the centerline of Pier 4, these shall have a low friction PTFE sliding surface with bonded stainless steel underneath the sole plate. The PTFE sliding surface shall conform to the requirements of the AASHTO LRFD Specification, Section 14.7.2, for dimpled and lubricated sheets.

8.1.4 Truss and stringer bearings (for floating floor systems) shall be designed and detailed to be replaceable by jacking the superstructure off the permanent bearings. The truss superstructure and pier cap shall be designed for this jacking load. The longitudinal and transverse analysis of superstructure shall consider the redistribution of reactions and forces when jacks are engaged to replace the bearings. The "Construction, Maintenance, and Inspection Manual" shall detail the procedure for bearing replacement including the intended position of the jacks. Bearing replacement shall be considered with a reduced live load.

8.2 Expansion Joints

8.2.1 Expansion joints shall be designed in accordance with Section 14 of the AASHTO LRFD Specification.

8.2.2 Modular expansion joints or finger joints shall be constructed at the ends of the truss bridge.

8.2.3 Expansions joints shall be located only at ends of the 4 span truss structure. Intermediate expansion joints will not be allowed.

8.2.4 Sliding plates shall be used as the walking surface over the expansion joint across the sidewalk. Provision shall be made for a safe riding surface over the expansion joint for bicycles across the shoulders.

8.3 Bridge Railings

8.3.1 Roadway

The barrier on the outside of the travel lanes shall be type TF-2 Indiana barrier rail with a TL-5 rating tested in accordance with NCHRP-350.

8.3.2 Sidewalk

The railings adjacent to the sidewalk shall have a minimum height of 42 in.

The pedestrian rail as detailed in the Contract Information Book Attachment and as specified in special provision, ALUMINUM BRIDGE HAND RAILING, shall be fabricated and constructed.

The gap between the edge of the sidewalk and edge of the rear face of the deck will be enclosed with galvanized grating.

8.4 Deck Drainage

Drains over the Ohio River can discharge directly into the Ohio River. Deck drain outlet pipes shall extend a minimum of 6 in. below the lowest adjacent superstructure steel. Deck drainage shall be designed in accordance with INDOT Design Manual.

8.5 Lighting

River navigation lighting will be required by the U.S. Coast Guard Permit. River navigation lighting shall be provided in accordance with US Coast Guard Permit and special provision, RIVER NAVIGATION LIGHTING SYSTEM.

Permanent aviation obstruction beacon system lighting will not be required.

8.6 Maintenance and Inspection Access

A galvanized inspection catwalk located near the center of the bridge shall be designed, fabricated and installed. The inspection system shall include galvanized steel handrail and stainless steel bar attached to both sides of the floor beam webs for inspection safety cabling. Motorized traveling inspection platforms will not be acceptable.

The inspection walkway shall be designed for a minimum live load of 60 psf as specified in ASCE 7-05 Table 4-1. The handrails, posts, grab-bars etc., shall also be designed to resist the minimum design loads as specified in ASCE 7-05 Section 4.4.2. This load need not be considered in the design of the bridge components.

Ladders and platforms shall be designed, fabricated and constructed to provide safe inspection and maintenance access to all surfaces and components of the structure in accordance with applicable provisions of OSHA CFR 1926. See special provision, LADDERS AND PLATFORMS.

VERTICAL CLEARANCE GAUGES

Description

This work will consist of providing a vertical clearance gauge on the upstream face of proposed Pier 5 and a vertical clearance gauge on the downstream face of proposed Pier 4 in conformance with these special provisions and requirements of the Coast Guard.

Materials

All materials used shall be either vinyl resin, copolymer type, or chlorinated natural rubber-base type paint, and shall be warranted by the manufacturer to be suitable for use on masonry under severe exposure or submersion in water conditions. Only 1 type paint base shall be used throughout and shall be compatible in all respects with the use intended. Material for the first coat shall be either of the following:

1. An undercoater adaptable for use as a primer under the succeeding coats, providing that such undercoat is tinted with material to be used for the second coat.
2. The same material as used for the second coat, providing the paint manufacturer certifies the same to be self-priming.

The second coat, which is white, and the finish coats of gauge markings, which are black, shall have a glossy finish. All materials proposed for use shall meet the approval of the Engineer.

"Gauge markings" are the numerals and footmarks on the vertical clearance gauge. The gauge markings will indicate the distance, in feet, below navigation span low steel elevation. The gauge markings will be black and the background will be white. The numerals will be Series E 2000, 36 in. in height and the numeral spacing will conform to the requirements specified in the "Standard Alphabets for Highway Signs" published by the Federal Highway Administration (FHWA), U.S. Department of Transportation.

The length of the footmarks must be no less than the width of a single numeral used, except numerals 1 and 4, and the thickness must be the same as the width of stroke of the numeral. The footmarks will extend to the nearest margin of the white background. The intermediate footmarks must be one-half the width of the stroke required for the numeral and three-quarters as long as the primary foot marks. The horizontal distance between the numeral and nearest edge of white background must be no less than one-half the width of a single numeral excepting numerals 1 and 4.

Finishing concrete Surfaces

The clearance gauges shall be painted on the face of the piers prior to erecting the main truss span structural steel. Unless otherwise permitted by the Engineer, formwork shall have been removed from the faces of the piers at least 60 days prior to the application of any paint or as otherwise recommended by the paint manufacturer and approved by the Engineer.

The area to be painted shall be prepared by removing all dirt, oil and other foreign substances. Prior to the application of the first coat, the surface shall be etched with approximately 10% solution of muriatic acid in water, flushed down with clean water and allowed to dry.

Paint applications shall meet the maximum dry mil thickness recommended by the paint manufacturer. The first coat shall be worked well into the pores of the concrete.

Paint shall not be applied when the air temperature is below 45 degrees Fahrenheit (7 degrees Celsius) nor when the air temperature exceeds 90 degrees Fahrenheit (32 degrees Celsius). Painting shall not be started unless it can be reasonably expected that the gauge can be completed with all coats plus 7 days time before any portion of the gauge becomes submerged, unless the material used will permit earlier submersion without detriment to the finished work.

The area to be painted shall receive 2 coats of white paint, after which the gauge markings shall be painted with 2 coats of black paint. Each coat shall be thoroughly dry before the succeeding coat is applied, with a minimum of 24 hours drying time per coat.

Alternative to Painting

The Contractor may, in lieu of painting the gauges, use a durable material which will be permanently fixed to the bridge pier. The material used shall be approved by the Engineer and be of such strength and durability as to provide a clearance gauge resistant to weather and current. If approved, cleaning of the pier prior to application will be the same as specified herein for painting of the gauges.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

TEMPORARY CAUSEWAY

Description

This work shall consist of the construction, maintenance and removal of temporary causeways and access roads to support construction equipment and to provide access in combination with barge operations during construction and demolition in the Ohio River.

The environmental permits allow the construction of a causeway or work platform as indicated. Areas where causeways are anticipated are indicated on the Construction Schematic Plan Details in the Contract Information Book. The maximum extent of causeways is limited.

The opening for river flow shall be maintained as shown on the plans and permits at all times. The approximate limits indicated for information only on the Construction Schematic Drawings represent the largest allowable encroachment into the waterway at respective locations.

The terms "work platform" and "temporary causeway" are used interchangeably.

Materials

The temporary causeway shall be designed to satisfy the contractor's means and methods. Only clean material, free from silt, soil, or other erodible or fine material shall be used.

Materials other than large sized riprap shall be submitted for approval of Environmental Agencies.

Construction

(a) Design - The temporary causeway shall be designed to satisfy the Contractor's means and methods. The causeway design shall be prepared by a professional engineer licensed in the state of Kentucky or Indiana. Construction shall not begin until the causeway plan has been approved by the Coast Guard. The temporary causeway calculations and drawings shall be submitted as a hold point prior to beginning temporary causeway installation.

If a method other than the causeway is proposed, a copy of the proposed plan including the schedule of operations shall be submitted for review and approval.

(b) Construction - Causeways shall be maintained throughout their life. Causeways shall be reconstructed at no additional cost to the Department.

(c) All temporary causeway material shall be completely removed from the river to the pre-existing streambed elevation. All other materials used in the construction of the causeways shall be completely removed when no longer needed for bridge construction. All materials remain the property of the Contractor and shall be disposed of properly.

Construction and maintenance of the causeway shall be done in conformance with criteria provided in permits.

Three parallel culvert pipes shall be provided at the normal water level near the river bank to help clean the water that is "pooled" behind the causeway.

An access gate across the entire width of the causeway entrance shall be provided and installed with a lock on each gate. A key shall be provided to the Engineer. The gate shall be closed and locked during non-working hours.

Measurement and Payment

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Time extension request will only be considered by the Department for damages to the causeways caused by flooding and ice flows when the county of the bridge site is declared a State or Federal Disaster area due to flooding.

VESSEL COLLISION REPORT

The document "Final Report - Study of Vessel Collision of Bridge Piers, Milton Madison Bridge, March 2010" prepared by Michael Baker, Jr. Inc. ("Vessel Collision Report") is a part of the contract documents.

The Vessel Collision Report calculates barge impact loads for proposed Milton Madison Bridge substructures. A summary of the calculated impact forces is provided in the Report. The corresponding static loads shall be applied to the substructures in the design of the project by the Design/Builder. The Vessel Collision Report also contains other project specific information related to the application of these loads in conformance with the special provision, Structure Performance Criteria.

The Vessel Collision Report for the contract is available and posted on the project FTP portal. The Design/Builder shall review the document and implement all applicable recommendations provided in the report.

WATER TRANSPORTATION FOR THE ENGINEER

Description

Water transportation for the Engineer shall consist of providing a boat and safety equipment at the site, along with adequate docking facilities as specified below. The boat shall be for the exclusive use of, and operated by, the Engineer.

Water Transportation for the Engineer

The boat shall not be less than 18 ft (5.5 m) in length with at least a 72-inch (1.8 m) beam, equipped with an outboard motor of at least 70 horsepower (52 kw), and shall be capable of accommodating at least 6 adult passengers, including the operator. In addition, the Engineer shall at all times retain the right to travel on, or be present on, any of the Contractor's floating plant or equipment.

The boat shall be in good condition and meet the approval of the Engineer. The boat and safety equipment shall at all times meet all applicable boating regulations of the United States Coast Guard.

The boat shall be equipped with 2 fuel tanks, complete remote control, a spotlight and an adequate whistle or horn. The motor shall be equipped with electric and hand starters, an alternator or generator, and slip clutch propeller protection. These requirements are in addition to all Coast Guard or State requirements.

The Contractor shall service, gas, oil and maintain the boat during the life of the contract unless otherwise directed by the Engineer.

Insurance for Water Transportation for the Engineer

The Contractor shall furnish the Engineer with evidence that liability insurance has been obtained, with a minimum coverage of \$500,000, and shall hold the Department and its representatives harmless from any and all damage to, or caused by, the boat while being operated by the Engineer.

The insurance shall be kept in effect until the project is completed, and the evidence of renewal of the policy as necessary shall be forwarded to the Engineer.

Method of Measurement

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment

This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

WIND ENGINEERING STUDY - FINAL REPORT

The document "Wind Engineering Study - Final Report, Milton Madison Bridge, January 2010" prepared by RWDI is a part of the contract documents.

The report calculates site specific wind loads for the Milton Madison Bridge. A summary of the calculated design forces is provided in the report. The corresponding loads shall be applied to the structure in the design of the project by the Design/Builder. The report also contains other project specific information related to the application of these loads in conformance with the special provision: STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO. 2.

Buffeting loads presented in the report were based on certain geometry, mass, and dynamic properties of the truss and supporting bearings as shown in the wind study appendix. The Design/Builder shall generate corresponding geometry, mass, and dynamic properties of the final bridge design that accounts for the stiffness of the truss and supporting bearings. A wind specialist shall be retained by the Design/Builder to review these in comparison with the Report to verify applicability.

The report for the contract is available and posted on the project FTP portal. The Design/Builder shall review the document and implement all applicable recommendations provided in the report.

VIBRATION MONITORING

Vibration monitors shall be installed on the following properties:

57 High Street, Milton, KY
75 High Street, Milton, KY
902 Fillmore Street, Madison, IN

Construction activities shall not result in vibrations on these buildings exceeding 0.2 in/s. INDOT will perform a pre and post construction inspection of the exterior condition of these buildings and the Design/Build team shall attend the inspection.

As appropriate, the Design/Builder shall observe the vibration monitors and report immediately to the Department if construction activities are exceeding the 0.2 in/s threshold. The Department will make the determination as to whether vibration from construction activities could cause vibration damage to the structures. If the Department determines that construction activities shall cause vibratory damage to the structures, the Design/Builder shall propose an alternative construction method to avoid or minimize to the extent practical damage to the structure. If damage occurs as a result of project activities, the Design/Builder shall be responsible for repair of any resulting vibration damage to historic properties. Any repairs shall be coordinated in advance with the respective SHPO to ensure they are carried out in accordance with the *Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*. Where access to privately owned property is necessary for monitoring or damage repair, consent shall be obtained prior to entry. If access is denied, a good faith effort shall be made by INDOT and KYTC to identify an alternate historic property nearby for monitoring that is likely to experience similar impacts.

01. DESCRIPTION

This specification identifies the Contractor's responsibilities for protecting the properties listed below from possible vibration damage during construction activities, and vibration and crack monitoring of those vulnerable properties listed below.

At a minimum, the following properties shall be protected per the requirements in this special provision. Additional properties may be protected and monitored as deemed necessary by the Contractor.

57 High Street, Milton (immediately east of bridge)
75 High Street, Milton (immediately west of bridge)
902 Fillmore Street, Madison (immediately east of bridge)

02. PRECONSTRUCTION SURVEY

The Contractor shall perform a pre-construction condition survey at the designated adjacent properties, and provide a copy of survey report(s) to the Engineer no later than 30 calendar days prior to starting work. The Contractor shall have a professional engineer licensed in the State of Indiana or Kentucky and experienced in evaluating structural vulnerabilities and vibration monitoring perform the survey.

At a minimum, the survey shall document all aspects of the structural condition through observations, actual measurements, plan sketches, photographs, and any other data the preparer may deem appropriate. The survey report shall be submitted to the Engineer electronically.

For each property, the Contractor shall perform a pre-construction condition survey that includes photos and plan sketches indicating existing vulnerabilities, an evaluation of the risk from construction vibration, and recommendation of maximum safe peak particle velocity (PPV) threshold. The Contractor shall determine the construction methods required to protect the church based on the pre-construction survey and the safe vibration threshold.

The Contractor is responsible for arranging with the property owners and tenants the rights-of-entry to their property in order to engage in condition surveys, vibration monitoring, and crack monitoring. The Contractor may commission a preconstruction condition survey of other nearby buildings/structures as they may deem necessary.

03. MONITORING PLAN

A. The Contractor shall provide to the Engineer a monitoring plan no later than 30 calendar days prior to commencing work. The plan will be reviewed by the Engineer and any comments will be returned to the Contractor within 20 calendar days. The Contractor will then have 10 calendar days to revise the work plan and resubmit a final plan to the Engineer prior to commencing work.

B. The plan shall describe the following:

1. Construction methods and equipment that the Contractor chooses to use to achieve low project vibration levels.
2. Alternative construction methods and equipment that will be used if the PPV threshold is reached or exceeded.

3. Detailed description of the vibration and structural integrity monitoring systems and if necessary catalog cuts of monitoring equipment that will be used; how the equipment will be calibrated and re-calibrated if necessary during the life of the project; description and schematics if necessary of how the independent components will function as a system.
4. Identification of the individual, and their contact information, designated to oversee the vibration and crack monitoring system(s); and daily recording activities required in this specification. A brief description of qualifications or resume of the individual is also required.
5. How site monitoring equipment will be deployed to continuously record vibration events, including crack monitoring during construction activity. Depending on the equipment deployed and method chosen for networking, it is possible there will need to be both electrical and telecommunications connections available at multiple remote locations. The monitoring plan will address how the Contractor will provide utility service to the equipment, protect the equipment from potential vandalism and the elements, and monitor the overall system's day-to-day operation.

The plan shall describe in reasonable detail the method and means the Contractor will use to identify and monitor existing cracks and document new cracks. For significant cracks or cracks that appear to have a high potential to migrate, it is recommended that the Contractor employ crack monitoring gauges.
6. Details for establishing and deploying an alarm system to announce immediate shut down of all site activities if a vibration event occurs which exceeds the PPV threshold established for any monitored property. The alarm system shall include a phone modem which will dial cell phones of key DOT and Contractor site personnel in the event of an exceedance.
7. Establish a protocol for the identification of the activity or equipment that caused the PPV threshold to be exceeded.
8. Description of the process which will be used to verify that the equipment will function as planned before starting work and the process which will be used to verify (daily) that the equipment remains in calibrated working order.
9. Detail a protocol including responsible parties to be notified if an exceedance occurs. This includes, but is not limited to the construction superintendent and the DOT lead inspector.
10. Daily activity log of vibration activity and crack monitors to ensure the identification of the cause of any vibration event. Depending on equipment deployed, crack monitors could be monitored remotely or by visual inspection. In either case, a daily inspection log shall be maintained either in written or electronic form.

11. Daily testing and logging of entire geophone/seismograph/communications network (start of day test) If the equipment fails the daily test, the contractor shall correct the deficiency before proceeding with planned activities for that day or temporarily suspend work until the equipment is repaired or replaced. All daily logs will be available to the Engineer for review and a summary of daily logging will be provided in the post-condition survey.

04. PRE-CONSTRUCTION SITE PREPARATION

Crack Monitoring:

In accordance with the project's monitoring plan, the Contractor shall mark existing cracks in such a way that future observations would clearly indicate whether cracks remained unchanged, opened, closed, or propagated. The Contractor shall monitor and log all cracks and crack monitoring devices daily and immediately notify the Engineer of any observed change. It is recommended, but not required, to have and record meteorological data for the close proximity to the project. Cracks that can be documented during the project to respond to changes in meteorological conditions will not require additional explanation in the final report.

Following is a list of companies that supply crack monitoring equipment; however other equipment of equal reliability and quality will be acceptable.

- Tell-Tale Crack Monitors, RST Instruments Ltd.; 800.665.5599; www.rstinstruments.com
- Crack Monitoring Equipment, Geotest Instrument Corp.; 866.430.7645; www.crackgauge.com
- Avongard Crack Monitor, Avongard Products USA; 800.244.7241; www.avongard.com

Vibration Monitoring:

In accordance with the project's monitoring plan, all monitoring equipment shall be initially installed and maintained during the project in accordance with manufacturer's recommendations, calibration standards, and specifications. No site work can begin until all monitoring equipment is deployed and verified to be operating in accordance with factory recommendations and specifications.

Proof of Installation:

The Contractor shall demonstrate that the installed equipment will continuously and accurately measure vibrations, electronically log the vibration history (date/time stamp), and provide a communication notice system that notifies site personnel should the PPV threshold be exceeded. The monitoring equipment shall remain in-place and in operation throughout the project.

05. VIBRATION LIMITS

After a thorough conditions evaluation, the Contractor shall propose in the pre-construction survey a unique PPV level for the monitored structures. The PPV level proposed by the Contractor shall be determined by a qualified expert in the field of vibration monitoring. If the Engineer agrees that the level proposed by the Contractor will reasonably protect the structure(s), that PPV level will be added to the contract documents by mutual benefit for the specific property. In no case shall the PPV level exceed 0.2 inches/second [ips] as measured at or in very close proximity to the monitored structure(s).

To ensure the PPV level is not exceeded, an alarmed monitoring system shall be implemented to signal any vibration event that equals or exceeds a threshold of 80% of the PPV level.

06. DEMOLITION/CONSTRUCTION

The Contractor shall periodically check to ensure that the monitoring system(s) are continuously operating within manufacture's specifications during the project.

The Contractor shall immediately cease work if the alarm at either structure indicating the PPV threshold is reached or exceeded causing a vibration event. In the event of an exceedance the Engineer shall be notified immediately. The shut down shall remain in effect until the Contractor has, to the Engineer's satisfaction, identified the cause of the exceedance; addressed the potential for another exceedance by replacing faulty monitoring equipment; modifying the work process; or providing a recommended change to the equipment being used. Work shall not resume until approved by the Engineer.

07. POST-CONSTRUCTION SURVEY

The Contractor shall perform a post-construction survey and analysis at the designated structures to determine if any structural changes are the result of the construction activity. The Contractor shall provide the Engineer with a copy of all post construction survey reports, daily log summaries for vibration and crack monitors, and analysis documents comparing pre and post structural condition prior to contract acceptance.

Method of Measurement:

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment: This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

FERRY OPERATIONS

Description: This work shall consist of all work, labor, equipment, and incidentals to provide ferry operations crossing the Ohio River between temporary ferry staging areas located in Indiana and Kentucky as designated in the contract.

General Requirements: The Design/Builder shall prepare a Ferry Operations and Parking Management Plan for the ferry service that presents the proposed measures to meet the following capacity and operational requirements. The Ferry Operations and Parking Management Plan shall be presented to the Engineer for approval prior to beginning operations.

For the purposes of this provision, normal operating conditions are defined as all hours when the ferry operator considers the conditions safe for ferry operation.

The ferry system shall be operated under the responsibility of the Design/Builder. The ferry system shall have sufficient capacity to transport a minimum of 240 vehicles per hour in both directions (120 vehicles per hour per direction) under normal operating conditions across the Ohio River from the hour of 5:00 am to 9:00 pm daily.

The ferry system shall provide sufficient number of boats, labor, etc. to transport a minimum of 120 vehicles per hour in both directions (60 vehicles per hour per direction) under normal operating conditions across the Ohio River from the hour 9:01 pm to 4:59 am daily.

The ferry should be continuously operating. The ferry operator should be able to see the access ramp on the Indiana side and the Kentucky side at all times. When a vehicle is waiting, they should pull down the ramp to the designated stop line and the ferry operation should be able to see that they are waiting from all locations on the ferry route.

During periods of time when only one ferry is operational or visibility is limited, the Design/Builder shall provide a communications system where persons arriving on the opposite shore from the ferry shall be able to notify the ferry pilot that they are waiting.

The ferry service shall accommodate a vehicle size up to that of a panel truck, equating to 1.2 passenger cars. Automobile or pick-up truck trailers will be counted as a separate passenger car.

The Design/Builder shall provide the number and carrying capacity of each boat to be involved in the ferry operation for the duration of the contract. The Design/Builder shall provide the combination of the specific boats to provide the required capacity in day time service of 240 vehicles per hour total in both directions.

Ferry service shall be suspended at the judgment of the ferry operator due to unsafe operating conditions that may include fog, excessive wind, ice, high water, or any other condition that makes it unsafe to operate the ferry across the River. If the ferry operator suspends service due for any reason, the Engineer shall be contacted immediately.

When in operation all ferry boats shall keep daily logs of the number of vehicles and pedestrians transported with the dates, times of departure and arrival for each run. The logs shall be separated by day time and night time service time references. Times of being out service shall be noted in the log along with the list of crew on board with associated titles. Refueling and maintenance shall be scheduled in non-service hours. Any delays or suspension of services should be noted and documented as to reason. All daily logs shall be certified as to accuracy and shall be transmitted electronically, by fax or in writing to the Engineer by 1:00 pm the following day. Any daily log not transmitted to the Engineers office within the specified time frame without reasonable explanation will delay payment for the Pay Items included in this special provision.

If a ferry has loaded vehicles or passengers and is not full and no vehicles or pedestrian passengers are waiting, the ferry shall depart within 15 minutes of loading the first passenger or vehicle.

Emergency Medical Vehicles transporting emergency medical patients shall be given immediate priority for loading and the ferry shall depart as soon as safely possible. Additional vehicles and pedestrians may be transported along with the Emergency Medical Vehicles if the ferry operator determines that it is safe to do so.

Method of Measurement: Ferry operations shall be measured by the "day" or "night" as approved by the Engineer for Day Time or Night Time service. A "day" is defined for Day Time service as operating to the capacity requirements for Day Time service from 5:00 am to 9:00 pm. A "night" is defined for Night Time service as operating to the capacity requirements for Night Time service from 9:01 pm to 4:59 am.

If ferry service is suspended due to adverse weather conditions that may include, but are not limited to, fog, excessive wind, ice or high water, that make it unsafe to operate, the ferry operator shall be paid for each hour of idle time for the ferry service, approved for payment by the Engineer. Ferries not in use from 9:01 pm to 4:59 am for standard overnight service reductions or maintenance will not be paid for Idle Time.

Payment will not be made for any days beyond the date of the bridge closing plus 365 days.

Basis of Payment: The Design/Builder will be paid for each approved Day Time and Night Time operation of ferry service and for each hour of idle time approved by the Engineer.

Payment will be paid under:

Pay Item	Pay Unit Symbol
Day Time Service for Ferry Operation	Days
Night Time Service for Ferry Operation	Days
Idle Time during Ferry Operation	Per Hour

If the Contractor does not provide the required capacity for the ferry operation, the Engineer will notify the Contractor in writing that the required capacity has not been provided. If a second notification is issued by the Engineer within any 7 day period, payment for each day in which there was at least one hour where the required capacity has not been met will result in no payment for that day.

If the vehicle queuing is greater than the required minimum, no additional payment will be made.

If, within any given hour, an emergency medical vehicle with an emergency medical patient is being transported across the river by the ferry, the Engineer will count this hour as meeting the required capacity for that hour.

The cost of mobilization and demobilization of all activities related to the ferry operations, construction of the access ramps, maintenance of the access ramps, labor, materials, equipment, and all incidentals shall be included in the Design/Build, LSUM item.

No payment will be made for the time that a ferry is out of service for reasons other than unsafe operating conditions.

DRILLED SHAFT FOUNDATIONS

DESCRIPTION

This work consists of furnishing all labor, materials, equipment and services necessary for construction of reinforced concrete drilled straight shafts all in accordance with 105.03. All references to contract documents, contract plans, plans, etc. in this specification shall mean the Design/Builder's approved plans and construction specifications.

QUALIFICATIONS OF DRILLED SHAFT CONTRACTOR

The Contractor performing the work described in this specification shall have successfully installed drilled shafts of both diameter and length similar to those shown on the plans and in similar geologic subsurface

SUBMITTALS

No later than 2 weeks prior to drilling shafts, the Design/Builder shall submit a signed statement that the Design/Builder has inspected both the project site and all the subsurface information including any soil reports/geotechnical reports made available in the Contract documents.

The Contractor shall submit an installation plan for review by the Engineer at least 28 calendar days before constructing the drilled shafts. This plan shall provide the following information:

- (a) Name and experience record of the drilled shaft superintendent in charge of drilled shaft operations for this project.
- (b) List of proposed equipment to be used including cranes, drills, soil augers, rock augers, rock core barrels, air lift equipment, bailing buckets, final cleaning equipment, de-sanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.
- (c) Details of overall construction operation sequence and the sequence of shaft construction in bents or groups.
- (d) Procedures for maintaining correct horizontal and vertical alignment of the excavation.
- (e) Details of shaft excavation methods.
- (f) If using a casing, method to advance the casing.
- (g) If temporary casing is used, provide details regarding the lengths and sizes of temporary casings and details regarding the methods to extract the temporary casing, including a quality control procedure to prevent concrete contamination, and to maintain the concrete slump to keep concrete workable by adding admixture such as retarders or superplasticizers.
- (h) If using slurry, details of the methods to mix, circulate and de-sand slurry. For polymer slurry, submit the manufacturer's recommendation for use of the slurry.

- (i) Details of methods to clean the shaft excavation.
- (j) Details of reinforcement placement including support and centralization methods.
- (k) Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods.

The Engineer will evaluate the drilled shaft installation plan for conformance with the plans, specifications and special provisions. Within 14 days after receipt of the plan, the Engineer will notify the Contractor of any additional information required and changes necessary to meet the contract requirements.

A pre-construction meeting shall be held no less than 14 days prior to commencement of drilled shaft installation. The pre-construction meeting shall include representatives of the Design/Builder and the Department. The Design/Builder shall designate a minimum of 3 persons, including the designated on-site construction manager, the drilled shaft foreman and the professional engineer responsible for the design of the drilled shafts to attend the preconstruction meeting. Representatives from the Department will include the INDOT District Construction Engineer, the design consultant for submittal review and the INDOT Office of Geotechnical Engineering.

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.

MATERIALS

All materials shall meet the requirements of the INDOT Standard Specification or as otherwise described herein.

- (a) CONCRETE: Concrete shall be class C in accordance with Section 702 of the INDOT Standard Specifications, except that air content requirements are waived when permanent casings are used and the slump shall be as defined in the Concrete Placement section of this specification and as modified herein.
- (b) REINFORCEMENT: Reinforcing steel shall be in accordance with 910.01.

CONSTRUCTION METHODS AND EQUIPMENT

- (a) PROTECTION OF EXISTING STRUCTURES: The Contractor shall control his operations to prevent damage to existing structures and utilities. Preventive measure shall include, but are not limited to, selecting construction methods and procedures that will prevent caving of the shaft excavation, monitoring and controlling the vibrations from construction activities such as the driving of casing or sheeting or drilling of the shaft.

- (b) GENERAL: Drilled shafts shall be installed by a specialty contractor who is experienced in this type of work. The Contractor shall perform the excavation required for the straight shafts or rock sockets through whatever materials encountered, including saturated granular layers and artesian water conditions, to the dimensions and elevations shown on the plans or as otherwise required.

Prior to beginning drilled shaft work, the Contractor shall submit to the Engineer for approval a detailed sequence of construction of drilled shafts including materials, methods and equipment for cleaning the shaft excavations, casting concrete, removing temporary casing, etc. The Contractor shall demonstrate the adequacy of his methods and equipment during construction of the first drilled shaft. Failure to demonstrate the adequacy of his methods and equipment is cause for the Engineer to require appropriate procedure alterations to eliminate unsatisfactory results prior to continuing drilled shaft construction.

Excavation by blasting is not permitted.

- (c) DRY CONSTRUCTION METHOD: The dry construction method shall be used only at sites where the ground water table and soil conditions make it feasible to construct the shaft in a relatively dry excavation, and where the sides and bottom of the shaft remain stable without any caving, sloughing, or swelling and may be visually inspected before placing the concrete.

The rate of flow of water into the hole should not be more than 12 in. (300 mm) within a 1 h period.

The dry construction method consists of drilling the shaft excavation, removing accumulated seepage water and loose material from the excavation and placing the shaft concrete in a relatively dry excavation.

- (d) WET CONSTRUCTION METHOD: The wet construction method shall be used where a dry excavation cannot be maintained for placement of shaft concrete. The wet construction method consists of drilling the shaft excavation below the water table, cleaning the excavation by means of a bail or bucket, air lift pump or other approved devices and placing the shaft concrete which displaces the water or slurry as the shaft excavation is concreted.

Where drilling is through materials having a tendency to cave, the drilling shall be advanced by drilling with a mineral slurry or by another approved method which will control the size of the excavation. Slurry should be added before water is encountered to limit the risk of caving or sloughing.

- (e) CASING CONSTRUCTION METHOD: The casing method shall be used when directed or required. In this method, the hole is advanced through caving material by the wet method as described above. When a formation is reached that is nearly impervious, a casing shall be placed in the hole and sealed in the nearly impervious formation. Drilling can proceed as with the dry method to the required depth.

- (1) TEMPORARY CASING CONSTRUCTION METHOD. The temporary casing construction method shall be used when the stability of the excavated hole or the effects of groundwater must be controlled. Remove temporary casings while the concrete remains workable. As the casing is being withdrawn, maintain a minimum head of fresh concrete in the casing of 5 ft above either the highest hydrostatic water level within the subsurface formation, including any artesian water levels or the hydrostatic level of fluid (groundwater or drilling fluids) in the annular space outside the casing, whichever is higher, so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. Increase the concrete head inside the casing as necessary to counteract groundwater head and fluid pressure outside the casing. Do not move the casing by rotating, exerting downward pressure and tapping to facilitate extraction, or extracting with a vibratory hammer. Extract casing at a slow, uniform rate with the pull in line with the shaft axis.
- (2) PERMANENT CASING CONSTRUCTION METHOD. The permanent casing construction method generally consists of driving or drilling a casing to a specified depth before excavation begins. If full excavation cannot be attained, the Contractor may either excavate material within the embedded portion of the casing or excavate a pilot hole ahead of the casing until the casing reaches the specified penetration. Make the pilot hole no larger than one-half the diameter of the shaft and center the hole in the shaft. Do not over-ream to the outside diameter of the casing unless specifically shown on the plans.

Ensure that the casing is continuous between the elevations shown on the plans. Unless otherwise shown on the plans, do not use temporary casing instead of or in addition to the permanent casing.

After installing the casing and excavating the shaft, place the reinforcing steel, then place the shaft concrete. After filling the permanent casing with concrete, pressure grout voids between the shaft excavation and the permanent casing with cement grout. Submit the method of pressure grouting the voids to the Engineer for approval. Pressure grouting is required to ensure contact (bearing) between the casing and any surrounding soil layer that is used for lateral support.

- (f) EXCAVATION AND 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 20% beyond the depths shown on the plans.

The excavation and over-reaming 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, or under reaming tools, the Contractor shall provide special drilling equipment including but not limited to: rock core barrels, rock tools, air tools, and other equipment as necessary to construct the shaft excavation to the size and depth required.

Sidewall over-reaming 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. Over-reaming may be accomplished with a grooving tool, or over-reaming bucket as directed by the Engineer. The Contractor shall bear all costs associated with both sidewall over-reaming and additional shaft concrete placement.

EXCAVATIONS

Shaft excavations shall be made at the locations, and to the top of shaft elevations, estimated bottom of shaft elevations, shaft geometry, and dimensions as shown in the contract documents. The Contractor shall extend drilled shaft tip elevations when the Engineer determines that the material encountered during excavation is unsuitable or differs from that anticipated in the design of the drilled shaft.

The Contractor shall maintain a construction method log during shaft excavation. The log shall contain information such as the description and approximate top and bottom elevation of each soil or rock material, seepage or groundwater, and remarks, including description of tools and drill rigs used and any changes necessitated by changing ground conditions.

Excavated materials which are removed from shaft excavations shall be disposed of by the Contractor in accordance with the applicable specification for disposal of excavated materials.

All drilled shaft concrete over the theoretical amount required to fill excavations for shaft dimensioned on the plans shall be furnished at the Contractor's expense.

The Contractor shall not permit workmen to enter the shaft excavation for any reason unless both a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied, and adequate safety equipment and procedures have been provided to workmen entering the excavation.

Excavate the shafts using methods and equipment suitable for the intended purpose and materials encountered. Use either the dry method, wet method, temporary casing method, or permanent casing method as necessary to produce sound, durable concrete foundation shafts free of defects.

When a particular method of construction is required on the plans, that method shall be used. If no particular method is specified for use, select and use a method based on site conditions. The method proposed by the Contractor must be submitted to the Engineer for evaluation and installation of the drilled shafts shall not commence until a method is approved by the Engineer.

If the excavation operation is stopped, protect the shaft cavity by installing a safety cover. The Contractor is responsible for the safety of the shaft excavation, surrounding soil, and the stability of the sidewalls. If necessary to ensure such safety and stability, use a temporary casing, slurry, or other methods accepted by the Engineer. Unless cased to the full depth, do not leave excavation unfilled overnight.

- (a) UNCLASSIFIED EXCAVATION: The Contractor shall provide the necessary equipment to remove and dispose of any materials encountered in forming the drilled shaft excavation to the dimensions shown on the plans or as directed. No separate payment will be made for either excavation of materials of different densities and character or employment of special tools and procedures necessary to accomplish the excavation in an acceptable fashion.
- (b) OBSTRUCTIONS: Surface and subsurface obstructions at drilled shaft locations shall be removed by the Contractor. Such obstructions may include man-made materials such as old concrete foundations and materials such as boulders. Special procedures and tools shall be employed by the Contractor after the hole cannot be advanced using conventional augers fitted with solid or rock teeth, drilling buckets and under-reaming 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. No special payment for obstruction removal shall be made.
- (c) LOST TOOLS: Drilling tools which 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 are not limited to, costs associated with hole degradation due to removal operations or the time the hole remains open.
- (d) EXPLORATION, SHAFT EXCAVATION: The Contractor shall take soil samples or rock cores to determine the character of the material directly below the complete shaft excavation. The soil samples shall be extracted with a split spoon sampler or undisturbed sample excavation. Rock cores and proof-testing are described below.
 - (1) ROCK CORES. The Contractor shall take rock cores, approximately 2 in. (50 mm) in diameter, to a minimum of 3 rock socket diameters below the anticipated tip elevation but not less than 10 ft (3.0 m) below the tip of the drilled rock sockets or as directed.

The core hole shall be properly grouted before the concrete pour for the shaft. The rock cores shall be extracted with a core barrel. Rock cores shall be measured, visually identified, observing such indicators as speed of drilling under given drill pressure, dropping or clogging of the drill bit and loss of drill water (if used), and described on the Contractor's field log within 24 h after the exploration is completed. The Contractor's Geotechnical Engineer will inspect the cores and determine the final depth of required excavation based on evaluation of the material's suitability. Obtain approval of the final bearing elevation from the Owner's Geotechnical Engineer prior completion of the shaft.

CASINGS

Casings shall be steel, smooth, clean, watertight, and of ample strength 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 size of shaft. No extra compensation will be allowed for concrete required to fill an oversized casing or oversized excavation. All casings, except permanent casings, shall be removed from shaft excavations. Any length of permanent casing installed below the shaft cutoff elevation, shall remain in place.

When the shaft extends above ground or through a body of water, the portion exposed above ground or through a body of water may be formed with a removable casing except when the permanent casing is specified. Removable casing shall be stripped from the shaft in a manner that will not damage the concrete. Casing can be removed when the concrete has attained sufficient strength provided; curing of the concrete is continued for the full 72 h period in accordance with specification; the shaft concrete is not exposed to moving water for 7 days; and the concrete reaches a compressive strength of at least 3000 psi (20.68 MPa) as determined from concrete cylinder breaks.

- (a) TEMPORARY CASING: All subsurface casing shall be considered temporary unless specifically shown as permanent casing in the contract documents. The Contractor shall be required to remove temporary casing before completion of concreting the drilled shaft. Telescoping, pre-drilling with slurry and over reaming to beyond the outside diameter of the casing may be required to install casing.

If the Contractor elects to remove a casing and substitute a longer or larger diameter casing through caving soils, the excavation shall be either stabilized with slurry or backfilled before the new casing is installed. Other methods, as approved by the Engineer, may be used to control the stability of the excavation and protect the integrity of the foundation soils.

Before the casing is withdrawn, the level of fresh concrete in the casing shall be a minimum of 5 ft (1.5 m) above either the hydrostatic water level or the level of drilling fluid whichever is higher. As the casing is withdrawn, care shall be exercised to maintain an adequate level of concrete within the casing so that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the shaft concrete.

Temporary casing which become bound or fouled during shaft construction and cannot be practically removed shall constitute a defect in the drilled shaft. The Contractor shall be responsible to improve such defective shafts to the satisfaction of the Engineer. Such improvement may consist of, but is not limited to removing the shaft concrete and extending the shaft deeper to compensate for loss of frictional capacity in the cased zone, providing straddle shafts to compensate for capacity loss, or providing a replacement shaft. All corrective measures including redesign of foundation caused by defective shafts shall be done to the satisfaction of the Engineer by the Contractor without either compensation or an extension of the completion date of the project. In addition, no compensation will be paid for casing remaining in place.

SLURRY

Drilling slurry will be defined as mineral slurry, polymer slurry, natural slurry formed during the drilling process, water, or other fluids used to maintain stability of the drilled shaft excavation to aid in the drilling process. In addition, the terms mineral slurry and polymer slurry, as used herein, will be defined as the final mixed composite of all additives, including manufactured mineral or polymer slurry additives required to produce the acceptable drilling slurry. Use drilling slurry if detailed in the approved installation plan, if in accordance with the contract documents or if approved in writing by the Engineer.

General Properties. Provide slurry containing material not detrimental to the concrete or surrounding ground strata.

- Mineral slurries - Provide slurry with both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system.
- Polymer slurries - Provide slurry with sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. Provide material to make the slurry with a percentage and specific gravity sufficient to maintain the stability of the excavation and to allow proper concrete placement.
- Water and on-site soils as a drilling slurry, if approved by the Engineer, - Meet the range of acceptable values for density, viscosity and pH shown in Table 1 for bentonite slurry, except that the maximum density is 70 pcf.

Preparation. Prior to introduction into the shaft excavation, pre-mix the manufactured mineral or polymer slurry admixture thoroughly with clean, fresh water and for adequate time in accordance with the slurry admixture manufacturer's recommendations allotted for hydration. Use slurry tanks of adequate capacity for slurry mixing, circulation, storage and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without written approval from the Engineer. Provide adequate desanding equipment as necessary to control slurry properties during the drilled shaft excavation in accordance with Table 1.

Control Tests. The Contractor is responsible for performing all slurry control tests using personnel with experience and proficiency performing such tests. Prior to beginning drilled shaft construction, submit the resume showing experience and training related to drilling slurry of the person(s) responsible for performing the control tests to the Engineer. Provide suitable apparatus to perform testing on the slurry to determine density, viscosity, sand content and pH of freshly mixed slurry, recycled slurry and slurry in the excavation. Conduct tests of slurry samples from within 1 foot (0.3 m) of the bottom and at mid-height of the shaft in each shaft excavation during the excavation process to establish a consistent working pattern. Conduct a minimum of 4 sets of tests during the first 8 hours of slurry use on the project. When the results show consistent behavior, the testing frequency may be decreased to 1 set every four hours of slurry use, or as otherwise approved by the Engineer. Furnish reports of all tests, signed by an authorized representative of the contractor, to the Engineer on completion of each drilled shaft. An acceptance range of values for the physical properties is provided in Table 1 below. The Engineer may observe the control tests and may elect to perform independent verification tests using the contractor's equipment.

Sampling. When slurry samples are found to be unacceptable, bring the slurry in the shaft excavation to within specification requirements. Do not pour concrete until resampling and testing results produce acceptable values. Prior to placing shaft concrete, take slurry samples from within 1 ft (0.3 m) of the bottom and at mid-height of the shaft. Remove any heavily contaminated slurry that has accumulated at the bottom of the. Dispose slurry in areas approved by the Engineer. Perform final shaft bottom cleaning after suspended solids have settled from the slurry mix.

Table 1					
Range of Acceptable Values for Mineral and Polymer Slurries in Fresh Water Without Additives					
Property	Bentonite	Emulsified Polymer	Dry Polymer	Units	Test Method
Unit Weight at Introduction	63.5 - 66.8	< 63	< 63	lb/ft ³	Density Balance
Prior to Concreting	63.5 - 70.5	< 63	< 63		
Marsh Funnel Viscosity at Introduction	32 - 60	33 - 43 ^a	50 - 80 ^a	sec/qt	Marsh Funnel
Prior to Concreting	32 - 60	33 - 43 ^a	50 - 80 ^a		
pH at Introduction	8 - 10	8 - 11	7 - 11		pH Paper or pH Meter
Prior to Concreting	8 - 10	8 - 11	7 - 11		
Sand Content at Introduction	< 4	< 1	< 1	%	API
Prior to Concreting	< 10	< 1	< 1	by volume	Sand Content Kit
Maximum Contact Time^b	4	72	72	hours	
^a Higher viscosities may be required to maintain excavation stability in loose or gravelly sand deposits.					
^b Without agitation and sidewall cleaning.					

Slurry Construction.

Time Limitations. When bentonite slurry is used, adjust construction operations such that the maximum time that slurry is in contact with the bottom 5 ft (1.5 m) of the shaft, the time from the end of drilling to the beginning of concrete placement, does not exceed 4 hours without agitation. If the 4 hour limit is exceeded, over ream the bottom 5 ft (1.5 m) of the shaft prior to performing other operations in the shaft.

Level of Slurry. During construction, maintain the level of slurry at a height sufficient to prevent caving of the excavation. If the Engineer determines that the slurry construction method is failing to produce the desired final results, discontinue operations and propose an alternate method for approval from the Engineer.

Slurry Manufacturer's Representative. When manufactured mineral or polymer slurry additives are to be incorporated into the drilling slurry mix, provide the technical assistance of a representative of the mineral or polymer slurry additive manufacturer at the site prior to introduction of the slurry into the first shaft where slurry use will be used, and during drilling and completion of a minimum of 1 shaft to adjust the slurry mix to the specific site conditions.

EXCAVATION INSPECTION

The Contractor shall provide equipment for checking the dimensions and alignment of each permanent 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. Unless otherwise stated in the specifications, shaft bottoms shall be cleaned mechanically such that a minimum of 50% of the base of each shaft will have less than 1/2 in. (12 mm) of sediment at the time of placement of the concrete. The maximum depth of sediment or any debris at any place on the base of the shaft shall not exceed 1.5 in. (38 mm.) Shaft cleanliness will be determined by the Engineer, by visual inspection and sounding with the weighted tape for dry shafts or other methods deemed appropriate to the Engineer for wet shafts. In addition, for dry excavations, the maximum depth of water shall not exceed 3 in. (75 mm) prior to concrete pour. The rate of flow of water into the hole should not be more than 12 in. (300 mm) within a 1 h period. In wet or slurry filled shafts, the Contractor shall provide a mini shaft inspection device (miniSID) and operator to allow the Engineer to visually inspect the bottom of the shaft and determine sediment levels prior to concrete placement.

Remove drilling spoils that adhere to the vertical sides of the bedrock socket.

CONSTRUCTION TOLERANCES

The following construction tolerances apply to drilled shafts unless otherwise stated in the contract documents:

- (a) The drilled shaft shall be within 3 in. (75 mm) of plan position in the horizontal plane at the plan elevation for the top of the shaft.
- (b) The vertical alignment of a vertical shaft excavation shall not vary from the plan alignment by more than 1/4 in./ft (21 mm/m) of depth. The alignment of a battered shaft excavation shall not vary by more than 1/2 in./ft (42 mm/m) of depth from the prescribed batter.
- (c) After all the concrete is placed, the top of the reinforcing steel cage shall be no more than 6 in. (150 mm) above and no more than 3 in. (75 mm) below plan position.

- (d) All casing diameters shown on the plans refer to outside diameter dimensions. The dimensions of casings are subject to American Pipe Institute tolerances applicable to regular steel pipe. When approved, the Contractor may elect to provide a casing larger in diameter than shown in the plans.
- (e) The top elevation of the shaft shall have a tolerance of +1 in. (25 mm) or -3 in. (75 mm) from the plan top of shaft elevation.
- (f) Excavation. The completed shaft excavation shall have a planar bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of +3/8 in./ft (31 mm/m) 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 or an extension of the completion dates of the project.

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. If not placing the concrete immediately after installing the cage, the Contractor may have to remove the cage before placing the concrete to verify the integrity of the excavated area and to ensure loose material is removed from the bottom of the hole.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel shall 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 10 ft (3.0 m) of the shaft) or as shown on the plans to insure 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 3 in. (75 mm) annular space between the outside of 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.

The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the rebar cage is not maintained within the specified tolerances, the corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional shafts shall be constructed until the Contractor has modified his rebar cage support in a manner satisfactory to the Engineer.

When approved by the Engineer, the Contractor need not provide the reinforcing steel for the extended length of the drilled shaft if it is determined in the field that the Contractor must drill the shaft deeper than the estimated length.

CONCRETE PLACEMENT

Concrete placement shall be performed in accordance with the applicable portions of 702 except as modified in this special provision and with the requirements herein.

Do not place concrete in any drilled shaft excavation without approval from the Engineer. Inspect the drilled shaft excavation immediately before placing the concrete. Provide a light powerful enough to thoroughly inspect the reinforcing steel cage, the sides, and the bottom of the drilled shaft. The inspection for the wet construction method consists of only probing and measuring.

Concrete shall be placed as soon as possible after reinforcing steel placement. Concrete placement shall be continuous from the bottom to the top elevation of the shaft. Concrete placement shall continue after the shaft excavation is full until good quality concrete is evident at the top of shaft. Do not vibrate concrete with a vibrator. Concrete shall be placed either by free fall or through a tremie or concrete pump. The free fall placement shall only be permitted for the dry construction method. Concrete placed by free fall shall fall directly to the base without contacting either the rebar cage or hole sidewall. Drop chutes shall 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 h. 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 h placement limit.

Prior to concrete placement the Contractor shall provide test results of both a trial mix and a slump loss test conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets the 2 h requirement. The Contractor may request a longer placement time provided he supplies a concrete mix that will maintain a slump of 5 in. 125 mm or greater over the longer placement time as demonstrated by trial mix and slump loss tests. The trial mix and slump loss test shall be conducted using concrete and ambient temperatures appropriate for site conditions.

Minimum concrete slump for placement under slurry by tremie or pump shall be 7 in. (175 mm). The Contractor shall maintain a concrete volume vs. depth chart for all concrete placed under slurry. Minimum depth measurements shall be taken after every truck load of tremie placed concrete and every 2 to 3 ft (600 to 900 mm) if pumped.

TREMIES

Tremies may be used for concrete placement in wet holes. Tremies used to place concrete shall consist of a tube of sufficient length, weight, and diameter to discharge concrete at the shaft base elevation. The tremie shall not contain aluminum parts which 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 10 in. (250 mm). 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 concrete placement shall be watertight. Underwater placement shall not begin until the tremie is placed to the shaft base elevation. Valves, bottom plates or plugs may be used only if concrete discharge can begin within one-half tremie diameter of the base. 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 10 ft (3.0 m) in concrete at all times after starting the flow of concrete. The flow of concrete shall be continuous. The concrete in the tremie shall be maintained at a positive pressure differential 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.

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 4 in. (100 mm) diameter and be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the shaft base elevation.

Pump an adequate quantity of grout, mortar, or concrete without coarse aggregate through the equipment ahead of the specification concrete to provide lubrication to the pumping system. Do not place the concrete used for lubrication in the shaft. The lubrication process will not be repeated as long as the pumping operations are continuous. Operate the pump so a continuous stream of concrete without air pockets is produced. Control the initial rate of concrete placement so not to lift or displace the cage of reinforcing steel. When the concrete reaches the top of the drilled shaft column, remove all laitance.

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, which will not cause a defect in the shaft if not removed.

The discharge orifice shall remain at least 10 ft (3.0 m) below the surface of the fluid concrete. When lifting the pump line during concreting, the Contractor may 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.

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 3 in. (75 mm). Free fall is not permitted in wet excavations. Drop chutes shall consist of a smooth tube of 1 piece construction. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that the free fall of the concrete measured from the bottom of the chute is less than 25 ft (7.6m) at all times. 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 reduce the rate of concrete flow into the excavation. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, the Contractor shall use either tremie or pumping to accomplish the pour.

TRIAL SHAFT HOLES AND LOAD TESTS

The Contractor will construct at least 2 non production shafts prior to construction of production shafts. One shaft will be located in the vicinity of the Kentucky approach piers and the other shall be located in the vicinity of the Indiana approach piers. These shafts must be constructed with the same equipment and methods proposed for the production shafts. Trial shafts will be tested and evaluated the same as specified for production shafts. If the trial shafts are not acceptable the Contractor must propose modifications to equipment or procedures that will prevent defects in the production shafts. The owner must approve these revisions prior to construction of production shafts.

Trial shafts may also be used for the required static load tests. Load tests are required for final design of the production shafts as detailed in the Geotechnical Overview.

The Contractor must submit a procedure for performing the load tests for approval. The design of the load test should be capable of verifying the proposed nominal end and side resistance that will be used for final design of the production drilled shafts.

DRILLED SHAFT INTEGRITY TESTING

- (a) INTEGRITY TESTING: All drilled shafts constructed for production shall be tested by the Contractor, using the crosshole sonic logging, CSL, and the impulse response spectrum test, IRS, methods on each shaft. The Contractor shall provide all material and labor required for installation of and access to the material necessary for performing the integrity testing. The Contractor will employ a testing company experienced in the use of CSL and IRS testing equipment to perform the testing and interpret the results. Submit the qualifications of the testing firm for approval prior to construction of the drilled shafts.
- (b) CROSSHOLE SONIC LOGGING TEST (CSL): All of the drilled shafts constructed for production on this project will be equipped with access tubes for the CSL testing. Installation of the tubes shall be the responsibility of the Contractor.

PRINCIPLE: The CSL test provides continuous vertical profiles of the ultrasonic pulse velocity (UPV) of the concrete. The UPV is a function of the density and modulus of the concrete, and can therefore be used to assess the uniformity and homogeneity of the concrete.

Access tubes are attached to the reinforcing cage and installed in the drilled shaft before concrete is placed. Transducer probes, a transmitter and a receiver, are lowered down adjacent pairs of access tubes. An ultrasonic pulse emitted by the transmitter travels through the concrete between the tubes to the receiver. The probes are connected to a control unit that contains a pulse generator/timer/recorder system.

The cables attached to the probes are withdrawn over a measurement wheel that is also connected to the control unit. This system takes a continuous series of measurements as the probes are raised up the access tubes. The data recorded is the position of the probes for each measurement, the amplitude of the received signal, and the time taken for the ultrasonic pulse to travel from the transmitter to the receiver.

MATERIALS: The Contractor shall supply the following materials for the CSL test installation:

- (1) Schedule 40 mild steel tubing of 2 in. (50 mm) internal diameter and threaded sleeve couplers sufficient to install the number of full length access tubes as required below in each of the drilled shafts. In addition, each tube shall have a threaded steel end cap fitted to the bottom.
- (2) Clean, potable water sufficient to fill the access tubes completely.
- (3) Cement grout sufficient to fill the access tubes when directed by the Engineer.

EQUIPMENT: The Contractor shall supply all equipment and materials required to provide access to the tubes, perform the tests and grout the holes upon approval.

INSTALLATION PROCEDURE: The Contractor shall provide and install the access tubes required for the CSL test according to the following schedule and instructions.

- (1) All drilled shafts constructed for production shall have full length CSL access tubes installed in them. The bottom of each tube shall be sealed watertight with a threaded end-cap. Any coupling of tubing needed to make up the required lengths shall be made using threaded sleeve couplers, sealed watertight.

The tubing shall be round and regular in section, with a clean interior surface, free of defects or obstructions that would prevent the passage of a 1.3 in. (30 mm) diameter probe through the tube. The exterior surfaces shall be free of any contaminants such as dirt, oil, grease, or heavy rust scale which may inhibit formation of a good mechanical bond with the concrete. The use of used or recycled tubing or slightly rusted tubing is acceptable provided that it meets the requirements above.

- (2) Place 1 tube per foot of drilled shaft diameter. The tubes shall be installed at approximately equidistant points around the interior of the reinforcing cage. Tubes shall be installed parallel to each other and securely attached to the reinforcing cage to prevent excessive movement during reinforcing cage handling and installation or placement of concrete.

The bottoms of the tubes shall be set 6 in. (150 mm) above the bottom of the reinforcing cage. No tubes are to be placed in contact with the bottom of the drilled shaft. The tops of the tubes shall extend at least 3 ft (1.0 m) and no more than 6 ft (2.0 m), above the proposed top of the concrete in the shaft. If the top of the concrete will be subsurface or underwater the tubes shall extend at least 3 ft (1.0 m), and no more than 6 ft (2.0 m) above grade or water level, or other reasonable access level if cofferdams or casings are used.

- (3) The reinforcing cages shall be handled in such a manner as to prevent excessive bending or distortion during lifting or placement. Excessive in this instance means bending or distortion that results in kinking or permanent bending of the access tubes, or displacement of the tubes so that they are no longer regularly spaced and parallel to each other. Longitudinal twisting or spiraling of the cage that may occur during lifting or placement is not significant, provided that the tubes remain parallel, undamaged, and securely fixed.

- (4) When the reinforcing cage and tubes are installed in the shaft, and before concrete is placed, the Contractor shall plumb and record the full depth of the shaft, and the full depth of the interior of at least 1 of the access tubes, relative to proposed top of concrete, or other site datum. After concrete placement, these figures, together with the elevation of the top of the finished concrete, the concreted length, and the date of concrete placement, shall be tabulated for each shaft and provided to the Engineer.
 - (5) Before concrete is placed, the tubes shall be filled completely with clean, potable water, and the tops of the tubes shall be sealed to prevent ingress of concrete or other foreign material and outflow of water. The tubes shall then be filled with potable water no later than 4 h after placement of concrete. The sealing method may be selected by the Contractor, but shall be such that no significant hammering or horizontal, vertical, or torsional force is required to unseal the tubes. Excessive force could result in breaking the bond between the concrete and the upper portion of the tube. The Contractor shall monitor the water level in the tubes no less frequently than every 12 hours, including weekends and holidays, between concrete placement and CSL testing and refill the tubes with water if necessary. The Contractor shall maintain a log documenting the water level readings and noting any water added.
 - (6) Before commencing this work, the Contractor shall submit to the Engineer his selection of tube type, size, and source, together with his proposed methods of installation, fixing, and sealing. Where the top of concrete will be subsurface, or in the river, the Contractor will also submit his proposed finish level for the tubing, and means of access for the testing team.
 - (7) CSL tests will be performed no earlier than 5 days after placement of the concrete if high early strength is not used. On completion of testing and acceptance of the shafts by the Department, the Contractor shall remove the water from the CSL access tubes and fill the tubes completely with grout placed by tremie or pumped from the bottom.
- (c) IMPULSE RESPONSE SPECTRUM (IRS) TEST: Concurrently with the CSL test, the testing contractor will perform the IRS test on each of the drilled shafts.

The head of the shaft is struck axially with a small sledge hammer that contains a load-cell. The response of the shaft is monitored by a geophone velocity transducer. Both instruments are connected to a data acquisition and processing system, where the raw data are converted into the frequency domain, and velocity is divided by force. The resultant graph of mobility against frequency contains information on:

The dynamic stiffness of the shaft/soil complex;
The length of the shaft, or depth of significant anomalies;
The regularity of the shaft's cross-section; and
The average quality of the concrete.

MATERIALS: Since impulse response testing will be performed concurrently with the CSL test, no additional materials are required for the performance of this test.

EQUIPMENT: The Contractor shall prepare the heads of the shafts for the IRS test, and provide all equipment and support necessary for the testing contractor to access the top of the drilled shafts and perform the test.

PROCEDURE: The IRS test will be performed no earlier than 5 days after placement of the concrete in a shaft, unless otherwise determined by the Department.

The Contractor shall prepare each shaft for testing by providing a safe means of personnel access to the concrete surface inside the reinforcing cage, removing any loose debris, and providing on each shaft a minimum of 2 areas of clean, sound, level concrete, free of laitance, grout, cracking, honeycombing, or contamination.

The surface of the shafts shall be free of standing water, and at least 1.0 in. (25 mm) above any water, slurry, or loose mud around the top of the shaft. The prepared areas shall, at a minimum, be as follows:

- (1) In the center of the shaft, with a minimum 3.0 in. (75 mm) diameter, and not more than 1.0 in. (25 mm) above or below the surrounding surface, such that a short handled 2 or 3 lb sledge hammer can be used to strike the surface squarely, with the handle parallel to the surface, and without the operators fingers touching the surface.
- (2) Near the perimeter of the shaft, within the reinforcing cage, not less than 18.0 in. (450 mm) from the center of the shaft. Minimum 3 in. (75 mm) diameter, and not more than 0.5 in. (12.5 mm) below the surrounding material.

- (d) **EVALUATION OF TEST RESULTS:** If the tests indicate that there are zones of defective concrete within a shaft, the defects shall be jointly evaluated by the Department and the Contractor. In cases where the nature or extent of a defect remains uncertain, excavation or core-sampling of the defective zone may be required in order to permit visual or laboratory assessment of the material. Such excavation or core-sampling shall be performed by the Contractor under the supervision of the Department. There will be no extra compensation to the Contractor for core-sampling or excavation work necessitated by a defect within the concrete.

- (1) In the event that a defect is considered deleterious to the performance of the shaft, options for the repair or replacement of the shaft shall be considered. Such repair or replacement shall be completed to the satisfaction of the Department, at no extra cost to the Department.
- (2) If the Department determines that the drilled shaft is unacceptable based on the CSL tests, the shaft shall either be replaced or cored in accordance with the sub-article below to permit further evaluation.
- (3) Production which have been determined to be unacceptable on the basis of the CSL tests shall be cored to determine the quality of the concrete. At least 1 core shall be taken from each defective shaft for the full depth of the shaft at no additional cost to the Department.

The decision to accept or reject a drilled shaft will be made by the Engineer.

An accurate log of cores shall be kept. The cores along with copies of the coring log shall be submitted to the Department for testing and inspection. Construction shall not proceed above the drilled shaft until the quality of the concrete in the shaft is determined to be acceptable and notification to continue construction is given by the Engineer.

QUALITY CONTROL SAMPLING, TESTING AND REPORTING.

The Contractor shall be responsible for performing all quality control sampling and testing. The Contractor shall provide copies of each sampling and testing report to the Engineer on the day such work was completed or performed. Failure to provide this report in a timely manner shall be cause for the Engineer to withhold progress estimates until such time as the reports are received by the Engineer.

In addition to the log sheet specified above in EVALUATION OF TEST RESULTS FOR DRILLED SHAFT INTEGRITY TESTING, the Contractor shall provide the following information to the Department.

- (a) Type of shaft excavation methods used.
- (b) Description of adequacy of clean out just prior to concrete placement.
- (c) Record of water depth in hole and rate of water infiltration prior to concrete placement. Time taken to place sufficient concrete to balance water head.
- (d) Method of concrete placement and removal of casing, if any. Record head of concrete before and during removal of casing. Record elevation of concrete when vibrations start, if any. Volume of concrete placed versus theoretical volume of concrete required.
- (e) Condition and time of concrete delivered to site, including record of slump, unit weight, air content and other tests and cylinders made for compression testing. Note if water was added at the site.

- (f) Record of difficulties encountered. This should include possible soil and water inclusion, possible voids, possible shaft squeeze-in and possible casing collapse.
- (g) If controlled slurry displacement procedures were used, record information on slurry properties, the bottom cleanup procedures used and the bottom checking procedures and results.
- (h) Record of deviations from the specifications and decisions required.

METHOD OF MEASUREMENT

Furnishing drilled shaft drilling equipment will not be measured.

Drilled shaft concrete will not be measured.

Unclassified shaft excavation will not be measured.

Unclassified extra depth excavation will not be measured.

Obstructions will not be measured.

Trial shaft holes will not be measured.

Static load tests will not be measured.

Exploration, shaft excavation will not be measured.

Instrumentation integrity testing and data collection will not be measured.

Permanent casing will not be measured.

Quality control sampling, testing and reporting will not be measured.

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Linear Foot as the unit of measurement for Drilled Shafts.

BASIS OF PAYMENT

This work will be included in the contract lump sum bid price for design/build. The cost of all materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

PEDESTRIAN ACCESS UNDER INDIANA APPROACH SPANS

Description: Vaughn Drive shall be closed to vehicular traffic; however, the Design/Builder shall provide for protected pedestrian access under the Indiana approach spans throughout construction of the project as approved by the Engineer.

Method of Measurement:

This work is included in the Lump Sum for Design/Build and will not be measured for payment.

However, the Design/Builder shall provide final as built quantities in Estimator format using Lump Sum as the unit of measurement.

Basis of Payment: This work will be included in the contract lump sum bid price for design/build. The cost of materials, labor, and necessary incidentals will be included in the cost of the lump sum pay item.

ADA COMPLIANCE

The Design/Builder shall assure the sidewalks and ramps of the Milton-Madison Bridge comply with the Americans with Disabilities Act (ADA) guidelines as described in the Department's criteria, to provide accessibility and mobility for disabled individuals (accessibility criteria), Chapter 51 of the INDOT Design Manual (IDM).

The cross slope of ramps and sidewalks shall not exceed 2%.

If the longitudinal gradient exceeds 5%, the sidewalk shall be considered a ramp as described in Section 51-1.07. The longitudinal slope shall not be steeper than 8%. If any sidewalk or ramp longitudinal slope exceeds 5% the Design/Builder shall provide a report detailing the constraints requiring the proposed slope and how the Design/Builder will fulfill the intent of the accessibility requirements. This report shall be considered a witness point.

Handrails shall be provided for the full length of Bridge Structure Nos. 1, 2, 3 and 4 as shown on the plans. This requirement supersedes IDM Section 51-1.07, which requires the use of handrails only on sidewalk or ramps with slopes of 5% or steeper.

STRUCTURE BACKFILL FOR MSE WALL

(Adopted 12-17-09)

The Standard Specifications are revised as follows:

SECTION 211, BEGIN LINE 112, DELETE AND INSERT AS FOLLOWS:

(c) Type 3

1. Structure backfill in accordance with 904.05 except only nominal size aggregates ~~No. 30, 1 in., 1/2 in. or No. 4, or No. 30 nominal size aggregates~~ or *coarse aggregate No. 5, No. 8, No. 9, or No. 11 or No. 12 coarse aggregate* shall be used. No slag other than ACBF will be permitted.

Section 904, begin line 320, delete and insert as follows:

904.05 Structure Backfill

The material shall be of acceptable quality, free from large or frozen lumps, wood, or other extraneous matter. It shall consist of suitable sand, gravel, crushed stone, ACBF or GBF. Structure backfill shall be in accordance with one of the following gradations shown in the table below, or coarse aggregate No. 5, No. 8, No. 9, No. 11, No. 12, No. 53 or No. 73 coarse aggregate in accordance with the gradation requirements of 904.03(e). Coarse aggregate No. 5, No. 8, No. 9, No. 11, No. 12, No. 53 or No. 73 shall be crushed stone or ACBF, Class D or higher

Sieve Sizes	NOMINAL SIZES AND PERCENTS PASSING					
	2 in (50 mm)	1 1/2 in (37.5 mm)	1 in. (25.0 mm)	1/2 in. (12.5 mm)	No. 4 (4.75 mm)	No. 30 (600 μm)
2 1/2 in (63 mm)	100					
2 in (50 mm)	90-100	100				
1 1/2 in (37.5 mm)	70-100	90-100	100	100		
1 in (25.0 mm)	55-95	70-100	85-100			
3/4 in (19.0 mm)	45-90	55-95	70-100			
1/2 in (12.5 mm)	35-85	40-90	55-95	85-100	100	100
No. 4 (4.75 mm)	20-65	20-70	25-75	45-85	90-100	
No. 8 (2.36 mm)	10-50	10-55	15-60	25-75	75-100	
No. 30 (600 μm)	3-35	3-35	3-35	5-45	15-70	70-100
No. 200 (75 μm)	0-8	0-8	0-8	0-8	0-8	0-8

MECHANICALLY STABILIZED EARTH RETAINING WALLS

(Revised 04-08-09)

The Standard Specifications are revised as follows:

SECTION 731, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 731 -- MECHANICALLY STABILIZED EARTH RETAINING WALLS

731.01 Description

This work shall consist of furnishing materials and placement of mechanically stabilized earth retaining walls in accordance 105.03.

The Contractor shall perform the necessary work to verify that the foundation is at the correct elevation, that the wall is constructed to the correct alignment, and that the work is in accordance with the specified tolerances. The checking of alignments and tolerances shall include verifying that the plumbness of the face panels is in accordance with 731.10 over the entire height of the wall. Alignment shall be checked at each layer of panels after the backfill behind the panels has been compacted, and the results shall be recorded.

731.02 General Design Requirements

The mechanically stabilized earth wall shall consist of a non-structural leveling pad, concrete face panels, coping, ground reinforcement elements mechanically connected to each panel, and an external drainage system. Ground reinforcement shall have sufficient strength, frictional resistance, and quantity as required by design.

The mechanically stabilized earth retaining walls system is to be selected from the Department's list of approved Retaining Wall Systems. A Retaining Wall System manufacturer may be included on the Department's list by following procedure J of ITM 806. The quantities shown in the Schedule of Pay Items will be the same for all mechanically stabilized earth wall systems. All mechanically stabilized earth walls shall be constructed in accordance with the approved plans and panel shop drawings based on the requirements herein. The recommendations of the wall system suppliers shall not override the minimum performance requirements contained herein.

If the wall manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information.

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, or other appurtenances shown on the plans shall be accounted for in the stability design of the wall.

The mechanically stabilized earth wall design shall follow the general dimensions of the wall envelope shown on the plans. The plans will locate the leveling pad at or below the theoretical leveling pad. The top of the face panel shall be at or above the top of the panel elevation shown on the plans.

Where coping or barrier is utilized, the wall face panel shall extend up into the coping or barrier a minimum of 2 in. (50 mm). The top of the face panels may be level or sloped to meet the top of the face panel line noted. Cast-in-place concrete will not be an acceptable replacement for panel areas noted by the wall envelope.

Where walls or wall sections intersect with an included angle of 130 degrees or less, a vertical corner element separate from the standard panel face shall abut and interact with the opposing standard panels. The corner element shall have ground reinforcement connected specifically to that panel and shall be designed to preclude lateral spread of the intersecting panels.

Face panels shall be designed to accommodate differential settlement of 1 linear unit in 100. Face panels of greater than 32 sq ft (3.0 m²) up through 64 sq ft (6.0 m²) in area shall be designed to accommodate differential settlement of 1 linear unit in 200. Where shown on the plans, slip joints to accommodate excessive or differential settlement shall be included.

Only one face-panels shape and size shall be used for a project that is part of a contract with multiple projects or contracts with MSE walls.

731.03 Design Criteria

The design by the manufacturer shall consider the internal and the external stability of the wall mass including the applied bearing pressure, overturning, sliding, and stability of temporary construction slopes. Internal and external stability shall include design for rapid drawdown conditions of the Ohio River. The design shall be in accordance with the ~~design, construction, and commentary divisions of the 2007 AASHTO Standard Specifications for Highway Bridges, LRFD Bridge Design Specifications and 2009 interim specifications unless specified otherwise herein.~~ The analysis of settlement, bearing capacity, and overall slope stability will be the responsibility of the ~~Engineer~~ Design/Builder.

The theoretical failure plane within the soil mass shall be analyzed so that the soil stabilizing component extends sufficiently beyond the failure plane to stabilize the material. External loads which affect the internal stability such as those applied through piling, bridge footings, traffic, and slope surcharge, shall be accounted for in the design. The size of all structural elements shall be determined such that the design load stresses do not exceed the allowable stresses found in the AASHTO Standard Specifications for Highway Bridges, unless otherwise shown on the plans.

The maximum allowable yield stress for reinforcement shall be not exceed the manufacturer's recommendation.

The phi (ϕ) angle for the internal design of the reinforced backfill shall be assumed to be 34 degrees. The ϕ angle of the backfill behind the mechanically stabilized earth mass shall be assumed to be 30 degrees.

The wall shall be defined by the wall envelope as shown on the plans. For design purposes, the height of wall H shall be measured from the theoretical top of the leveling pad to the top of the wall. For a level surcharge situation, the top of the wall shall be measured to the top of the coping or to the gutter line of the traffic barrier. The top of the wall shall be the theoretical top of the face panels only when a coping or barrier is not used. For an abutment face, the design height H shall be defined as the height measured from the top of the leveling pad to the top of the roadway surface. For a wall with a sloping surcharge the top of the wall shall be measured at a point 0.3H back from the face where the design height is H and the actual wall height is H.

For aesthetic considerations and to make differential settlement unnoticeable, the panels shall be erected such that the horizontal site line is discontinuous at every other panel. This shall be accomplished by starting erection with the lower panel level of each wall by alternating full height and half height panels. Panels above the lowest level shall be of a standard size except as required to top out the wall to be in accordance with the plan elevations.

The connections of the ground reinforcement to the panels shall be in two elevations for standard panels. The connections shall not be more than 30 in. (750 mm) apart vertically. To prevent out-of-plane rotation, standard face panels shall be connected to ground reinforcement on at least three different points in two different planes. However, preapproved systems utilizing a horizontal stabilizing leg to prevent rotation shall only require ground reinforcement attachments in one plane.

Partial panels shall have three different connection points, but only one plane shall be attached to ground reinforcement. Panels, which are located at the top of the wall, shall not be attached to the coping or the traffic barrier.

The ground reinforcement shall be the same length from the bottom to the top of each wall section whether bar mats, grids, or strips steel are used. Differing ground reinforcement elements shall be clearly marked for ease of construction. This element may be used individually or in a prefabricated grouping. The minimum length of the ground reinforcement shall be $0.7H$, but not shorter than 8 ft (2.5 m), in accordance with the AASHTO Standard Specifications for Highway Bridges for an abutment on a spread footing.

The ground reinforcement for the mechanically stabilized earth volume shall be sized using the lesser of the allowable forces for each specific connection and each specific reinforcing element. The connection's allowable force shall be taken as $2/3$ of the connection test load at the allowable pullout deformation limit of $1/2$ in. (13 mm) or one half of the ultimate load, whichever is less.

The ground reinforcement length shall be as required for internal design or as shown on the plans. The length shall exceed the minimum noted as required for design consideration. One hundred percent of the ground reinforcement, which is designed and placed in the reinforced earth zone shall be connected to the face panels.

For mats, grids, or strip steel, the minimum zinc coating thickness shall be 2 oz/sq ft (610 g/m²). Such thickness shall be assumed to be 86 μ m for purpose of calculation of reduced structural section.

The design contact pressures under the stabilized mass for each reinforcement length shall be clearly indicated on the shop drawings and shall not exceed the maximum allowable soil bearing capacity shown on the plans. Passive pressure in front of the wall mass will be assumed to be zero for design purposes.

731.04 Submittals

The Contractor shall submit one copy of the design computations for approval. If the computations are computer generated, one sample set of hand calculations, for one wall location, shall also be submitted. The Contractor shall submit eight sets of design drawings for approval after the design computations are approved and before beginning wall construction operations. Design computations and design drawings shall be signed and sealed by a professional engineer.

(a) The design drawings shall include all details, dimensions, quantities and cross-sections necessary to construct the wall and shall include but shall not be limited to the following:

- 1. A plan and elevation sheet or sheets for each wall.*

2. *An elevation view of the wall which shall include the elevation at the top of the wall at all horizontal and vertical break points at least every 50 ft (15 m) along the face of the wall, all steps in the leveling pads, the designation as to the type of panel, the length of soil reinforcing systems, the distance along the face of the wall to where changes in length of the soil reinforcing systems occur, and an indication of the original and final ground lines and maximum bearing pressures.*
 3. *A plan view of the wall that indicates the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment. A plan view and elevation view which detail the placing position and connection of all steel ground reinforcing elements in areas where piling, utility, or other structures are near the wall.*
 4. *A typical cross section or cross sections showing elevation relationship between ground conditions and proposed grades, as well as the drainage system.*
 5. *All general notes required for constructing the wall.*
 6. *All horizontal and vertical curve data affecting the wall.*
 7. *A listing of the summary of quantities on the elevation sheet for each wall.*
- (b) *All panel details shall show all dimensions necessary to construct the element, all reinforcement in the element, and the location of soil reinforcing system devices embedded in the panels.*
- (c) *The details for construction of walls around drainage facilities and the out-letting of internal drainage from the backfill zone.*
- (d) *All details of the architectural treatment.*
- (e) *The details for diverting strips or mesh around obstructions such as piles, catch basins, and other utilities shall be submitted for approval.*
- (f) *The details for each connection between the concrete panel and the mesh or strip.*
- (g) *Determination of the ϕ angles for reinforced materials and retained materials.*

Design calculations and shop drawings shall be submitted to the Engineer for review and approval.

MATERIALS

731.05 Materials

The Contractor shall make arrangements to purchase the materials described herein, including concrete face panels, retaining strips or mesh, tie strips, fasteners, joint materials, and all necessary incidentals, from a mechanically stabilized earth wall system manufacturer on the Department’s list of approved retaining wall systems.

Materials shall be in accordance with the following:

<i>B Borrow</i>	<i>211.02</i>
<i>Coarse Aggregate, Class A or Higher, Size No. 8 or 91</i>	<i>904</i>
<i>Concrete Admixtures</i>	<i>912.03</i>
<i>Concrete, Class A</i>	<i>702</i>
<i>Fine Aggregate, Size No. 23</i>	<i>904</i>
<i>Fly Ash</i>	<i>901.02</i>
<i>Geotextile</i>	<i>913.18</i>
<i>Portland Cement</i>	<i>901.01(b)</i>
<i>Rapid Set Patching Materials</i>	<i>901.07</i>
<i>Steel Welded Wire Reinforcement, Smooth</i>	<i>910.01</i>
<i>Reinforcing Bars</i>	<i>910.01</i>
<i>Structure Backfill</i>	<i>904.05</i>
<i>Water</i>	<i>913.01</i>

Backfill material used in the mechanically stabilized earth wall volume shall be structure backfill, type 3 in accordance with 211 for backfill placed above the Q100 Flood Elevation.

Backfill material used in the mechanically stabilized earth wall volume shall be coarse aggregate size No. 8, Class A, AS or AP, for backfill placed at or below the Q100 Flood Elevation. Slag will not be permitted.

The internal friction or ϕ angle of the structure backfill in the reinforced soil mass shall be not less than 34 deg in accordance with AASHTO T 236 or AASHTO T 297 under consolidated drained conditions. Testing for the ϕ angle shall be performed on the portion finer than No. 8 (2.36 mm) sieve, using a sample of the material compacted to 95% in accordance with AASHTO T 99, methods C, or D. No testing for the ϕ angle is required when 80% of the materials are greater than No. 4 (4.75 mm) sieve. An approved geotechnical laboratory shall perform the tests.

Structure backfill criteria shall be as follows:

<i>Property</i>	<i>Criteria</i>	<i>Test Method</i>
<i>pH</i>	<i>5 < pH < 10</i>	<i>AASHTO T 289</i>
<i>Chlorides</i>	<i>< 100 ppm</i>	<i>AASHTO T 291</i>
<i>Sulfates</i>	<i>< 200 ppm</i>	<i>AASHTO T 290</i>
<i>Organic Content</i>	<i>1 % max.</i>	<i>AASHTO T 267</i>
<i>Resistivity</i>	<i>3000 Ω-cm (min.)</i>	<i>AASHTO T 288</i>
<i>Permeability & Gradation</i>	<i>30 m ft/day (9 m/day) (min.)</i>	<i>AASHTO T 215 AASHTO T11 & T27</i>

If the minimum resistivity exceeds 5000 Ω-cm, the requirement of the testing for chlorides and sulfates may be waived. The resistivity shall be tested at 100% saturation. The gradation shall be run on the material used in the permeability test. All of the above tests shall be run a minimum of once per two calendar years per source.

ACBF shall be in accordance with the pH, chlorides, sulfates, organic content, resistivity and permeability requirements of structural backfill as noted above and ITM 212. Total sulfides shall also be determined in accordance with EPA 376.1, using the 100 mL pH water samples obtained during ITM 212, and shall not exceed 400 ppm. The ACBF shall have a maximum corrosion rate as follows for steel and zinc when tested in accordance with ASTM G 59.

1. Zinc Corrosion Rate First 2 years15 µm/yr/side
2. Zinc corrosion to depletion.....4 µm/yr/side
3. Carbon steel rate.....12 µm/yr/side

If ACBF or coarse aggregate No. 8's are used, and soil, B borrow, structural backfill, or coarse aggregate No. 53's are to be placed above the ACBF or No. 8 aggregate, a single layer of geotextile shall be placed on top of the ACBF aggregate in accordance with 616.10. A type C certification in accordance with 916 for the geotextile materials shall be furnished to the Engineer prior to use.

The structure backfill shall be supplied in accordance with 904 and a type A certification in accordance with 916 for the above additional testing of the structure backfill shall be furnished to the Engineer prior to use. One copy of all test results performed by the Contractor, which are necessary to demonstrate compliance with the specifications, shall also be furnished to the Department's Geotechnical Section. An approved geotechnical laboratory shall perform the tests.

(a) Concrete Face Panels

Concrete shall be in accordance with the applicable requirements of 702. Concrete shall have a compressive strength equal to or greater than 4000 psi (27.5 MPa) at 28 days.

Retarding agents, accelerating agents, or additives containing chloride shall not be used without approval. Air-entraining and slump requirements shall be in accordance with 702.05.

Ground reinforcement connecting hardware and rebar lifting devices shall be set in place and secured prior to beginning casting, in accordance with the dimensions and tolerances shown on the design drawings.

1. Testing and Inspection

Acceptability of the panels will be determined on the basis of compressive strength tests and visual inspection. The panels shall be considered acceptable regardless of curing age when compressive test results indicate that the compressive strength is in accordance with 731.05(a). The wall manufacturer of the panels shall provide for all testing and inspection services during the production of the panels. Services shall be completed by a Department approved testing laboratory. An American Concrete Institute certified concrete field testing technician, grade 1, shall be present during production of the face panels to direct all sampling and testing.

2. Casting

The panels shall be cast on a flat area, with the front face of the form at the bottom, and the back face at the upper part. Tie strip guides shall be set on the rear face. The concrete in each unit shall be placed without interruption and shall be consolidated as necessary to prevent the formation of segregation or cleavage planes. Clear form oil of one manufacture shall be used throughout the casting operation.

3. Curing

The panels shall be cured for a sufficient length of time such that the concrete develops the specified compressive strength.

4. Removal of Forms

The forms shall remain in place until they may be removed without damage to the unit.

5. Concrete Finish

The concrete surface for the front panel face shall have a surface finish produced from contact with the form. The rear face of the panel shall be roughly screeded to eliminate open pockets of aggregate and surface distortions in excess of 1/4 in. (6 mm).

6. Tolerances

All panels shall be manufactured within the tolerances as follows:

a. Panel Dimensions

Lateral position of tie strips shall be within 1 in. (25 mm). All other dimensions shall be within 3/16 in. (5 mm).

b. Panel Squareness

Squareness, as determined by the difference between the two diagonals, shall not exceed 1/2 in. (13 mm).

c. Panel Surface Finish

Surface defects on smooth formed surfaces measured on a length of 5 ft (1.5 m) shall not exceed 1/8 in. (3 mm). Surface defects on textured finished surfaces measured on a length of 5 ft (1.5 m) shall not exceed 5/16 in. (5 mm).

7. Compressive Strength

Acceptance of the concrete panels with respect to compressive strength will be determined on the basis of production lots. A production lot is defined as 50 panels.

Frequency of production control testing will consist of a minimum of one test per production lot but not less than one test per day. The wall manufacturer will sample the concrete in accordance with AASHTO T 141 and prepare a minimum of two cylinders in accordance with AASHTO T 23. Curing of the cylinders shall be in the same manner as the panels are cured.

When the average results of two cylinders tested in accordance with AASHTO T 22, meet or exceeds the requirements of 731.05(a), the production lot panels or those panels represented by a day's testing may be shipped.

When the cylinder test results are less than the requirements of 731.05(a) and additional cylinders for testing are not available, the manufacturer may core the panels. The wall manufacture will randomly select two panels from the lot for core testing in accordance with AASHTO T 24. The wall manufacture shall obtain one core on the backside of each panel with a device that produces uniform test samples without coring completely through the panel. Coring shall not be located within 6 in. (150 mm) of the panel fasteners or the edges of the panels and shall avoid the panel's reinforcement. The wall manufacture shall fill the core holes with equivalent concrete materials or rapid set patching materials and trowel to produce a smooth finish. Excess material removed during troweling shall not be reused.

If rapid set patching material is used, mixing and curing shall be in accordance with the manufacture's recommendations. If the average strength test results from the cores meet or exceed the requirements of 731.05(a), the production lot panels may be shipped.

A type A certification in accordance with 916 shall be furnished for each shipment prior to use of the panels. All cylinder or core test results, including the age of the cylinders or cores at the time of testing, shall be included on the certification for each production lot.

Verification of compressive strengths of the panels will be conducted by the Engineer. The frequency of verification testing will be one test for every 750 panels per manufacturer with a minimum of one test per contract. One panel will be randomly selected and two locations selected for coring. The Engineer will obtain two 4 in. (100 mm) cores on the backside of the panel without coring completely through the panel. The Contractor shall refill the core holes with rapid set patching materials and trowel to produce a smooth finish. Excess material removed during troweling shall not be reused. Mixing and curing of the patching materials shall be in accordance with the manufacture's recommendations.

The Engineer will test the cores in accordance with AASHTO T 24. The verification test results will be averaged and compared to the manufacturer's results reported on the certification. If the initial verification test results do not meet the requirements of 731.05(a), the Engineer will randomly select two different panels for additional verification testing.

If the additional verification tests meet the requirements of 731.05(a), no further action is required. If the test results still do not meet the requirements of 731.05(a), installation of panels shall cease and the Engineer will conduct an investigation. Panels manufactured on the same dates as the panels cored for verification tests that have already been installed will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03. The Engineer will conduct verification testing until three consecutive dates of production meet the strength requirements of 731.05(a). The Contractor or wall manufacturer shall make arrangements so that panels from three consecutive dates of production are accessible for coring. Installation of panels may resume once acceptable verification testing results are achieved.

8. Rejection

Units shall be subject to rejection due to failure to be in accordance with the requirements specified above. In addition, the following defects may be sufficient cause for rejection:

- a. Defects which indicate imperfect molding*
- b. Defects which indicate honeycombed or open texture concrete*
- c. Defects in the physical characteristics of the concrete, such as broken or chipped concrete, or color variations or dunnage marks on the front face due to excessive form oil or other reasons.*

The Engineer will determine whether spalled, honeycombed, chipped, or otherwise defective concrete shall be repaired or be cause for rejection. Repair of concrete, if permitted, shall be completed in a satisfactory manner. Repair to concrete surfaces that are to be exposed to view after completion of construction shall be subject to approval.

9. Marking

The place and date of manufacture, and production lot number shall be clearly scribed on the rear face of each panel.

10. Handling, Storage, and Shipping

All panels shall be handled, stored, and shipped so as to eliminate the danger of chipping, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported on firm blocking located immediately adjacent to tie strips to avoid bending the tie strips.

(b) Concrete Leveling Pad

Concrete, Class A, for the leveling pad shall be in accordance with the applicable requirements of 702.

(c) Concrete Coping

Concrete, Class A, for the coping shall be in accordance with the applicable requirements of 702. Reinforcing steel in the coping shall be in accordance with the applicable requirements of 703. The coping may be precast or cast-in-place.

(d) Welded Wire Reinforcement, Clevis Connector, and Connector Bar

The welded wire reinforcement shall be shop fabricated of cold drawn steel wire in accordance with ASTM A 82 and shall be welded into the finished mesh fabric in accordance with ASTM A 185. Galvanization shall be in accordance with ASTM A 123.

Clevis connectors, if used, shall be attached to the alignment templates using the bars provided with the forms. The vertical and horizontal alignment of the connectors shall be +1/8 in. (+3 mm). The holes inside the loops shall be free of all concrete and debris, loose or otherwise.

The clevis connector shall be fabricated of cold drawn steel wire in accordance with ASTM A 82 and welded in accordance with ASTM A 884. Loops shall be galvanized in accordance with ASTM A 153 Class B-3 or ASTM A 123.

The connector bar, if used, shall be fabricated of cold drawn steel wire in accordance with ASTM A 884 and galvanized in accordance with ASTM A 123.

A type A certification in accordance with 916 for welded wire reinforcement, clevis connector, and connector bars shall be furnished prior to use of the materials.

(e) Ground Reinforcement

The ground reinforcement may be a deformed steel strip or a welded wire grid. The grid or strip used shall be consistent with that used in the pullout test and shall be consistent throughout the project.

The grid shall consist of not less than two longitudinal wires, perpendicular to the wall, welded to equally spaced cross ribs capable of developing passive pressure with the fill. The deformed strip shall be of constant width. The strip thickness shall vary only from the standard undeformed section to the standard deformed section as required to produce the pullout resistance.

All longitudinal wires of each welded wire grid shall be of the same diameter. All transverse wires of each welded wire grid shall be of the same diameter, but not necessarily the same as the longitudinal wire diameter.

The face panel edges shall be configured to conceal the joints. All horizontal and vertical joints shall be covered with a joint cover to prevent backfill leakage while passing water.

Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Physical and mechanical properties of the strips shall be in accordance with ASTM A 572 Grade 65 (A 572M Grade 450). Tie strips shall be shop fabricated with hot rolled steel in accordance with the minimum requirements of ASTM A 570 Grade 50 (A 709M Grade 345). Galvanization for reinforcing strips and tie strips shall be in accordance with ASTM A 123 and the minimum zinc coating thickness shall be 2 oz/sq ft (0.64 L/m²). All reinforcing strips and tie strips will be inspected to ensure that they are true to size and free from defects which may impair their strength and durability.

A type A certification in accordance with 916 shall be furnished for ground reinforcement prior to use of the materials.

(f) Reinforcing Bars

Mill certificates for reinforcing bars as shown on the plans shall be furnished for approval. All reinforcing bars shall be in accordance with ASTM A 615 Grade 60 (A 709M Grade 400).

A type A certification in accordance with 916 shall be furnished for reinforcing bars prior to use of the materials.

(g) Fasteners

Fasteners shall consist of 1/2 in. (13 mm) diameter, hexagonal cap screw bolts and nuts, which shall be galvanized and in accordance with ASTM A 325 (A 325M).

A type A certification in accordance with 916 shall be furnished for fasteners prior to use of the materials.

(h) Alignment Pins

The rods used to align the face panels during construction shall be 3/4 in. (19 mm) diameter, 12 in. (300 mm) long. The rods shall be mild steel, polyvinyl chloride, or fiberglass. A sample shall be submitted prior to use to the Materials and Tests Division for approval.

(i) Joint Materials

Bearing pads shall be rubber, neoprene, polyvinyl chloride, or polyethylene, and of the type and grade recommended by the supplier of the mechanically stabilized earth wall system.

The joint cover shall be either a non-woven needle punch polyester geotextile or a woven monofilament polypropylene. The joint cover shall be attached to the rear face of the panels with a suitable adhesive.

Horizontal and vertical joints shall be provided between adjacent face panels to prevent concrete-to-concrete contact and chipping when differential settlement occurs. The horizontal and vertical joints shall contain compression blocks, pins, or other approved means as recommended by the manufacturer to provide a uniform joint. Panels without an uninterrupted vertical joint shall have a minimum joint thickness of 3/4 in. (19 mm).

A type A certification in accordance with 916 for joint materials shall be furnished prior to use of the materials.

CONSTRUCTION REQUIREMENTS

731.06 General Requirements

The wall manufacturer representative shall provide technical instruction, guidance in pre-construction activities including the preconstruction conference, and on-site technical assistance to the Contractor during construction.

731.07 Foundation Preparation

The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcing strips or as shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted in accordance with 203. The base of the wall excavation shall be proofrolled with an approved compacting equipment. If unsuitable foundation material is encountered, it shall be removed and replaced with B borrow in accordance with 211.02 and compacted in accordance with 211.04.

At each foundation level, an unreinforced concrete leveling pad shall be provided as shown on the plans. The leveling pad shall be cured in accordance with 702.22 a minimum of 12 h before placement of concrete face panels.

731.08 Retaining Wall Excavation

This work shall consist of the excavation of material whose removal is necessary for the construction of the mechanically stabilized earth walls in accordance with the plans, the requirements herein, or as directed. Excavation shall include the construction and subsequent removal of all necessary bracing, shoring, sheeting, cribbing, an all pumping, bailing, and draining.

Prior to starting excavation operations at the wall site, clearing and grubbing shall be in accordance with 201.03. The Contractor shall clear and grub the area to the excavation in accordance with the limits shown on the plans. All timber, stumps, and debris shall be disposed of in accordance with 201.03.

The Contractor shall notify the Engineer a sufficient time before beginning the excavation so that measurements may be taken of the undisturbed ground.

Where necessary for safety, the excavation shall be shored or braced in accordance with State and local safety standards. Excavation and related work shall be performed such that no portion of the wall is endangered by subsequent operations.

Where excavation for the wall is adjacent to a traveled way, the method for shoring, sheeting, or bracing the excavation opening shall be approved before beginning the excavation. The Contractor shall submit five copies of drawings in accordance with 206.09 showing details of the proposed method of excavation protection.

After the excavation for each wall location has been performed, the Contractor shall notify the Engineer. Concrete for the leveling pad shall not be placed until the Engineer has approved the depth of the excavation and the foundation material.

All sheeting and bracing shall be removed as the backfilling progresses.

All material for backfill shall be subject to approval and shall be free from large or frozen lumps, wood, or other undesirable material. All backfill shall be compacted in accordance with 203.

731.09 Wall Erection

Concrete face panels shall be handled by means of a lifting device set into the upper edge of the panels. Panels shall be placed in successive horizontal lifts in the sequence shown on the plans as backfill placement proceeds. As backfill material is placed behind the panels, the panels shall be maintained in vertical position by means of temporary wooden wedges placed in the joint at the junction of the two adjacent panels on the external side of the wall. External bracing will be required for the initial lift.

Panels placed in contact with the ground or covered by standing water shall have face discoloration removed by means of a chemical wash. Panels shall be stored on blocking to minimize contact with the ground or being covered by standing water.

Plumbness, vertical tolerances, and horizontal alignment tolerances shall not exceed 3/4 in. (19 mm) when measured with a 10 ft (3 m) straightedge. The maximum allowable offset in panel joints shall be 3/4 in. (19 mm). For a wall of over 10 ft (3 m) height, the overall plumbness from top to bottom of the wall shall not exceed 0.05 in./ft (4 mm/m) of wall height.

Ground reinforcement shall be placed normal to the face of the wall, unless otherwise shown on the plans or as directed. Prior to placement of the ground reinforcing strips, backfill shall be compacted in accordance with 731.10.

731.10 Backfill Placement

Backfill placement shall closely follow erection of each course of panels and ground reinforcement. Backfill shall be placed so as to avoid damage or disturbance to the wall materials or misalignment of the concrete face panels. Wall materials that become damaged or disturbed during backfill placement shall be removed and replaced or corrected as directed. All misalignment or distortion of the concrete face panels due to placement of backfill outside the limits described herein shall be corrected as directed.

The work shall also include B borrow backfilling above a theoretical 1:1 slope behind the ground reinforcement in accordance with the details shown on the plans.

Structure backfill shall be compacted to 95% of the maximum dry density in accordance with AASHTO T 99. Compaction equipment shall be in accordance with 409.03(d). Density of the compacted aggregate will be determined in accordance with 203.24(b). If No. 8 backfill materials are used, compaction shall consist of four passes with a vibratory roller, and one pass with the same roller in static mode. A vibratory roller shall be equipped with a variable amplitude system, a speed control device, and have a minimum vibration frequency of 1000 vibrations per min. A roller in accordance with 409.03(d)4 may be used. All displacement or rutting of the aggregate shall be repaired prior to placing subsequent material.

The maximum loose lift thickness shall not exceed 8 in. (200 mm) except that lifts 3 ft (1 m) from the wall or closer shall not exceed 5 in. (125 mm) in loose thickness. This lift thickness shall be decreased if necessary, to obtain the specified density.

Compaction within 3 ft (1 m) of the back face of the concrete face panels shall be achieved by means of a minimum of five passes with a lightweight mechanical tamper, roller, or an alternative vibratory system.

At the end of each day's operation, the last level of backfill shall be sloped away from the concrete face panels. In addition, surface runoff from adjacent areas shall not be permitted to enter the wall construction site.

Cutting or altering of the basic structural section of ground reinforcement at the site will be prohibited, unless the cutting is preplanned and detailed on the approved design drawings. Cutting shall only be considered if adequate additional ground reinforcement is provided to produce the required strength shown in the approved calculations. If the grid or strip is shortened in the field, the cut ends shall be covered with a galvanized paint or Bitumastic 50 coal tar to prevent corrosion of the metal.

731.11 Method of Measurement

Concrete face panels and wall erection will be measured by the square foot (square meter) of wall surface area. The concrete leveling pad will be measured by the linear foot (meter). Common excavation will be measured by the cubic yard (cubic meter) in accordance with 203.27 to the neat lines shown on the plans. Structure backfill and B borrow will be measured in accordance with 211.09 to the neat lines shown on the plans. Unsuitable foundation materials, if found, will be measured in accordance with 211.09. Geotextile materials if used in accordance with 731.05 will not be measured.

The measurement of concrete face panels, and wall erection will be based on the neat line limits of the wall envelope as shown on the plans and not that of the wall system supplier. The wall envelope limits will be considered to be the vertical distance from the top of the leveling pad to the top of the coping, and the horizontal distance from the beginning to the end of the leveling pad.

Precast or cast-in-place concrete coping will not be measured. Drainage of the backfill including piping, aggregates and geotextile materials will not be measured.

This work is included in the Lump Sum for Design/Build and will not be measured for payment. However, the Design/Builder shall provide final as built quantities in Estimator format using the units of measurement as described herein.

731.12 Stockpiled Concrete Face Panels

~~*Partial payment will be made for panels and ground reinforcement stockpiled on the project site or at the Contractor's approved storage location. Partial payment will be based on the delivered cost of the wall panels, as verified by invoices that include freight charges. The Contractor shall furnish the invoices and Type A certification. The partial payment will not exceed 75% of the contract unit price for concrete face panels. Prior to construction, the Engineer will verify that the panels are in accordance with 731.05(a).*~~

731.13 Basis of Payment

~~*Concrete face panels and wall erection will be paid for at the contract unit price per square foot (square meter). The concrete leveling pad, complete and in place, will be paid for at the contract unit price per linear foot (meter) for leveling pad. Common excavation will be paid for at the contract unit price per cubic yard (cubic meter) in accordance with 203.28 to the neat lines shown on the plans. Structure backfill and B borrow will be paid for at the contract unit price per cubic yard (cubic meter) in accordance with 211.10. Unsuitable foundation materials will be paid for in accordance with 211.10.*~~

Payment will be made under:

Pay Item

Pay Unit Symbol

Design/BuildLump Sum

The cost of services including the testing laboratory, certified testing personnel, and the testing and inspection of the concrete panels shall be included in the ~~cost of concrete face panels~~ lump sum bid price for Design/Build.

The cost of all mechanically stabilized earth wall materials including concrete face panels, ground reinforcement, tie strips, fasteners, joint materials, concrete coping, repair or replacement of face panels damaged or removed due to backfill placement, and incidentals shall be included in the ~~cost of concrete face panels~~ lump sum bid price for Design/Build.

The cost of all labor and materials required to prepare the wall foundation, place the ground reinforcement, and erect the concrete face panels shall be included in the ~~cost of wall erection~~ lump sum bid price for Design/Build.

The cost of labor and materials required to provide for the drainage of the backfill including piping, aggregates, and geotextile materials shall be included in the ~~cost of concrete face panel~~ lump sum bid price for Design/Build.

The cost of refilling and refinishing of the core holes from verification coring shall be included in the ~~cost of concrete face panels~~ lump sum bid price for Design/Build.

The cost of performing the laboratory tests by an approved geotechnical laboratory for structural backfill or ACBF slag shall be included in the ~~cost of the pay items in this section~~ lump sum bid price for Design/Build.

The cost of all labor and materials for geotextile materials, used, shall be included in the ~~cost of the pay items in this section~~ lump sum bid price for Design/Build.

The cost of cutting, altering, and recoating of the ground reinforcement at the site shall be included in the ~~cost of wall erection~~ lump sum bid price for Design/Build.

WASTE AND BORROW SITES

The contractor is advised that it is their responsibility to gain U.S. Army Corp of Engineer's approval before utilizing a waste or borrow site that involves "Waters of the United States". "Waters of the United States" are defined as perennial or intermittent streams, ponds or wetlands. Ephemeral streams are also considered jurisdictional waters, and are typically dry except during rainfall, but have a defined drainage channel. Questions concerning any potential impacts to "Waters..." should be brought to the attention of the appropriate District Office for the Corps of Engineers for a determination, prior to disturbance. Any fees associated with obtaining approval from the U.S. Army Corp of Engineer or other appropriate regulatory agencies for waste and borrow sites is the responsibility of the contractor.

COORDINATION FOR PEREGRINE FALCONS

1.0 DESCRIPTION. Currently there is a nest box for the Peregrine Falcon on existing Pier 8 of the Milton Madison Bridge. Although the Peregrine Falcon was removed from the federal list of endangered and threatened species in 1999, they remain protected by the Migratory Bird Treaty Act (MBTA). Additionally, the Peregrine Falcon, a rare bird in Kentucky, is considered a Species of Greatest Conservation Need in Kentucky's State Wildlife Action Plan. As set forth by the MBTA, it is illegal to destroy a nest of a Peregrine Falcon. Therefore, the Contractor shall minimize the risk of nest disturbance or destruction.

2.0 MATERIALS. Reserved.

3.0 CONSTRUCTION.

1. The Contractor shall coordinate the removal of the Peregrine Falcon nest box on Pier 8 with the Kentucky Department of Fish and Wildlife Resources (KDFWR) and the Kentucky Transportation Cabinet (KYTC). Removal of the nest box by KDFWR will take place after July 1, 2010 and prior to February 1, 2011.
2. The Contractor shall cover all potential nesting sites with tarps, prior to February 1 with coverage maintained through June 30, to prevent the Peregrine Falcons from nesting on the bridge in 2011 and 2012. The contractor shall coordinate with KYTC and KDFWR to determine the potential nesting site areas of the bridge that need to be covered.
3. If Peregrine Falcons nest on the bridge between February 1 and June 30, the contractor will not be able to work within 300 feet of the nests. Any loss of work days due to the Peregrine Falcons nesting on the bridge will not be a basis for the D/B Team to request a change order for either an increase in fee or time.
4. When the construction of the new superstructure is complete, the Contractor shall coordinate with KYTC, INDOT and KDFWR for the installation of a new falcon nest box on a bridge pier. The falcon box will be provided and installed by KDFWR.
5. The Contractor shall design and construct a locking barrier that will restrict access to the new falcon nest box by the general public.

4.0 MEASUREMENT. No measurement will be taken for this special provision.

5.0 PAYMENT. Payment for the completion of activities associated with this special shall be included in the pay item, "Design / Build, LSUM" provision. The Department will consider payment as full compensation for all work required in this provision.

DESIGN/BUILD LUMP SUM

The Design/Builder shall divide the total costs for all pay work specified as Design/Build LS into 2 equal parts to be bid as:

Payment will be made under:

Pay Item	Pay Unit Symbol
Design/Build #1	LS
Design/Build #2	LS

The two items shall have the same unit price and will each represent 50% of the work specified as "Design / Build, LSUM" in the Contract. Payment will be made for "Design/Build #1" until the total percentage of the Contract completed exceeds the distribution of cost associated with Design / Build #1. Following complete payment of Design / Build #1, payment will be made for "Design / Build #2 for the remainder of the Contract.

Should the Design/Builder fail to bid these items in equal lump sum amounts the Department reserves the right to reallocate the total of the two items equally and make payment on that basis.

OPEN TO UNRESTRICTED TRAFFIC

SECTION 101, BEGIN LINE 308, DELETE AND INSERT AS FOLLOWS:

101.33 Open to Unrestricted Traffic

The condition that exists when all pavement work is completed, including surface courses, and shoulders, *but not including sidewalks*. All safety features including guardrail and signs are in place, ~~and pavement markings are in the final marking pattern~~. A minimum of one 12 ft. lane of vehicular traffic in each direction shall be provided on the bridge. Completed shoulders may be used for construction purposes.
