FOREWORD

The General Instructions to Field Employees (GIFE) manual is intended for use by field personnel assigned to Indiana Department of Transportation construction projects.

The purpose of the manual is to establish standard procedures for construction administration and inspection activities with the intent that field personnel will carry out their duties in a uniform manner throughout the State.

There are many areas that are not yet covered by this manual and in general, standard Department practice should be followed in lieu of specific instructions until those areas are addressed. Field personnel should contact their supervisor with specific questions about procedure.

These instructions cannot cover every contingency and field personnel are expected to use their best judgment in dealing with the specific and unusual situations that arise on any project. However, Department personnel are expected to apply these established procedures to the best extent possible on any given project.

The use of this manual by others is solely at the risk of the user. The Department does not warrant the accuracy of the contents of the manual or any of its supporting material.

Questions about the instructions and suggestions for improvement should be directed to the Division of Construction Management.
The GIFE will be revised as necessary to keep information current with Department standards, policies and procedures.

When a revision is issued, the new or revised information will be indicated by highlighting and the revision date will be noted next to the title of the subsection revised. The revision date in the upper right hand corner of each section will be changed to indicate the latest revision date of any subsection within the section. If an entire section or subsection is added, only the section or subsection title will be highlighted, otherwise only the new or revised text will be highlighted. Highlighting will be removed from the revised portions once a subsequent GIFE revision is issued.

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SECTION 1 – INTRODUCTION

1.1 ACRONYMS (Rev. 01-21-14)
Whenever the following abbreviations are used in this manual, standard specification, or citation they are to be construed the same as the respected expressions represented.

AASHTO American Association of State Highway and Transportation Officials
ACI American Concrete Institute
ADA American Disabilities Act
AE Area Engineer
AMRL AASHTO Material Reference Laboratory
ATSSA American Traffic Safety Services Association
AWS American Welding Standards
CCO Construction Change Order
CCT Construction Certified Technician
CM Construction Management (Division)
CMD Concrete Mix Design
CO Central Office
CRC Continuous Reinforced Concrete
CRI Cost Reduction Incentive
CTT Certified Testing Technician
CWTS Certified Worksite Traffic Supervisor
DBE Disadvantaged Business Enterprise
DCD District Construction Director
DDC District Deputy Commissioner
DDCM Director, Division of Construction Management
DHPA Division of Historic Preservation and Archeology
DMF Design Mix Formula
DMT District Materials & Testing
DMTE District Materials & Testing Engineer
DNR Department of Natural Resources
DO District Office
DT District Traffic
DTE District Traffic Engineer
EEO Equal Employment Opportunity
ES Environment Services
ESAL Equivalent Single Axle Load
ESC Erosion and Sediment Control
FCR Final Construction Record
FE Field Engineer (CO Construction Management Division)
FHWA Federal Highway Administration
FOB Free on Board
GIFE General Instructions to Field Employees
HMA Hot Mix Asphalt
HT Highway Technician
IA Independent Assurance
1.2 ORGANIZATION  *(Rev. 07-31-15)*

Our particular organization begins with the inspector/Highway Technician (HT). Fundamentally, every employee assigned to construction duties is an inspector — first, last and always. This fact should be remembered by the PE/S.

The inspector/(HT) is under the supervision of the PE/S. The inspector/(HT) will receive instructions and daily assignments from the PE/S. Within the scope of an assignment, the inspector/(HT) will keep accurate records of all activities and prepare reports as required. In order to have satisfactory accomplishment of any task, it is important that the individual has a thorough knowledge of the specifications. In the event of disagreement or misunderstanding, consult with the PE/S for interpretation and clarification of the specifications.

Inspector/(HT) are representatives of State government; and therefore, should perform their duties with a high standard of conduct. This requires courtesy in their relations with both the construction employees and those public citizens with whom they come in contact.

Keep in mind that the Contractor also works through an organization. Therefore, questions or suggestions should ordinarily be made to the Contractor’s regularly designated supervisors. In their absence instructions of a minor nature may be given to individual workers involved. Do not waste the foreman’s or worker’s time by carrying on unnecessary conversation with them during work activities.

Assistant PE/S occupies a status similar to the inspector/(HT) in that they too shall be a qualified inspector; and at the same time be prepared to assume any of the PE/S’s duties that may be assigned or delegated.

The PE/S is in local charge of the project representing the Indiana Department of Transportation and is responsible for the project’s orderly operation of the state’s responsibilities:

(a) specification enforcement and interpretation
(b) interpretation of plans
(c) contacts with the public
(d) inspection of construction
(e) preparation and filing of records
(f) reports and estimates.

The PE/S should keep the project staff informed of project activities as stated above. The PE/S is responsible and accountable to the DDC and any authorized representatives. The PE/S is supervised by the AE who is the State employee in responsible charge of project supervision. The AE is supervised by the DCD who is supervised by the DDC.

Responsibility cannot be delegated. The inspector/(HT) and assistant PE/S are placed on the project to assist the PE/S in carrying out the duties. It is not enough to merely give instructions; you must follow up to see that your instructions are being carried out.
The District organization has similar responsibilities to the Chief Engineer through the DDCM and staff. The Chief Engineer is responsible to the Commissioner, who is responsible to the Governor. It is essential to efficient operation of a large organization of this kind that instructions and decisions come through established channels. It is likewise essential that all personnel assume and carry out their respective duties and assume their allotted responsibilities to the fullest.

The District construction organization is expected to make all decisions within their authority. Only after a problem is thoroughly discussed by the PE/S, AE and DCD and they have concluded that they need assistance in solving their particular problem should the FE be contacted. The DDCM should not be contacted directly unless an emergency exists and the FE cannot be contacted.

The Contractor should be encouraged to work with the District construction organization to solve problems that may arise on projects. For example, the District will have to obtain CO approval on all changes in plans.

The PE/S should not exceed the provisions of the specifications. The provisions of the specifications are to be enforced, but the management of the work is the responsibility of the Contractor. In simple language, the State personnel are inspectors and not foremen and can tell the Contractor what is required, and the Contractor will determine how to do it. Continuous inspection of the work in all its phases is imperative. The time to correct improper work is at the beginning. Do not wait until the work has been completed.

In carrying out your duties, you will be governed by the SS, SP, plans, and such other verbal or written instructions as you may receive from time to time. A Contractor’s statement that they were permitted to do something on another job should not affect your judgment on decisions if it is contrary to the specifications.

In case of discrepancy, the coordination of plans, SS, supplemental specifications and SP must be followed as outlined in Section 100 of the SS. If a discrepancy or conflict is discovered, the PE/S is to be advised without delay.

There are changes and revisions necessary to keep the specifications and SP up to date. It is important that the specifications and SP for each contract be reviewed.

It is not expected that you know the specifications and SP specifically word for word, but it is expected that you read them and study them sufficiently to have a working knowledge of their contents, and can, when need be, locate the various items pertaining to your work.

**1.3 PUBLIC RELATIONS** *(Rev. 09-14-16)*
There is one important phase of our work that is common to all personnel and that is public relations. Frequently, project personnel have direct contact with the public in some aspect of our work.
In the exercise of our jobs we will encounter property owners and others who will have questions, complaints, and problems. Many of these we cannot solve, but some we can explain and correct. In any event, we can deal with these people in a courteous manner. If the question or problem is beyond your jurisdiction or is from a media source, direct the question or person to the District Public Information Office (PIO).

1.3.1 PE/S Communication Guidelines
These instructions provide guidelines to the PE/S in order to conduct appropriate internal and external communications related to contract matters.

The PE/S should remember that all forms of written communication reflect on the professionalism and integrity of the individual, the reputation of the Department and may become public information or used as evidence in legal proceedings.

All information that is necessary for complete documentation of project construction should be reported factually without the addition of personal opinions, editorial comments or criticism of individuals, companies or INDOT. The PE/S should discuss any concerns regarding the project with the AE.

Specific guidance for various types of communication is provided as follows:

(a) **Daily Work Reports.** Daily Work Reports (DWRs) and Diary entries in SiteManager should include all information necessary to provide a complete description of the construction activities that occurred on the job and any problems encountered. These reports may become public through requests for information and will be used to substantiate and evaluate claims submitted by the contractor.

It is important that sufficient detail is provided to establish the level of effort provided by the contractor and any problems encountered on the project or with the performance of the contractor. For each day of work, accurate information should be provided concerning weather and impacts to the ability of the contractor to perform work on the controlling operation. Information must be recorded that reports the work effort of the contractor and approved subcontractors with details about the number of personnel and equipment. Individual construction reports can then be generated from SiteManager for selected dates of the contract. This is a valuable tool in the analysis of claims and requires accurate information to be provided.

Problems encountered on the project should be described in sufficient detail to establish when the changed condition or other problem was identified, the decisions and actions needed and what resolutions were obtained. Communication through the AE to the PM should be documented for major problems and change order decisions. Any concerns with the decisions reached should be discussed with managers but not editorialized in the report.
For problems encountered with the contractor’s performance, factual statements of the problem should be made that are compatible with ratings and comments provided in the Contractor Performance Evaluation System (CPE). Individuals or companies should not be criticized in a personal or unprofessional manner.

(b) Email communications. Emails can be an efficient tool used to exchange information and provide written documentation of the exchange. Email communications should be written in a concise and professional demeanor. All email communications should contain information in the subject line that clearly identifies the contract number and issue. If future requests for information require searches for emails, it is very difficult and time consuming to perform searches of emails without complete subject headings.

Similar to DWRs, emails may also become public information. Individuals, management decisions or companies should not be criticized in emails. When seeking information from a contractor by email, state the question(s) as briefly and clearly as possible in a new, original email written directly to the contractor. Do not forward long chains of internal communications. These internal deliberations may contain other information that does not directly pertain to the question for the contractor and could create confusion or concern about the nature of the request. Furthermore, internal emails may also contain opinions, strategy, or assessment information about the responsibility for a problem which may compromise the Department’s position in future negotiations, if forwarded.

(c) Requests for Information. When responding to requests for information, the PE/S should make sure that the request has been submitted through the INDOT Division of Legal Services. Respond to the request by replying directly to, and only to, the INDOT staff member who initiated the request. Do not provide copies of any project documents directly to citizens, media, vendors, contractors, or others. If one of these external entities makes a direct request for information to you, refer them to the proper channels for making such a request. Calculations, shop drawings, layout details, unit costs, and mix designs should all be considered proprietary information and not released.

1.4 SAFETY (Rev. 11-14-17)
Safe Production is the most important component of highway engineering. It enters into design, construction and maintenance.

A prime consideration of any contract is to provide for the safe and orderly movement of traffic through the work zone, while allowing the contractor to maximize production. All employees must continually look for opportunities to enhance safety at any point during a project and do their utmost to build safety into our highways following sound principles during construction.
The control of traffic movement should be a major topic of discussion at the pre-construction conferences on all contracts. The traffic control plan as shown in the plans must be reviewed and discussed with the Contractor. If conditions warrant an additional review of the traffic control plan, the Area Engineer must be contacted and review necessary changes. The PE/S is responsible for monitoring the traffic control for the Department. The Contractor is required to designate at least one employee as the Work Site Traffic Control Supervisor to be accountable for the over-all traffic control on the project. At all pre-construction conferences the Contractor must verify certification of the Traffic Control Supervisor and provide contact information for the referenced individual. Proper installation and maintenance of traffic control devices is an important phase of a project; thereby providing safety measures for the traveling public and all employees. Strict and consistent enforcement of the specifications and regulations pertaining to the erection, maintenance and removal is critical to ensuring the well-being of workers and the traveling public. Ensuring adherence to the traffic control plan and enforcement of the specifications is a major responsibility of the PE/S.

Run overs and back overs constitute the highest incident rates for fatalities in construction. Therefore, safety within the work area is as important as safety for the motoring public. Discussions regarding entering/exiting locations, the parking of personal vehicles, use of cell phones, and movement of equipment through the job must be discussed prior to the start of work. When a new phase is implemented, this same discussions must be held again. The increased maneuverability of heavy earth moving equipment has resulted in the necessity for additional safety measures. HTs performing soil compaction tests should be aware of the equipment movement patterns and keep a state vehicle close to the test location if possible.

The Indiana Manual of Uniform Traffic Control Devices supersedes the Manual of Uniform Traffic Control Devices (Federal). Refer to these manuals for additional information and diagrams. Both are located on the Safety website. If additional information is needed, the local Safety Director or the Statewide Safety Division should be contacted.

1.5 OCCUPATIONAL SAFETY FOR CONTRACTORS (Rev. 11-14-17)
The Department’s employees are expected to be safety conscious and aware of reasonable safety standards and shall cooperate with the Department’s Safety personnel and IOSHA in the area of occupational safety and health hazards.

If Department personnel observe what appears to be an obvious violation of the Safety Standards, it should immediately be brought to the attention of the Contractor’s job superintendent. All accidents, incidents, or Contractor’s injuries involving safety must be fully documented in the PE/S diary section of the Daily Report. A copy of the Daily Report which documents the apparent violation must be sent to the DCD and local Safety
Director or Statewide Safety Division within one day of the incident. It shall also be documented on this report if correction of the apparent violation has been initiated.

If the apparent violation is not corrected the PE/S will immediately contact the local Safety Director or Statewide Safety Division informing them of the potentially dangerous violation.

Construction Department personnel should not make judgments or interpretations of complex safety standards. The Department’s safety personnel will collaborate with the Contractor and PE/S to mitigate any safety hazards. If the Department’s safety personnel determines that a violation exists, the PE/S will cooperate with implementation for correction.

1.6 FEDERAL HIGHWAY ADMINISTRATION (Rev. 03-24-09)
Many of our projects utilize federal funds; however, federal involvement may not be included. Only those projects designated by The Department will involve federal oversight. Waiver of federal oversight will be indicated on the Proposal Page of the contract documents.

Federal oversight includes but is not limited to the following:
   (a) Pre-construction conference
   (b) Partnering meetings
   (c) Change order approval
   (d) Time extensions
   (e) Problem resolution
   (f) Pre-final inspection
   (g) Claims
   (h) On site project reviews
   (i) Contract acceptance

1.7 UTILITY RELOCATION PROCESS–CONSTRUCTION PHASE (Rev. 03-24-09)
The following coordination process must be used for all Department let contracts. The PE/S must oversee this process. The steps are as follows:

1. Initiate right-of-way staking, if applicable. In cases where early staking would be beneficial, the owner may choose to accomplish this as follows:
   a. Use its own survey crew.
   b. Contract the staking out.
   c. Include a provision in the contract requiring the contractor to stake within two weeks of notice to proceed.

2. Pre-construction Conference. Agenda must address utility coordination and need for individual utility meetings. Contractor and utility schedules shall be shared, reviewed, and modified as necessary.

3. Individual utility meetings for major concerns, if necessary.
4. Contractor performs clearing, right-of-way staking, etc., required by the contract special provisions for utility relocations, within _______days after the pre-construction conference. (The number of days is determined by the special provisions and/or at the pre-construction conference.)

5. Plan changes during construction, including changes in phasing, must be coordinated with affected utilities before implementation.

6. Utilities relocate in a timely manner.
   a. Utility progress meetings are held when appropriate.
   b. Utility notifies owner and contractor of relocation plans changes.

Encourage utilities’ participation in partnering concepts to help create teamwork with open and honest communication.
SECTION 2 – GENERAL INSTRUCTIONS

2.1 CONSTRUCTION INSTRUCTIONS (Rev. 05-03-17)
These instructions are intended to assist in the interpretation of the contract documents. These instructions do not supersede or amend the contract documents and hold no contractual obligation on the contractor. These instructions are intended as requirements for Department personnel under most circumstances encountered during a project. When the instructions do not accommodate a specific issue or are not followed in a particular instance, the reason for deviating from the instructions should be clearly documented so those who may review or audit the project records can understand the reason for the deviation.

Updating the GIFE is an ongoing process. Sometimes additional or revised instructions will be issued by means of Construction Memorandums. Such memoranda will become as binding on the project personnel as these instructions. A full listing of current Construction Memorandums is available on the Department’s website.

These instructions are intended to cover the construction features of the work that have given the greatest trouble in the past, the preparation of forms, reports and records pertaining to the progress, description, and records of work performed.

All questions related to matters pertaining to construction proper, such as alignment, grade or structure changes, interpretations of the specifications, matters pertaining to materials and tests etc., should initially be addressed to the AE.

2.2 CONTRACT (Rev. 07-15-14)
A copy of the Contract Information Book, CIB, will be furnished to the PE/S. The CIB will include a proposal page and the Schedule of Pay Items for the contract. In addition, the CIB may also include plan sheets, Recurring Plan Details and Special Provisions. Additional information about permits, asbestos investigations, etc. may also be included. It is essential that the CIB be reviewed so that the correct specifications will be used. The PE/S should also be familiar with the hierarchy of contract documents as shown in section 105.04.

The contract may be adjusted as necessary and as approved by the use of a change order.

A set of plans must be marked in red as construction progresses to show all changes that have been made during construction. These plans are to be labeled “As Built” and are to be submitted to the DO with the FCR.

In general, "As Built" plans are to be produced by the PE/S unless a SP requires the contractor to prepare the plans. If this is the case, final payment of the contract will not be made until the “As Built” plans have been submitted to the PE/S.

2.3 INITIAL DUTIES OF THE DISTRICT (Rev. 05-25-18)
The DO will notify all utilities, governmental units, railroads, and any other organization utilizing the right-of-way, of the planned construction and invite them to the pre-
When the contract is let, the DCD will write a letter to the County Surveyor of the county or counties in which the contract is located. The letter will ask the county official to advise the DO, by letter, of the locations of any established corners and legal drains that fall within the limits of the project. The letter to the County Surveyor will be sent by certified mail with return receipt requested. Transmitted with the letter should be a strip map showing the locations of the project (similar to the detail on the title sheet of the plans). This letter should quote the following from IC 8-23-9-24:

“If in the construction or maintenance of a state highway it is necessary to remove or bury a monument marking or evidencing an established corner, the department shall cause to be set in the pavement or right-of-way at the place where the monument was located a monument capable of activating a metal detection device. The top of the monument must be level with the pavement or the grade of the right-of-way. The department shall cause a memorandum of the monument to be filed in the county surveyor’s office of the county.”

The law requires the construction of a monument wherever it is necessary to remove or bury an established corner. An established corner has been interpreted to mean any land section, 1/2 section corner, etc., or any property corner, provided such corner has been officially established by a person authorized by law. In general, only a County Surveyor or a professional land surveyor has authority to officially establish corners.

A pre-construction conference must be set-up with the contractor for a date prior to the beginning of the first work. The time and place for the meeting should be sent to all parties, on whose part action will be required in the construction of the work. This should be far enough in advance for them to arrange their representation. The following entities should be notified of the pre-construction conference.

1. Contractor
2. District Construction Office staff
3. District and Central Office Production
4. Consultant Designer (if applicable)
5. Project Manager
6. Division of Construction Management
7. CO and District Utility Section
8. All involved utilities
9. CO and District Environmental Services
10. Permit Agencies (e.g. IDEM, USACE, IDNR when applicable)
11. District Office of Materials and Tests
12. District Public Information
14. District Safety

For some of the above, the notice will be largely informational, permitting them to select the pre-construction conferences at which they wish to be represented. The following must
also be notified when they have involvement in the project:

Local officials should also be invited to INDOT pre-construction conferences if work will have an impact on their community.

1. FHWA (if not exempt from FHWA oversight)
2. County officials
3. Municipal officials
4. Design Consultant
5. District Local Programs Coordinator
6. District Environmental Scientist
7. Railroads
8. Affected industries.

On contracts where the pre-construction conference may be lengthy and the attendance large, the meeting should be scheduled such that matters of interest mainly to the State and contractor may be discussed after other representatives have addressed their concerns for the project and have been given the opportunity to leave the meeting.

At the pre-construction conference, lines of authority for all parties involved in the work should be clearly defined and determinations made as to notifications in emergencies. The contractor should be advised as to the authority of the PE/S on the job, compliance with specifications, and that its cooperation will be expected in these respects. The contractor must be prepared to submit the required project schedule at the meeting. An effort should be made at this time to coordinate the contractor’s schedule with utility schedules, permit schedule restrictions and with the interests of others affected by the construction. All problems cannot be resolved or even anticipated at the pre-construction conference, but known problems should be recorded at this time so that work toward early solutions can begin.

On Federal aid projects, the contract EEO requirements should be discussed; calling attention to the required posters, equal opportunity employment practices, payroll requirements, including the three year preservation clause and that subcontractors and temporary plant operations are governed by the same regulations as the prime contractor. On State funded projects, the discussion of the MBE/WBE requirements for the project must take place.

Environmental concerns should also be discussed at the pre-construction conference. INDOT Environmental Services has developed a checklist for the use of the District and PE/S. The checklist is included for informational purposes and is located in 2.5.1. It is primarily the responsibility of the PE/S to ensure that the contractor has properly implemented and maintained the storm water management plan and other requirements of all environmental permits acquired. The PE/S should consider utilizing storm water specialists and environmental managers within the district or INDOT Environmental Services at Central Office for additional information on proper placement, implementation and, maintenance of storm water management features if questions arise. Reference should also be made to 3.1.
If there are any questions or difficulties in the identification of such features for specific projects, Construction Management should be contacted in advance of the pre-construction conference.

Minutes of the pre-conference must be kept and copies provided to all those in attendance within three business days. A copy must also be included as an attachment to SiteManager.

Section 2.4 provides a sample list of topics for the pre-construction conference that should be included on typical contracts. Items may be added and deleted as necessary to address the issues on any individual contract.

2.4 LIST OF AGENDA ITEMS FOR PRE-CONSTRUCTION CONFERENCES
(Rev. 02-12-18, edited 05-29-18)
A link to a complete check list of agenda items can be found in section 90 of these instructions or at: [www.in.gov/dot/div/contracts/standards/GIFE/PCCA.pdf](http://www.in.gov/dot/div/contracts/standards/GIFE/PCCA.pdf)

2.4.1 General

1. Introduction period.

2. Attendance roster (names and representation).

3. Authority of state and contractor representatives and chain of command. All parties (including key subcontractors) must disclose levels of authority within their organization both in terms of decision-making authority and monetary authority. Discuss where to go for information as well as for decisions. Also, discuss whether the contractor’s superintendent will be a hands-on working superintendent who is part of a field crew or primarily a manager. Review specification requirements for a superintendent.

4. Authority of contractor’s personnel signing vouchers and estimates, and contract responsibility for construction operations (Form IC 113 – Signature Affidavit).

5. Establish time frames for making decisions and problem resolution. Identify any areas where prompt decisions are critical to keeping the job on schedule.

6. Both the Department and the contractor should share information about (1) personnel who are in new positions of authority or new to their organization; (2) use of trainees; and (3) use of inexperienced subcontractors.

7. Periodic progress meetings. Determine how often progress meetings should be held, who should participate, who will conduct the meeting, and who will keep minutes. Develop checklist of agenda items that should be covered at each meeting.
8. Discuss special provisions, plans, specifications, and public relations in general.

Review recent specification changes that are applicable to the contract. Discuss unique SP to make sure the intent is clear. Examine any new procedures, methods, or materials that are required by the contract to make sure there is complete understanding of how the procedure is to be performed or the material used.

9. Discuss sampling and testing materials in general; emphasize joint responsibility of state and contractor for timing of delivery and sampling, and that material must be approved prior to use.

10. Discuss contractor’s plan, equipment, construction schedule and review time allowed for completion of contract.

11. Construction Engineering. Discuss what work will be performed by the construction-engineering subcontractor, any layout that will be handled by the prime contractor or other subcontractors. Discuss any additional layout that is needed and coordinate on how it will be handled. Discuss whether GPS will be used for construction engineering and how required staking for checking the work will be handled.

12. Contractor’s operations with respect to utility installations and utilities plans for cooperation.

13. Traffic control, signs, barricades and information signs need to be discussed.

14. Prime contractor’s responsibilities pertaining to subcontractors.

15. No work to be performed prior to award.

16. Railroad agreements and work to be performed by railroad forces. Coordinate with contractor’s schedule and vice versa.

17. Storm Water Management, and appropriate features and sequencing. Include identification of the contractor’s Storm Water Quality Manager, and a review of the contractor’s Storm Water Quality Control Plan (SWQCP) which should include inspection and maintenance of storm water devices, sequencing of E&SC measures, staging of the work, contract commitments, etc. (For more additional detailed information please see 2.5.1, and 3.1).

18. Discussion of all environmental permit requirements including 327 IAC 15-5, U.S. Army Corps of Engineers, IDEM, US Fish and Wildlife and any others. Discuss methods of performing work within or adjacent to regulated resources and within or adjacent to the INDOT project construction limits.
while maintaining compliance with the environmental permits. Discuss periods when certain work is not allowed, such as work in a stream, tree clearing, and threatened and endangered species restrictions. All waiver requests such as fish spawning or Indiana Bat tree clearing will need to be requested by the contractor through INDOT Environmental Services. Any revisions the contractor needs to make to the SWQCP will need to be submitted through INDOT ES as well. (For more additional detailed information please see 2.5.1 and 3.1.3).

19. Plan design features involving hydraulics, hazardous materials, and vegetation plantings and establishment timelines.

20. If contract involves demolition work, remind contractor that it cannot enter a parcel without written “Notice to Proceed with Demolition Work,” as specified in section 108.03 of the Standard Specifications.

21. Change order, time extension, and progress payment procedures. Make sure all parties understand the change order approval process.

22. Discuss expected quality of the final product.

In addition to the list above, the following items may apply to specific types of contracts.

2.4.2 Bridge Contracts

1. Bridge Inspection Requirements.
2. Right of way fences.
3. Cofferdams.
4. Railroad force account work.
5. Falsework.
6. Piling and pile driving equipment.
7. Field books (for all field notes).
9. AWS welding specifications.

2.4.3 Federal Aid Contracts

1. Discuss how payrolls will be submitted. Discuss numbering of payroll reports and that no report is required for any week that a contractor is not active on the site.
2. Civil Rights Commission Reports.
3. Informational signs.
4. Display board (payrolls, equal rights, environmental permits).
5. FHWA prior approval of Change Orders before performing work.
6. Cooperation with FHWA field engineers and review teams.
2.5 INITIAL DUTIES OF PE/S *(Rev. 05-25-18)*

Listed below are some of the first duties of a PE/S upon being assigned to a project.

(a) Before entering upon any property, check to see if the right-of-way has been secured and INDOT has a right of entry. The special provisions of the contract should state this information. If right-of-way has not been secured for any parcel, instruct the contractor and assigned project personnel not to enter the parcel.

(b) Determine from the plans whether or not a detour will be required during the construction of the project. If it is required, check the plans against the standards to ensure that all required route markers, signs, and barricades will be correct and in place before the traffic is detoured.

(c) If construction engineering is not a part of the contract, run the centerline and set the grade stakes, as specified under Section 3, Grading, of these instructions, as soon as possible after assignment to the project. This is desirable in order to permit the property owners, utilities, etc., as long a time as possible to move their fences, buildings, pole lines, etc. If the contract has not been awarded, stakes can be secured from the DO, a count being kept of the number of each size obtained so that the contractor can “repay” with like number and kind during the life of the contract, as the contractor is required to furnish all necessary stakes.

(d) Approximately ten days before the monuments are to be set, the County Surveyor is to be contacted by the PE/S and given the opportunity to be present during placement or to check the monument shortly thereafter. The PE/S should document on the daily report details in regards to monuments and with respect to contacts made with the County Surveyor.

The preservation of corners is vital. Failure to take care of this feature of the work is unacceptable.

(e) Start early to locate all farm drain tiles as this is a slow process and requires perseverance. Contact all property owners and enlist their help in locating farm drain tile on their property.

(f) Check through the AE to see if there are any utility or railroad agreements pertaining to the project. Keep in close contact with the utilities and railroads so they can be advised at all times of construction progress and plans, and stay ahead of the contractor’s work with their work.

(g) Note any mailboxes that will need to be replaced either permanently or temporarily due to the project.

(h) It is essential that the contractor provide a suitable office for the PE/S as soon as possible. The PE/S should review the proposed office location for
safety, security, parking and accessibility prior to approval. The office size should also be reviewed for compliance with contract provisions.

(i) Other State and Federal agencies have areas of concern that fall within our project limits. This is particularly true where rivers, streams, wetlands, ponds, lakes, floodplains or other drainage features are concerned. By law, these agencies have extensive permit and approval powers over construction wherein hydraulics, the environment, or the ecology is concerned. When designers prepare plans for a contract they, in many cases, included features necessary to secure such permits or agreements. For this reason it is vital that construction of the contract be accomplished in accordance with the plans. To ensure that project personnel are aware of special environmental requirements, IDEM permits, U.S. Army Corps of Engineer permits, and Indiana Department of Natural Resources permits, copies of these documents are available on the Department’s website. The PE/S should review all preliminary engineering reports and environmental documents prior to the pre-construction conference. The PE/S should also be familiar with and utilize INDOT’s Storm Water Quality Field Guide, and IDEM’s Storm Water Quality Manual. In the event the plans have not addressed any conditions of those special documents, or if field conditions appear to have not been properly addressed regarding environmental concerns, the PE/S should contact the AE for guidance on making any necessary changes. The District Storm Water Specialist, District Environmental Scientist, the Division of Construction Management, and the Environmental Services Section can also provide assistance. Changes to the contract work that may violate the environmental requirements are not permitted without submittal and review by INDOT Environmental Services and approval from the appropriate authorities.

(j) **The contractor shall prepare a Materials Source List for the contract. It shall be submitted at the pre-construction conference.**

(k) On all contracts involving Federal participation, Forms FHWA 206, FHWA 809 with attached minimum wage rates, EEO Discrimination Poster, and the contractor’s EEO Policy are required to be placed and maintained on an all-weather bulletin board. All of the above forms, except the contractor’s EEO Policy, will be stocked in the DO for project distribution. The Wage Scale Determination will be supplied in the contract. It is the PE/S’s responsibility to see that the contractor is adequately supplied with the required forms and that copies of each plus the contractor’s EEO policy are properly posted by the contractor in a conspicuous location on the project.

(l) The PE/S shall prepare Form IC 662, Report of Crop Damage, when a crop is actually destroyed. This report should be prepared and submitted as soon as practical after a crop has been damaged and it should show sufficient dimensions to compute an exact acreage.
(m) If an accident occurs on a project the PE/S will contact the police agency involved to obtain an accident report.

(n) Accident reports need to be reviewed to determine if recurring problems require changes to the current traffic control. The accident reports should be scanned and included with the daily report for the date of the accident.

(o) The contractor must identify and submit for approval the location of all borrow and waste disposal sites. The PE/S must review the submittal for compliance with the specifications. Form IC 203, Request for Acceptance of Borrow or Disposal Site, is available on the Department’s website and must be completed by the contractor for each proposed site. The PE/S must review and sign the form if approved. Questions about borrow or disposal sites should be directed to the AE.

2.5.1 PE/S Environmental Services Permit(s) Checklist
The checklist has been developed to help support project delivery and keep the project in compliance with environmental requirements.

Before PRE-CONSTRUCTION CONFERENCE

**PE/S initial permit review**
1. Locate project specific permits and commitments online.
2. Print permits and review conditions that must be followed during construction.
3. Note on the plans any identified waterways or areas of special concern and areas with commitments.
4. Note the name of permit applicant (INDOT or LPA for non-INDOT projects) and contact number or email.
5. Contact the permit applicant (INDOT or LPA) with any questions/concerns or proposed revisions to the permits.

During PRE-CONSTRUCTION CONFERENCE

**Discuss expectations for permit compliance including**
1. Review permits and commitments with the contractor and document any conflicts with the plans or the contract.
2. Compliance with all permit conditions is required during construction.
3. Offsite movement of sediment violates multiple waterway permit conditions.
4. Permitting procedures for offsite borrow and waste areas; because these are off the R/W, local requirements need to be followed by the contractor.

**Discuss issues related to permit modifications/waivers that may be needed including**
1. Communicate any modification/waiver needs to the permit applicant. All modification requests must be made through INDOT ES for INDOT contracts.
Potential contractor permit modifications/waivers may include: temporary impacts (stream crossings, causeways, pump-arounds), waivers (fish
spawning, Indiana Bat tree clearing restrictions), additional temporary or permanent impacts inside or outside of the construction limits, IDEM Notice of Intent (NOI) amendment, etc.

2. Sequencing project construction phasing with the SWQCP.
3. Documentation and notification requirements of changes in the SWQCP.
4. Allowing time for processing by INDOT ES and regulatory agencies; may take several weeks or longer.

Discuss utility companies’ responsibilities for environmental compliance and permitting impacts related to their work.

During CONSTRUCTION

Contractor’s Initial operations (clearing/demolition)
1. Post all permits on the bulletin board prior to the start of construction.
2. Install perimeter control measures prior to land disturbing activities.
3. Install any needed temporary storm water management measures for clearing/demolition.

Non-permitted impacts
1. Obtain knowledge of all permit conditions and the stream/wetland/pond/lake/floodplain/habitat impacts that are permitted.
2. Do not impact any natural resource not in the permits or exceed impacts to natural resources listed in permits without consultation with INDOT ES.
3. PE/S should spot check off-site borrow/disposal areas for permit compliance.
4. Comply with Indiana Bat tree clearing restrictions IF REQUIRED (no clearing April 1 - September 30).
5. Comply with fish spawning season restrictions IF REQUIRED (no in-stream work April 1 - June 30).
6. Direct questions/concerns during construction to permit applicant (INDOT or LPA).

Storm Water Management
1. Perimeter control measures should be in place prior to land-disturbing activities.
2. Focus should be on erosion control measures first (these measures are less expensive and more efficient); sediment control measures should be a secondary focus (these measures are expensive to install and are less efficient).
3. PE/S should spot check weekly/rain event inspections reports provided by contractor for accuracy.
5. Ensure the storm water management measures used are correctly installed and maintained per INDOT Standard Specifications, and Standard Drawings.
6. Modify the SWQCP as needed to meet field conditions, and, if needed, consult District Storm Water Specialist or Central Office ES Storm Water team for assistance.

7. Review the contractor’s schedule for completing earth disturbing activities and establishment of the required 70% permanent vegetation for reasonableness.

Permit violation response (if necessary)
1. Coordinate with permit applicant (INDOT or LPA).
2. PE/S and the contractor should prepare a formal response detailing corrective action for all violations (Rule 5, etc.).

Mitigation site construction
1. Construct the site as per project plans and communicate any recommended changes to the plans with the permit applicant (INDOT ES or LPA).
2. Direct questions and concerns during construction to INDOT ES for resolution.
3. Contact INDOT ES for plant material concerns or issues.

PREFINAL
Inform District Storm Water Specialist and INDOT ES of Prefinal for discussion of
1. Construction of the contract according to the plans including all compensatory mitigation or restoration areas.
2. Notice of Termination (NOT) requirements.
3. When site inspection reports should end.
4. Final plant material inspection and acceptance.
5. 70% uniform, permanent vegetation density requirement.

RESOURCES:

IDEM Emergency Response
Phone: (317) 233-7745
Toll Free: (888) 233-7745
(http://www.in.gov/idem/files/er_quickref.pdf)

Indiana Storm Water Quality Manual
(http://www.in.gov/idem/stormwater/2363.htm)
Chapter 7: Storm Water Quality Measures: Construction and Land-Disturbing Activities.
Description: IDEM publication that provides the purpose, specifications, installation guidelines, and maintenance guidelines for storm water management. This chapter also includes information on stabilized construction entrances, secure concrete washouts, and stream crossings.
USGS Topographic Maps
(http://viewer.nationalmap.gov/viewer/)
Description: USGS maps can be used when evaluating an area for potential streams (solid or dashed blue-lines).

INDOT Links
INDOT Request for Acceptance of Borrow or Disposal Site (IC 203).
(http://www.in.gov/indot/2735.htm)
Description: The contractor is required to complete this form for any off-site borrow or disposal site. It includes what permits, if any, have been obtained by the contractor and whether or not the site has been cleared of wetlands and archaeological resources.

INDOT, Environmental Services (ES)
Ecology and Waterway Permitting Office
(http://www.in.gov/indot/2522.htm)
Description: The tasks assigned to this section are summarized on this webpage as well as links to Ecology & Waterway Permitting Staff and Permitting Guidance.

2.6 CONSTRUCTION PROGRESS (Rev. 09-08-09)
It is the intent to allow a reasonable length of time for completion of all contracts. The Department has a good record for completing contracts within the contract period. As an incentive for reasonable progress on our contracts, the salaries and other expenses of the engineering forces are assumed by the State during the allotted time of construction. If the contractor overruns the completion date, it is charged a flat rate per day as liquidated damages, not as a penalty, as explained in section 108.09 of the Standard Specifications.

The contractor must furnish an acceptable project schedule in accordance with the specifications. The schedule should be discussed at each progress meeting and updated by the contractor as necessary. It is important that the PE/S review the schedule to ensure that it accurately reflects the activities required and the order in which they will be accomplished.

2.7 SUBCONTRACTS & RENTAL/LEASE AGREEMENTS (Rev. 05-25-18)

2.7.1 Subcontracts
A prime contractor may subcontract the work in accordance with current Federal Regulations and SS. Section 108.01 of the SS states that “The contract, contracts, or portions thereof; or the right, title, or interest therein shall not be sublet, sold, transferred, assigned, or otherwise disposed of without written consent.” Approved subcontractors will not be permitted to further subcontract their work.

All subcontract requests must be sent to the DO for approval. To obtain approval of a proposed subcontractor, the contractor must make a request on Form IC-730 (State Form 4351) “Request for Approval of Subcontractor” by submitting an original of the form to the DO. An electronic version of the IC-730 is available on the Department’s website along with instructions for completion of the form.
There must be a written subcontract agreement between the prime contractor and the subcontractor. A copy of the subcontract agreement must be on file in the offices of the prime contractor and the subcontractor. On Federal-Aid contracts, a set of the applicable Federal Wage Stipulations, Notice of Requirement for Affirmative Action, EEO Special Provisions, Form FHWA-1273 (Federal Contract Provisions) and all applicable contract SP pertaining to the subcontractor’s operation must be physically attached to and become a part of the agreement. On state-funded contracts, the State Wage Provisions and the applicable contract SP must be part of the agreement. These documents must be made available for review by appropriate INDOT or FHWA personnel upon request.

Subcontracting and the timely submission of requests must be a subject for the pre-construction conference.

2.7.2 Field Control of Subcontractors

A subcontractor should not be allowed to start work on the project until approved by the DO. The PE/S may get verbal approval of the IC-730 from the DO and allow a subcontractor to work prior to the IC-730 approval.

The DO and project personnel are responsible for monitoring the EEO requirements for DBE, MBE and WBE programs. Since the achievement of specific DBE participation on Federal-aid contracts is mandated by Federal Regulation, it is necessary that all persons, at whatever level, become very familiar with these instructions.

Emphasis on the utilization of subcontractors requires that special care be taken by the DO and project personnel to insure that the DBE’s are being utilized and are performing as set out in the contractor’s proposal. The specific sheets in the proposal are identified as “DBE Affirmative Action Certification.” On all Federal-Aid contracts, the prime contractor is required to list in its proposal those DBE’s it intends to use to satisfy the DBE Goal stated in the SP of the contract.

The fact that the contractor lists specific DBE’s in the proposal obligates it to use the DBE’s to the extent the listed items are performed under the contract. NO CHANGES OR ADJUSTMENTS TO DBE ITEMS ARE PERMITTED UNLESS APPROVED BY THE DO. At the end of the job, the contractor will be required to certify actual utilization of the DBE’s listed in the proposal. If it cannot certify full utilization of DBE’s for the items listed, it must provide a satisfactory explanation why its commitment was not reached.

With this in mind, the topic of subcontractors, particularly DBE contractors, must be made an important part of the pre-construction conference. A discussion with the contractor and subcontractor, if possible, must be in sufficient detail so the DO and project personnel know what the DBE will be doing. If the DBE is to do the entire contract item, then the DBE is required to do exactly that with no actual work on the item by the prime contractor or others. If on the other hand, the DBE is going to do only a portion of a contract item, then a detailed discussion must be conducted to explain exactly what portion of the item will be performed by the DBE.

Any deviation from performing the “entire” contract item must be explained on the
“Request for Approval of Subcontractor,” Form IC-730. The explanation may be attached to the IC-730 if necessary. In either case, whether the DBE is doing the entire item or only a portion, no work of any nature on the specific item may be done by anyone, including the prime contractor, prior to subcontract approval by the DO. Since the PE/S will be at the job site to observe the contractor and its approved subcontractors, it is absolutely necessary that he or she knows who is doing what on the contract. If any item is not being performed as set out in the proposal, all work on that item must be stopped, unless there is immediate danger to life or the traveling public, until a proper approval or explanation is received.

All subcontracts must be approved by the DO before the subcontractor can be permitted to start work. Although some verbal approvals may be given for DBE subcontractors, the contractor should be encouraged to submit sublet requests early, especially if the DBE is doing “portions” of an item which will require additional explanation. The PE/S shall not permit any other person, whether it’s the contractor’s people or another subcontractor, to perform an item which has been designated in the proposal for a DBE.

If for any reason the prime contractor finds that a DBE subcontractor will not, or cannot, perform as set out in the proposal, the prime contractor must notify INDOT. Since all subcontracts must be approved by the DO, the contractor cannot arbitrarily delete items from the DBE or switch items to another subcontractor, DBE or not, without first obtaining approval. The approval to change or substitute subcontractors will be processed by the DO. All requests for changes from the original listing in the proposal must be in writing from the contractor.

The contractor shall be responsible for electronically submitting certified payrolls for its employees and any subcontractors to the PE/S on a weekly basis. The filing shall be in a format acceptable to the Department. Failure of the contractor to submit a payroll in a timely manner for its employees or any subcontractors may result in the withholding of progress estimates until the certified payroll is properly submitted.

On all Federal Aid contracts, EEO Attachment CM 32-34 signed by the proposed subcontractor must be submitted with the request to sublet.

The successful prime contractor is required to provide the Director of the Office of Federal Contract Compliance Program (OFCCP) notification in writing, with a copy to the Department, of each subcontract they award in excess of $10,000.00. This notification shall include the name, address, telephone number, and employer identification number of the subcontractor. It shall also contain contract number, type or nature of work to be subcontracted, the subcontract dollar amount, the geographical area in which the work is to be performed, and the estimated starting and completion dates.

The notice shall be forwarded to the Assistant Regional Administrator, Office of Federal Contract Compliance Programs, U.S. Department of Labor, 429 N Pennsylvania Street, Indianapolis, Indiana 46204, within ten (10) working days of the award of each subcontract by the prime. The contractor, in its letter to OFCCP, may wish to indicate that it has awarded the subcontract subject to the approval of INDOT. The contractor shall submit a copy of the notification with the IC-730, “Request for Approval of Subcontractor,” in
addition to the required Attachment CM 32-34. The Department will not give approval of
the IC-730 unless accompanied by the OFCCP notification. No work shall be performed
by the proposed subcontractor until the DO has given approval.

The DO will hold the sublet request until the Notice to Proceed is issued.

The DO is to emphasize to the contractor at the pre-construction conference that all sublet
requests should be submitted as soon as possible. Also, the contractors are to be reminded
that all requests are to be submitted through the DO. Any request received in the CO
directly from the contractor will be sent to the DO for approval. All subcontract requests
shall be accompanied by a Certification of Unearned Work completed by the subcontractor.
To comply, the proposed subcontractor must complete the Certification at the bottom of
the back side of the IC-730 Form or the subcontractor may complete a Certification and
submit it separately from the IC-730.

When the dollar value of the subcontract request exceeds $100,000.00 or the unearned
work certificate exceeds $300,000.00, the proposed subcontractor must be pre-qualified
with INDOT. Pre-qualification is not required for “hauling” or for “construction
engineering”. All subcontractors must be approved even though pre-qualification may not
be required.

2.7.3 Rental /Lease Agreements
The purpose of a Rental/Lease Agreement is to allow the contractor to rent or lease a piece
of equipment.

All work not performed by an approved subcontractor must be performed by personnel
hired by the prime contractor and the certified payroll must reflect that the persons have
been paid directly. The contractor or subcontractor is permitted to rent or lease equipment
from other contracting firms or rental agencies as long as there is a bona fide rental/lease
agreement. The agreement cannot contain any provisions that might cause it to be
construed as a subcontract agreement. Such an agreement would be in violation of the
contract.

The difference between a subcontract and a rental/lease agreement is that a subcontract will
stipulate items of work by unit of measure such as: EACH, TON, CYS, LFT, etc., along
with specific quantities and unit prices. A standard rental/lease agreement will stipulate the
basis for payment as an hourly, weekly, or monthly rate for the rental of equipment or
trucks (with or without operators). If the operator is provided by the prime or subcontractor,
the operator must be paid directly by the prime or subcontractor. If the operator is furnished
with the equipment, the operator must be paid by the lessor.

The rental/lease agreements could cover such items as traffic control devices, trucks,
equipment (with or without operators), etc., and the agreement must be signed by the
parties involved and shall contain a statement that this is the only agreement that exists
between the parties.

The PE/S will need to secure copies of the rental/lease agreements from the contractor or
subcontractor when a DBE firm is involved (either as a first tier lessee or a lower tier lessee). Times when a rental/lease will be secured would be when a lease is made with a DBE firm either as the lessee or the lessor; a hauling lease with a DBE firm; a situation where a DBE hauling lessor subleases a portion of their hauling to another DBE firm etc. Rental/lease agreements will also need to be secured by the PE/S if a DBE firm leases to a non-DBE firm. Again, any time a DBE is a part of a rental/lease agreement on a project, an agreement must be secured.

If the PE/S suspects a problem on the project because of a rental/lease agreement with any contractor, subcontractor, lessee or lessor, including non-DBE’s, the PE/S has the right to request and receive the agreement for review. The PE/S should make the request through the Prime Contractor.

Payrolls will also need to be secured from the Prime Contractor by the PE/S for workers involved with rental/lease agreements when the work is covered by the Davis Bacon Act so that it can be determined that the wage rates meet the predetermined wage rates set out in the contract.

Upon receipt of an agreement, the PE/S is to review same to determine if it is a standard rental/lease agreement and if it is, retain the agreement in the project file. If the agreement contains any provisions that seem beyond the scope of a standard rental/lease agreement, such as labor, then it is to be forwarded to the DO for review and interpretation. When the PE/S becomes aware of an obvious violation, the contractor is to be instructed to stop the operation involved until the violation is corrected.

All contracts contain a Special Provision that requires the contractor to 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.

Questions that the PE/S may have on the issue of rental/lease agreements or payrolls related to rental/lease agreements should be addressed to the district’s EEO Officer. The following chart is being provided for added guidance.
## Documents Required: Yes/No

<table>
<thead>
<tr>
<th>Lease Agreements Between</th>
<th>Lease Agreement</th>
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<th>Certified Payrolls Non-Davis-Bacon Act Work</th>
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<tr>
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<td>Yes</td>
<td>No</td>
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<tr>
<td>Prime and Non-DBE Lessor</td>
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<tr>
<td>DBE Subcontractor and DBE Lessor</td>
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<td>DBE Subcontractor and Non-DBE Lessor</td>
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<td>Hauling Lease Non-DBE</td>
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### 2.8 MAINTENANCE OF TRAFFIC DEVICES (Rev. 05-25-18)

The proper and consistent arrangement of all maintenance of traffic devices is very important at all times. Therefore, their arrangement should definitely convey to the traveling public good information for the safe and orderly movement of traffic through the construction project at all times. Poorly constructed, located, or maintained devices are a poor advertisement for the improvement and do not promote good public relations.

The SS and SP indicate under what conditions the various types of devices are to be used. The contract plans indicate the various types of devices that are applicable to the contract.
and the planned location of the devices. However, the contractor is responsible for the field layout, placement, operation, and removal of temporary traffic control devices. The contractor’s Certified Worksite Traffic Supervisor (CWTS) certified by the American Traffic Safety Service Association (ATSSA), or approved equal certifying organization, must direct all field layout, placement, operation, maintenance, and removal of temporary traffic control devices. The CWTS should attend the pre-construction conference to discuss maintenance of traffic issues. The field layout will be reviewed by the Engineer prior to placement of temporary traffic control devices. A copy of the CWTS certification shall be provided to the Engineer prior to the start of the installation of temporary traffic control devices or if the CWTS changes. For contracts where no plans are furnished, the SS and SP should clearly indicate the requirements for the location of traffic control devices. The procedure prior to start of the work should be the same as previously outlined for contracts where plans are furnished. It is recommended the PE/S jointly inspect the first traffic control devices and setup with the CWTS and document the traffic control features. This documentation should list the type of device, location, date erected, date removed or relocated, contract item number, and other information pertinent to traffic control. A sketch showing the traffic control set up may be necessary to thoroughly explain the traffic control plan used.

Under Section 801.03 of the SS, the CWTS is responsible for completing a traffic control device report whenever devices are installed, removed, relocated, or repaired, or a minimum of once per week. The CWTS is responsible for the completeness and accuracy of the traffic control device report form, but the PE/S should verify that the contractor is making a good faith effort to inspect at least on a weekly basis and in submitting these forms. If the inspections are not being done or the forms are not being submitted damages may be assessed in accordance with 105.14.

Judgment is to be exercised in the placement of advance warning signs to ensure adequate sight distance. Some variation in sign intervals may be required to obtain a safe sight distance. See the current Standards and MUTCD for placement of signs. The intent of requiring a CWTS is to ensure the contractor takes responsibility for proper installation and maintenance of traffic control devices.

Advance warning signs should be clearly visible or completely covered, as conditions require. These signs should be moved when the point of interference with traffic changes.

Warning signs need to be located where they are most effective. It is recognized there will be unique conditions that require special consideration: 1) whether the location is paved or conducive to the use of posts, 2) height of mounting, and 3) lateral distance from the pavement. In general, the mounting height of signs and size of posts should be as shown on the Standards for signs and detours.

Sections 105.13, 105.14, 107.12, and 801.03 of the SS call specific attention to the fact that all signs, barricades, and other protective devices must be maintained in satisfactory condition at all times. Poorly maintained devices or devices that are not readily visible to the traveling public are often ignored or can create a safety risk to both the motorist and the worker. The proper and correct construction, erection, painting, lighting,
maintenance of all barrels, barricades, sign standards, and any other signs is the sole responsibility of the contractor. It is a responsibility and duty of the PE/S to make random inspections to assure contract requirements are being followed. Furthermore, the PE/S should conduct a nighttime inspection of traffic control devices the first night they are installed. This is especially true at the start of a phase when a lane is being restricted or a road closed. Traffic control devices that seem to be acceptable during daylight hours are often found to have deficiencies at night. The contractor should be contacted in a timely manner so these deficiencies can be corrected prior to the following night. The PE/S should use the ATSSA brochure “Quality Standards for Work Zone Traffic Control Devices” as an inspection tool.

A temporary traffic control device will be deemed to be in non-compliance when considered unacceptable. A type of temporary traffic control device will be deemed to be in non-compliance when 25 percent or more of the individual devices are considered Marginal. Damages may be assessed in accordance with 105.14 for non-compliance.

The contractor will be immediately notified of any defects and advised of the corrective measures to be taken at once. Any deficiencies noted are to be entered on the Daily Report. The time and date the contractor was notified, and when corrective measures were taken should also be entered on this report.

Temporary Worksite Speed Limit Sign Assemblies are used in areas where the contractor’s work causes a potential hazard, especially during lane closures. Enforceable reduced speed limits at worksites can be established without the Official Action process required for other speed zones. The design, placement, location, operation, measurement, and payment of such sign assemblies must be in accordance with the Standards and Specifications. Worksite speed limits are in effect when the lights are flashing. Such speed limits should not be used for the entire contract unless there is work in progress for the entire length. These speed limits are to be in effect only where and while work is in progress and workers are present. They should not be set up at the beginning of the day if work in that area is not going to be performed. The maximum spacing is 2 mi (3.2 km). The CWTS is required to keep a daily record of the total number and location of signs displayed, using the roadway reference system, the area where each worksite speed limit is established, and the times they are established and discontinued.

On the signature sheet of the contract Invoice Voucher and Progress Estimate, a statement is included as to the condition of barricades, signs, detours, etc. If any of these items are not satisfactory, the estimate should be held at the project office until the unsatisfactory conditions have been corrected. A letter should be sent to the contractor setting out the reasons for holding up the Progress Estimate with a copy to the DO and CO.

2.9 MAINTENANCE OF TRAFFIC (Rev. 05-03-17)
The SP for all contracts normally indicate whether the contract is to be closed to traffic, or whether traffic is to be maintained at all times. In some instances, the contractor will be required to construct certain portions while maintaining traffic and other portions while closed to traffic. Upon assignment to the contract and receipt of the contract proposal, the PE/S should discuss thoroughly the requirements regarding traffic with the AE and the
contractor, or an authorized representative. This conference should be well in advance of the start of any construction operations in order for the contractor to have ample time to make all necessary arrangements to erect the required barricades and standards.

When traffic signals are involved, before starting work, the contractor must provide the names of the Level II Traffic Signal Construction Technicians, the Level II Traffic Signal Field Technicians and Work Zone Traffic Safety Specialists, who have been assigned to perform the signal related work, and a photocopy of each person’s certification card granted by the International Municipal Signal Association (or an approved equivalent).

When portable signals are used, a technician, certified by the manufacturer, shall be available 24 hours a day to respond within 2 hours for the maintenance of the traffic signal equipment. A copy of the certification shall be provided to the PE/S prior to the placement of the portable signals.

The PE/S should conduct random checks to determine that traffic is moving efficiently and smoothly. There should be a clear understanding with the contractor that its vehicles will strictly observe the movement of one way traffic and not be permitted to drive around a line of waiting cars and potentially into the path of oncoming traffic.

It is the intent of the Department to minimize interference with traffic from construction and maintenance operations during major holidays. In order to comply with the intent of this policy, the DDCM may order, in writing, the suspension of work on individual contracts for specific periods of time.

2.10 MAINTENANCE OF TRAFFIC DURING WINTER MONTHS (Rev. 09-08-09)
Section 104.04(b) of the SS states that unless otherwise expressly provided in the contract, existing state roads and other public roads and streets within the limits of the contract shall be kept open to two-way traffic between the dates of December 1 and April 1. The specifications further state that private drive and mail box approaches which are disturbed by the contractor and on which the surfacing has not been completed, shall be maintained in a condition satisfactory to the Engineer during the time work is suspended.

The PE/S must be thoroughly familiar with requirements outlined in the specifications and SP as they pertain to maintenance of traffic. The contractor’s attention should be called to those requirements, pointing out its responsibilities for the maintenance of traffic during winter months. This should be done sufficiently in advance of December 1st to insure adequate time for the proper completion of the surface and the necessary preparation for opening the contract to traffic on the specified date.

2.11 DETOURS (Rev. 09-08-09)
The PE/S should not allow demolition operations to begin on a road until the detour has been established and necessary warning lights, signs, and barricades have been properly placed by the contractor, according to the plans and specifications.

2.12 CONSTRUCTION ENGINEERING BY CONTRACTOR (Rev. 05-25-18)
These instructions are to be used on those contracts, which include the pay item of
Construction Engineering. Construction Engineering is to be accomplished in accordance with specifications covering this specific pay item.

The primary purpose of the item of Construction Engineering is to accomplish the layout and setting of vertical control elevations utilizing the contractor’s personnel. The PE/S in charge of the contract will continue to be responsible for: decisions involving engineering judgment, measurement of pay quantities, inspection, serving as the point of contact for the public. The PE/S is responsible for checking the accuracy of the contractor’s construction engineering as necessary. The degree of checking will vary from project to project. The construction engineering is to be checked and inspected for quality of workmanship in the same manner as any other item of the contract.

The PE/S must check the original cross sections by plotting the elevations taken by the contractor’s crews every 500 ft for complete cross sections and every 100 ft on centerline. Structure locations should be checked after being staked by the contractor. It is good practice for the PE/S to check lead dimensions and bridge grade elevations on all bridge contracts.

As pay items are completed for drainage structures and bridge structures, the quantities should be documented in the project files either in a field book for pay quantities or on standard Department forms and should not be entered in the field book used for staking. An entirely separate field book should be used for measurement of pay quantities such as borrow pits, undercut, and peat excavation. At no time should this book be issued to or used by the contractor.

The staking by contractor personnel is to be performed in accordance with accepted surveying practices. Field notes shall be kept in hard covered bound field note books in a clear, orderly and neat manner consistent with standard engineering practices and in accordance with the Department’s prescribed notebook procedure, including titles, number, and indexes. Such note books shall be furnished by the contractor and shall adequately document all survey information. The field books shall become the property of the Department upon completion of the work. The field books may be inspected by the State project personnel at any time and should be regularly checked for completeness including index, dates, party personnel, and closing of level circuits. Copies of field notes shall be furnished to the Engineer upon request during the contract time.

The contractor’s work shall include re-establishing original survey points, survey centerlines, referencing necessary control points; running level circuits to check original bench marks and setting additional bench marks; setting stakes for right-of-way, culverts slopes, subbase, subsurface drains, subgrade, paving, bridge footings, piers, and abutments; and any other stakes required for control elevations such as footings, caps, bridge seats, and screed elevations. The contractor’s personnel shall be used to locate all farm tile, supervised as necessary by the PE/S.

On road contracts the level circuit to check the plan benchmarks will be run the full length of the contract. On bridge contracts the circuit shall include four plan benchmarks, if available, two on each side of the structure.
After the grade stakes have been set for earthwork, the contractor shall take an elevation on the top of each stake and tie in such elevation to a permanent plan benchmark. At the same time, the contractor shall take a complete cross section at each 500 ft and centerline elevation every 100 ft. Using this information in conjunction with the plans, the contractor shall prepare a grade sheet on the standard forms furnished by the State including necessary information for special ditches.

In the staking of culverts, the contractor shall perform the necessary checking to establish the proper location and grade to best fit the conditions on the site. The PE/S will make a cursory inspection to verify the contractor’s decision. Any revision of plan length or size of culverts is to be done by the PE/S and never by the contractor.

The bid price for the item of Construction Engineering is on a lump sum basis. The payment for this item on a Progress Estimate is to be made in proportion to the percent of the contract completed. This may be done by estimating the percent complete and should not require extensions of all pay items for the Progress Estimate being prepared.

It must be stressed that the Department’s engineer will make all measurements and surveys that involve the determination of final pay quantities, including original and final cross sections for all earthwork.

The following points should be re-emphasized:

(a) The State personnel will make all measurements and surveys that involve the determination of final pay quantities.

(b) The PE/S is responsible for decisions involving engineering judgment.

The efficiency and satisfactory results from the use of construction engineering will depend largely upon a high degree of cooperation between the State and contractor personnel.

When the contractor elects to use GPS controls for construction engineering and machine controls, it must still provide adequate staking necessary for the PE/S to check the accuracy of the work. The use of GPS should be discussed during the pre-construction conference.

2.13 WAGE RATE PROVISIONS ON FEDERAL-AID CONTRACTS (Rev. 01-21-14)
As a condition of Federal participation in highway projects, the Department and its representatives are responsible for the enforcement of the Federal labor standards as set out in the SP. In this respect it is the responsibility of the PE/S to make frequent examinations of the contractor’s employment records, which by the terms of the contract are required to be made available at the site of the work during the progress thereof. Such examination shall establish (1) whether the wages being paid to laborers and mechanics are at rates not less than those predetermined by the Secretary of Labor as contained in the contract provisions; (2) whether the work being performed by any specific class of employee, including helpers and apprentices, conforms to the classifications set forth in said contract
provisions for the wage rate they are being paid; and (3) whether the classifications are correct and whether there is evidence of any disproportionate employment of laborers, helpers or apprentices as to indicate avoidance of the minimum wage rate provisions of the contract.

Systematic spot interviews are to be made by the PE/S and/or the DO EEO Officer with the employees of the contractor or subcontractor on the job to establish reasonable assurance that the minimum wage rate provisions are being fully complied with and that there is no misclassification of labor or disproportionate employment of laborers, helpers or apprentices. Employee interviews should be made early in the life of the contract and whenever changing operations bring in an influx of new employees. Most violations in the past have been occasioned by groups coming in from other areas where different wage rates prevail, and their supervisors not informing themselves as to the required scale. Employee interviews should be documented in the records. An easy way is to encircle the employee’s name on the State copy of the payroll and note the interviewer name and the results of the interview, i.e., an OK if the employees’ rate equals or exceeds the minimum. The responsibility for seeing that sufficient interviews are made to insure that minimum wage scales are being met, rests with the PE/S, but this does not preclude his delegating the duty to a responsible subordinate nor does it preclude such interviews being made by AE’s, and they are encouraged to continue interviews where they have been so doing.

The Special Provision for Federal-Aid projects specify that the contractor will submit weekly a certified copy of its and all subcontractors payrolls to the PE/S. Form WH-348, Contractors Weekly Payroll Affidavit is a weekly statement with respect to the payment of wages which must accompany the weekly payroll. Detailed instructions of the contractor’s responsibility in regard to payment of fringe benefits are given on the back of Form WH-348. All PE/S or others responsible for checking contractor’s payrolls should use these instructions as guidelines when checking payrolls.

The drivers of bona fide independent trucking firms who make deliveries to the construction site for or on behalf of either the contractor or the materials supplier are not subject to the wage requirements provided the source or supplier is an established commercial supplier. A trucking firm does not need to have an established published tariff in order to be considered a “common carrier.” The exception set out above is applicable only if the source is a recognized commercial source; and would not apply to temporary sources or production by the contractor or a subcontractor. In view of this interpretation it will be necessary to question the transportation feature when a contractor is purchasing material F.O.B. (Free on Board) supplier’s plant or source to determine whether or not the truck drivers are subject to the minimum wage rates. Even though there has been a prior determination by that a source or supplier is considered commercial and the production not subject to the minimum wage rates it will still be necessary in each subsequent instance to determine the purchase arrangements, F.O.B. source or F.O.B. job site, to determine the status of the truck drivers. Anytime that material is purchased F.O.B. a commercial source, it will be necessary to differentiate whether the drivers are employees of the contractor or a bona fide independent trucking firm. An owner-operator or trucks rented by the contractor would not be considered an independent trucking firm. As a guideline, an independent trucking firm would be any company that normally contracts the hauling of
2.24 batches or like materials from the prime contractor, and thus assumes the responsibility to perform that particular operation.

2.14 FIELD OFFICE (Rev. 05-03-17)
The purpose for having a field office is to provide the State’s personnel a place to work on office details of construction engineering, reports, and required records for the job. Meeting the general public at a field office may be limited, but this purpose should not be forgotten in its maintenance, furnishing, and location. The location of the field office will be approved by the PE/S. The field office and equipment must be complete with fire resistant file cabinets and all other utility and equipment requirements as noted in the latest SS (Section 628).

Due to the possibility of vandalism or loss by fire, for whatever reason, one of the first considerations in the location of the office should be safety from these hazards. Generally a populated area, lighted area, or patrolled area will be safer than one in which none of these conditions exist. For these reasons consideration must be given to locating the office in a village or town as compared to a more remote area along the highway. Convenience to a job and safety to the traveling public must be considered. The office and a logical parking space should be located so that neither is on public right of way and within 30 ft of the edge of pavement lanes open to traffic.

Cleanliness and orderliness should be kept in line with the purpose of conducting the business of the State. A clean and neat office is conducive to a business-like atmosphere; and creates a lasting impression in the mind of everyone having occasion to enter. Wall decorations, which would be considered in poor taste in any public building, reflect poor taste of a PE/S when found in a field office and are not permitted.

The equipment furnished in the field office is for State business only. If the field office is used to supervise more than one contract, terms shall be agreed upon prior to use for additional contracts.

Payment for the field office should be continuous from the start of the contract until the work is completed. This would include the months that the contract may be suspended over the months. The exception to this procedure is stated in Section 108 of the SS.

2.15 PARTIAL PAYMENT FOR STOCKPILED MATERIALS (Rev. 01-21-14)
Items listed in Section 111 of the SS or in the SP can be considered for partial payment for certain stockpiled materials.

The PE/S is to substantially verify the quantity of materials reported by the contractor, and document same in a field book (measurements and computations). This quantity of materials should be reported in the same units as shown in the Proposal, when practical; i.e., subbase in cubic yards, base seal in tons, and dowel bar assemblies in ft.

A Change Order will need to be processed to establish an item for each stockpiled material. Payment would be authorized up to the verified amount. The unit cost should not exceed the maximum amount listed in the contract provisions. The PE/S should note below the
write-in item, “Authority provided under Partial Payments Provision.” Lump Sum items would be paid as a percentage of the contract item (see contract provisions).

Stockpiled materials must be kept separate from other production materials and be identified and marked for use only on the specific contract. When payment is authorized for stockpiled material, such material shall not be used for any other item except their intended item. The PE/S and/or the plant inspector shall make frequent inspections of the stockpile to assure the materials are not being used for other work unless authorized in writing by the DDCM. If stockpiled materials are used without prior authorization, progress payment amount will be deleted from the next Estimate.

2.16 EQUAL EMPLOYMENT OPPORTUNITY (Rev. 01-21-14)
All Federal-Aid contracts contain some type of EEO requirements. These requirements differ from contract to contract; therefore, it is essential that the PE/S carefully examine the provisions of the contract and know which requirements are applicable. It is the PE/S’s responsibility to maintain a complete and accurate file of all EEO documentation required for the contract.

The following is a list of various types of EEO documentation; some or all of which may be required on a specific contract:

1. Minutes of pre-construction conference and/or EEO conference if held separately.

2. Record of visits of the contractor’s Equal Employment Opportunity Officer on the project to review Equal Employment Opportunity compliance posture.

3. Records of meetings of the contractor’s supervisory personnel.


5. Copy of the Equal Employment Opportunity Bulletin Board form listing the required posters for the project.

6. Statement by the contractor that the notation “An Equal Opportunity Employer” will be used in all advertisement for employees.

7. A list prepared by the contractor of the area minority group organizations which it will contact as a potential source likely to yield minorities for referral to the project for employment, as the need for personnel arises and when it does not violate a bargaining agreement.

8. Records of payroll.

10. Statement by the contractor indicating if pre-apprenticeship, and on-the-job training are being used on the project.

11. Statement by the contractor that it is reviewing at a minimum of every six months all employees for training and promotion on project.

12. Records indicating minority contractor and/or organizations contacted that might yield potential minority subcontractors in the prime contractors efforts to utilize minority subcontractors. This is not required if there are no subcontractors.

13. List of all unions, which furnish employees for the project.

14. Name of unions, which do not have EEO clauses in their agreements with the contractor or its representative.

15. Copies of letters to unions informing them of company Equal Employment Opportunity policies and the goals of the contractor to include minority and majority persons in the performance of his contract.

16. List of name, address, and telephone number of Equal Employment Opportunity Officer of prime contractor and all subcontractors (should know them if possible).

17. Statement by contractor indicating whether it is under Part I (signatory to Hometown Plan) or Part II (abiding by the affirmative actions and goals of minority manpower utilization) of the Hometown Plan Bid-Conditions (Applicable under Hometown Plan Provisions only).

18. Copies of “Optional Form 66” (Manpower Utilization Report) or all applicable contractors and if all minority utilization goals are not being met, a copy of the explanation as to why the contractor is not meeting the goals should be provided for each applicable craft. (Applicable under Hometown Plan Provisions only).


It is the responsibility of each prime contractor to insure subcontractor compliance with all the previous mentioned minimum documentation requirements for Equal Employment Opportunity.

Affirmative action by DO personnel in the specified contract requirements is essential in order to accomplish the goals of Equal Employment Opportunity.

It is believed that the outlined Equal Employment Opportunity documentation
requirements will meet current FHWA Equal Employment Opportunity Provision Requirements for Federal-Aid Highway contracts.

2.17 CONTRACT REQUIRED INSURANCE (Rev. 01-21-14)
Prior to commencing work, the contractor must furnish evidence of insurance as required by the Special Provisions and Sections 103.04 SS. The Division of Contract Administration will administer the insurance filings and maintain the files. The DO shall be responsible for monitoring insurance expiration for contracts within their DO and notification to contractors. The PE/S will enforce Section 103.04 of the SS. When the contractor fails to submit the insurance documents in a reasonable time after the award of the contract, a Notice to Proceed may be issued accompanied with a letter advising the DO that no physical work at the job site is to be permitted until the contractor furnishes the required insurance documents. In this instance contract time (workdays or calendar days) shall be assessed, in accordance with the provisions of the contract, the same as would normally be assessed if the contractor could proceed. The DO will be advised by CO when the insurance documents have been filed and work may begin.

Approximately every 10-14 days, the DO will receive a computer listing of active contracts within their DO. The first part of the listing will show those contracts on which insurance will expire within a few weeks. The second part of the listing will show all active contracts, for information only.

The DO shall review the listing of contracts on which insurance expiration is near and determine whether renewal is necessary. For example, if the contract has been completed, or will be completed, prior to the expiration date, usually renewal is not necessary. NOTE: Contracts remain on the listing until the Final Acceptance Letter is issued.

If the DO determines that renewal of insurance is necessary, the DO shall send a letter of notification to the PE/S. The letter shall specifically state that the insurance documents must be sent directly to the Contract Management Supervisor in the Division of Contract Administration, and that if evidence of renewal is not received prior to the expiration date, work on the contract shall be suspended in accordance with Section 103.04 of the SS. Section 103.04 requires that no work shall be performed by the contractor without insurance except that necessary for traffic maintenance and the protection of life. It is the DO’s responsibility to see that this specification is strictly enforced.

When Railroad Protective insurance expires, no work shall be performed by the contractor on, over, or under the railroad’s property, or within fifty (50) feet of the railroad’s tracks until this insurance is renewed. Work may continue on the contract in other areas provided all other insurance is in force.

As soon as the PE/S is made aware of the pending expiration, he or she should inform the contractor’s project manager that all work will be suspended after the expiration date until notification of renewal is received. Contract time shall continue to be assessed in accordance with the contract. Suspension of work, notification of renewal and resumption of work shall be noted on the Daily Reports.
The DO may verify the status of any contract insurance via the DO computer terminal (DOT/CICS). The computer files will be updated daily and may be inquired upon by the DO. It shall be the DO’s responsibility to use this capability to monitor contract insurance and inform the PE/S when the insurance filing or renewal has been made. No other notification will be sent to the DO of filings and renewals. The DO shall notify the PE/S verbally as soon as possible, and follow up with written notification. The written notification should state the date on which verbal notification was made.

If the contractor asserts that the insurance filing or renewal has been made, but the DO is unable to verify this fact through the computer terminal, the DO may contact the Contract Management Supervisor in the Division of Contract Administration for verification and assistance.

2.18 CONTRACT TIME ADJUSTMENTS AND TIME WAIVERS (Rev. 05-03-17)

The primary difference between a contract time adjustment and a time waiver is that a contract time adjustment is associated with changes in the physical work performed on the contract and a time waiver is not. Physical work is work performed by the contractor, a subcontractor or a third party such as a utility or railroad. A contract time adjustment is typically used when necessary to revise the contract time up until substantial completion. A time waiver is typically used to eliminate liquidated damages for delays that are not the fault of the contractor after substantial completion.

The following guidance should be followed for all contract time adjustments and time waivers. This guidance is in addition to the requirements of the Department’s policy for time extensions and is not intended to supersede any part of the policy.

2.18.1 Contract Time Adjustments

A contract time adjustment is used when it is necessary, as defined in the contract documents, to modify a contract’s original completion date for specified contract work. Contract time adjustments also apply to all types of intermediate contract dates, such as intermediate completion dates, closure periods, mowing cycles, and any other date or time specified in the contract, either original or by change order. Intermediate contract dates are referenced as Milestones within SiteManager.

For an intermediate contract date, completion of the work means that the portion of work specified in the contract for that date or period has been completed and can be used for its intended purpose as defined in the contract. This is typically the date that the portion of work is opened to traffic or is otherwise placed into service for its intended purpose.

An intermediate contract date is to be documented within the Milestone module of SiteManager. The following Milestone information is recorded:

- Description of intermediate contract date
- Type of time charged
- Rate of time charged
- Bid time (if applicable)
- Time charged (if applicable)
• Time remaining (if applicable)
• Incentive/Disincentive rate amount (if applicable)
• Intermediate contract start date
• Original intermediate contract completion date
• Adjusted intermediate contract completion date
• Actual intermediate contract completion date.

The initial Milestone information is usually uploaded at the beginning of the contract. If not, the PE/S will need to create a new Milestone for the intermediate contract date and follow the prompts accordingly. To verify if intermediate contract dates are applicable to the contract, refer to the contract information book under “Contract Completion Information”. Milestones should be monitored and completed as the event occurs and not entered at the end of the contract. Consult the SiteManager User Reference Manual for further information and definitions.

For a contract completion date or time, completion is defined as the last day of work. However, when the work is substantially complete in accordance with 101.59 and the contractor and Department agree that the project is ready for pre-final inspection, additional time is given in accordance with 108.09 for punchlist work and removal of signs, which generally constitutes the last day of work. Time given for punchlist work and removal of signs should be addressed by a time waiver and not a contract time adjustment.

In cases where the time associated with the change cannot be determined, an exception may be made to address the time on a future change order. One of the following statements must be included in the explanation portion of each change order:

• TA – A contract time adjustment is required for this change and has been addressed herein.
• TAP – A contract time adjustment is potentially required for this change, but cannot be quantified at this date. Any contract time adjustment required for this change will be addressed by change order at a future date.
• TAN – A contract time adjustment is not required for this change.

When a contract time adjustment is not made at the same time as the change order revising the work, the future change order that addresses the time must include a reference in the explanation to the original change order that revised the associated work.

2.18.2 Time Waivers (Rev. 11-05-15)

Time Waivers are used to excuse liquidated damages between the All Contract Work Complete date and Final Acceptance date, and should be used in the following two instances. The first instance occurs between All Contract Work Complete and Last Day of
Work. In order to justify days that are to be waived, the PE/S is to document, in the diary section on the Last Day of Work, the types of operations that took place during this time period. The documentation should indicate how much of this time period is due to waiting on sod maintenance to expire or obtaining NOT. Because extra work that is added at the pre-final inspection falls within this time period, a change order to adjust contract time is not necessary. Additional time to complete extra work should be agreed to at the pre-final inspection and documented in the diary on the Last Day of Work. This work should not be included with the 5 days allotted to perform corrective or cleanup work for the final inspection per Standard Specification 108.09.

Unlike the first instance where the appropriate time waiver is automatically captured in the IC-632, in the second instance, which falls between Last Day of Work and Final Acceptance, a Time Waiver Change Order is required. This change order will be of the Type "Time Waiver". The amount of days granted by the time waiver will be entered on the Time Adjustment Tab. This Change Order will not affect any milestone or the Adjusted Contract Completion Date, but will excuse the desired number of liquidated damage days that would have been assessed between Last Day of Work and Final Acceptance.

One example of when to use a “Time Waiver” Change Order is as follows:

A contract may have conducted an HMA mix design review for HMA placed on that contract.

- The contractor had completed their work and punchlist on 9/30/14 and INDOT issued the IC-686 after the final inspection.
- The contractor removed their signs on 10/01/14 and this day has been entered into SiteManager as The Last Day of Work. INDOT was currently reviewing the HMA mix designs on this contract which was beyond the contractor’s control or responsibility.
- The HMA mix design review was completed and with no issues on 4/15/15; INDOT has issued the final acceptance letter and this date was entered into SiteManager as Final Acceptance.

If the contractor had no responsibility with the HMA review, the Contractor will be excused of the liquidated damages after their Last Day of Work and the Final Acceptance. Therefore, a time waiver shall be created between 04/15/15 (Final Acceptance) and 10/01/14 (Last Day of Work). The difference in these 2 dates would be 196 days and should be entered on the Time Adjustment Tab (SiteManager) on the corresponding “Time Waiver” change order.

A “Time Waiver” change order would not be used for operations such as NOT or sod maintenance. NOT and sod maintenance must undergo final inspection before the contract can be accepted. On the day NOT or sod maintenance has been obtained on a contract where the signs have already been removed, an IC-686 will be issued and will be marked as the Last Day of Work. The IC-632 will already capture this waiver period according to section 108.09 of the Standard Specifications, the waiver period allowed for pre-final inspection, punchlist, final inspection and signs removal.
Questions about the use and documentation of contract time adjustments and time waivers should be addressed to the appropriate Division of Construction Management Field Engineer.

2.19 CHANGE ORDERS (Rev. 02-25-15)
A Change Order is a written agreement executed by the Department and the Contractor that modifies an existing contract.

In order to allow the Department to manage Change Orders, each Change Order must accurately identify the reason for the contract modification for future reference.

2.19.1 Contract Modifications
A Change Order must be executed to document any of the following changes to a contract:

- Monetary Adjustment
- Time Adjustment
- Scope or Design Change.

Monetary adjustments may result in additional compensation for the contractor or a credit to the Department. They may result from changes in quantities associated with existing contract pay items or the addition of new pay items to the contract.

Time adjustments may result in either increased or reduced contract time to perform work associated with closure periods, intermediate completion dates, or the contract completion date. Once the time adjustment change order for an intermediate contract date is approved in SiteManager, the time adjustment will be conveyed to the appropriate Milestone.

One form of scope and design change is a Construction Change. Construction changes occur when issues are found after the letting which require that change in the scope or design. Construction changes typically include revised plan sheets or specifications related to revised design or a changed condition. Construction changes for contracts can be found on INDOT’s website, where they are posted for viewing or download. These scope or design changes may result in monetary or time adjustments or both.

2.19.2 Procedure for Documenting Non-Participation Pay Items
Prior to executing change orders that add new pay items to the contract, the PE/S should check the list of non-participating work categories, provided below, to verify whether any of the pay items included in the change order require the “non-participating” designation. In situations where the “non-participating” designation is required, it is necessary to designate the affected pay items as “non-participating” and purchase orders utilizing 100% State or 100% LPA funds must be utilized to pay for these “non-participating” items.

“Non-participating” means that a pay item is not eligible for federal funding and “participating” means that an item is eligible for federal funding. Federal regulations prohibit the use of federal funds for payment of some pay items.
An item should only be checked as “non-participating” if it is an item that is being added to the contract that is one that FHWA would not normally agree to participate in the funding. To make a pay item “non-participating”, assure the check box inside the “Change Order Items” tab is selected, within the “Change Orders” window of SiteManager.

Below is a list of frequent federal non-participating categories:

- Work outside the highway right-of-way without permits, etc.

- Work outside the limits of the project (unless necessary to implement project; traffic control, etc.) Work performed outside the NEPA limits of the project may jeopardize federal funding for the project.

- Work not necessitated by the highway project (i.e. fence upgrades, utility upgrades, etc.).

- Adjustment of private facilities (signs, fences, lawn sprinklers, etc., unless covered as a part of a right-of-way agreement or permit).

- Storm and sanitary sewer work and other drainage or utility work that is not a result or purpose of the road or bridge work. Example: replacing sewer leads that were not in conflict with the construction activity proposed.

- Excessively expensive treatments that do not appear to be in the public interest. This could include expediting the project for a questionable purpose, or proposing the use of very extravagant roadway treatments or street side appurtenances.

- Significant hauling or transportation charges of salvaged items to INDOT’s or agency garages or storage sites for future use on non-federal projects. Hauling for less than 5 miles from the project site has been used by some state transportation department’s construction engineers as a reasonable distance to haul material.

- Non-conforming work such as substandard details, designs determined undesirable or discontinued because of poor performance. Example: A588 guardrail, salt susceptible roadside plantings, etc.

- Payment for work done by an unapproved subcontractor.

- Payment for betterments that are not currently part of the project. Example: payment for excess sizing of sanitary sewer adjustment for future development. The additional cost over replacement-in-kind should be borne by the owner of the facility being adjusted.
• Payment for work that should typically be considered maintenance work by the owner agency. Examples: graffiti removal, snow plowing, trash removal, moving roadsides, etc.

• Payment for rework (including incorporated materials, etc).

• Payment of work and materials not meeting specifications that are incorporated into the project.

• Contact claim awards if state transportation department is determined to be negligent. Example: utility and right-of-way claims.

• Administrative settlements not adequately supported and justified.

• Specifying use of proprietary items, (i.e. specific brand name or single manufacturer items such as Eagle controllers, 3M sign sheeting, Caterpillar diesel, Hewlett Packard computer) unless:

  - Suitable number of other proprietary items or generic items is allowed.
  - INDOT certifies (via public information finding) proprietary item is essential for synchronization with existing highway facilities or that no equally suitable alternate exists.
  - Proprietary item is used for experimental purposes.
  - FHWA finds it is in the public interest to use a proprietary item.

The PE/S will need to work with District personnel to either add the required funds to an existing 100% State funded or 100% LPA funded purchase order as appropriate or to establish new 100% State funded or 100% LPA funded purchase orders to facilitate payment for the “non-participating” work.

An item on a change order is “non-participating” does not mean that the entire change order itself will be non-participating. If you have both “participating” and “non-participating” items on the same change order make sure that the amounts get split up when adding the funds to purchase orders.

Once the “non-participating” item is added to the contract an “*” will be included with the item on the estimate. Please note that it is not necessary to designate the item as “non-participating” in the item name but it should be explained that the item is non-participating when the change order explanation is prepared in SiteManager.

2.19.3 Procedure for Documenting Non-Participation in Time Extensions
When FHWA determines they will not participate in state-approved time extensions, the non-participation time period and costs will be documented through the use of the field office pay item and payroll records for construction inspection. During the timeframe for a standard contract from beginning of construction until the final construction record (FCR) is complete, the contract is kept open and the field office and administrative costs of the
inspection staff are compensated. This procedure will extract only the portion of the non-participating time out of the standard process.

**For example:**
A contract is to be completed on November 15. Time extensions totaling 45 days are granted to the contractor for reasons that the state has determined are outside of the contractor’s control. Fifteen of the 45 days are granted from November 16 to November 30 and the remaining 30 days extend into the following construction season from April 1 to April 30. Therefore the contract completion date is extended to April 30. FHWA agrees to participate in only 30 days of the state-approved, 45-day extension. Therefore, 15 days of the state-approved time extension need to be paid for by a non-participating item and employee time charged to a state funded labor code.

**Suggestion:**

1. **Place non-participating time at the end of the state-approved time extension period.** For time period, April 16 - April 30 (the final 15 days of the time extension) the field office will be paid for by a non-participating item and employees will charge time to a state funded labor code so no federal reimbursement will be sought. Beginning May 1, the field office will be paid again through the original item and employees will revert to charging time to the federal project number. The non-participating time is clearly separated in this option. The pay items are on record and a note can be included in the project files and FCR showing the times charged to a separate time and labor code.

2. **Place non-participating time at the end of the contract.** If there are 15 non-participation days, then continue to charge for the field office using the participating item until the last month the field office is used, and then create a new non-participating item. Likewise, continue charging time to the federal project number and switch to the state labor code during the last month. This scenario could be more difficult to determine exactly when to switch the pay item and labor codes. This time period will be after construction is complete and during the time the staff is working on the final. This could be particularly difficult if the non-participating time period is large.

Essentially, we will not charge FHWA for the construction inspection costs for the non-participating timeframe by adding the field office as a non-participating item by change order and using this item for the time of the non-participating delay. The non-participating costs will be based on construction inspection costs alone and will not include, or be based upon, the value of the Liquidated Damages amount waived. This process will not be utilized when the time extension is for an intermediate completion date, as the inspection costs would still be incurred beyond that time regardless. Furthermore, if the contractor substantially completes the work prior to the adjusted non-participating time extension date, we would stop using the state-only code and the non-participating field office item at that date and go back to charging our time to the project, using the participating field office item until the completion of the final.
2.19.4 Extent of Work Covered by Change Order
In order to facilitate management of Change Orders, it is necessary to limit pay items included in a Change Order to those required to mitigate a specific event or reason for the change. It is possible for a Change Order to include monetary adjustments, time adjustments, and Scope or Design changes as long as each Change Order component is related to the mitigation of the same event.

For example, if an unknown existing utility facility is found to be in conflict with a planned storm sewer trunk line and it is determined that the appropriate mitigation for the conflict is to split the trunk line into two smaller pipes that are installed around the utility, it is acceptable for all of the following to be included in the same Change Order:

- Monetary adjustments resulting from quantity changes for existing pay items and the addition of new pay items required to construct the revised storm sewer structures around the utility facility.
- Time adjustments to closure periods, intermediate completion dates, and the contract completion date as required for construction of the revised storm sewer facilities.
- Scope or Design changes consisting of revised plans and new specifications required to construct the revised storm sewer.

It would not be acceptable to include a monetary adjustment associated with changing the pavement marking material throughout the contract area from paint to thermoplastic on the above noted Change Order. The type of pavement marking materials is not affected by the revised storm sewer layout, so a separate Change Order would be required to document the change in pavement marking material.

2.19.5 Reason Codes
Reason codes are used to categorize Change Orders so that the Department can track the cause of changes, assess the extent and source of accountability and work to minimize similar changes on future contracts.

Each Change Order requires selection of a reason code from the drop down menu within the SiteManager Change Order module. Only one reason code may be selected per Change Order. The AE and the Division of Construction Management Field Engineer assigned to the District are available for guidance regarding selection of the proper reason code for individual Change Orders.

Below is a list of the available reason codes:

**Errors and Omissions**
- Design/Plan Related
- Specification Related
- Special Provision Related
- Environmental Related
- Item Related
- Permits Related
- Quantity Related, Minor
<table>
<thead>
<tr>
<th>Category</th>
<th>Items</th>
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<td><strong>Quantity Related, Major</strong></td>
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<td>Related, Major</td>
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<td>R/W Related</td>
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<td>Geotechnical Related</td>
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<td>Traffic Control Related</td>
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<td>Constructability Related</td>
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<td>Work On Private Facilities</td>
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<td>Weather Related</td>
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<td><strong>Payment Adjustments</strong></td>
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<td>Material Related</td>
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<td>Contract Liens Related</td>
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<td>Closure Times</td>
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<td>Cost Reduction Incentive</td>
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<td><strong>Standards/Specifications Change</strong></td>
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<td>Time Related</td>
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<td>Time and Monetary Related</td>
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<td>Specification Change Only</td>
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<td><strong>Final Quantity Adjustment</strong></td>
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<td>Damage to State Property</td>
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Contract Renewal

Maint. Of Traffic Safety Improvements

Emergency Work

- **Errors and Omissions** - Change Orders are often required because contract documents include information which is incorrect or omits an element required to construct the overall contract in accordance with its original scope. The contractor is entitled to consideration of monetary and time adjustments in situations involving errors and omissions. The INDOT Project Manager needs to be informed when errors or omissions are found in a contract so that the PM can help with the resolution of the issue and so that they can involve the Designer early on in the project. In this way the Designer may be held accountable for extra costs or damages that may be involved on the project if the errors or omissions arise from the Designer's negligence. The key to using the reason codes in Errors and Omissions is that the situations giving rise to the reason for the extra costs arising from the Designer's negligent errors or omissions should have been caught before the contract was let. If the problems could not have been known ahead of time through reasonable due diligence then the reason codes that should be used most likely will be in the section for Changed Conditions.

  **Design/Plan Related:** This reason code is used when there is a problem with the design/plans on the project. Examples of this may be that the wrong size drain pipe was called for on the project and it has to be changed to a new size pipe which could require new items for pipes and potentially inlets and manholes.

  **Specification Related:** This reason code is used when the contract specifications did not adequately cover a need on the project. An example of this would be where there is an item in the itemized proposal and there is not an item in the specifications that matches or describes this item.

  **Special Provision Related:** This reason code is used when the special provision of the contract does not adequately cover the work in the contract for which it is meant to cover. An example of this could be that a special provision specifies that the only products that you can use to build the work are found to not meet the requirements of Buy America and because of this extra costs were incurred and/or not participated in by FHWA.

  **Environmental Related:** This reason code is used when an issue involves things that are environmental in nature that were overlooked in the contract documents. For example an underground storage tank is found on newly purchased property and the designer should have been able to tell that it was there utilizing reasonable due diligence but did not show it in the contract documents or give a way to handle its removal. Evidence of this could be that the there are visible signs at ground level that the tank exists beneath
the surface. In this case, one might also consider the Design/Plan Related reason code because it was left off the plans. Such a situation should be viewed in a manner that the reason code that best represents the situation should be used. In this case, it is an omission from the plans, but because it is environmental in nature, this reason code is more exact in description and should be used. As additional information, this situation would merit a reason code of Changed Condition Environmental Related if a tank was found, but there was no means to tell that it existed other than discovering it during excavation. Another example would be if there was a storm water management plan shown in the plans but no items were placed in the itemized proposal to cover the work.

**Item Related:** This reason code should be used for items that are missing from the contract and the design would dictate that they be in the Itemized Proposal. For example this reason code could be used if an HMA overlay was being placed that required that the existing surface be milled first and there was no item in the contract to cover the work.

**Permits Related:** This reason code should be used when extra costs are incurred because a permit was not obtained for the contract either by the Design Consultant or by INDOT.

**Quantity Related, Minor:** This reason code should be used when there is a quantity increase or decrease that is caused by a mistake made by the designer of the contract and the result was less than 5% of the original contract award amount or $250,000.00 whichever is less. An example of this would be where the item for HMA surface overran on a project because the designer did not add in the quantities for the S-lines on the project.

**Quantity Related, Major:** This reason code should be used when there is a quantity increase or decrease that is caused by a mistake made by the designer of the contract and the result was more than 5% of the original award amount or $250,000.00 whichever is less. An example for this could be the same as above in minor.

**Right-of-Way Related:** This reason code should be used when extra costs are incurred because of right-of-way problems. An example of this could be when there was only enough right-of-way purchased for the building of the face panels for an MSE retaining wall but the amount of right-of-way did not allow for the placement of the straps behind the wall.

**Geotechnical Related:** This reason code should be used when extra costs are incurred which are related to soils information on the project. An example of this is when the geotechnical report for the project says that the project will need to be undercut by 2 feet and the material replaced with aggregate 53 and the designer had this information during design but did
not take this into account in the plans and then the costs for the undercut and aggregate had to be added by change order.

**Traffic Control Related:** This reason code should be used when extra costs are incurred related to problems with traffic control on the project. An example of this could be when a contract requires lane shifts and lane closures and no items were included in the contract to cover temporary pavement markings.

**Utility Related:** This reason code should be used when extra costs are incurred related to problems with utilities that should have been foreseen by the designer using reasonable due diligence in preparing the plans. An example of this would be where there is a conflict between an existing water line and a new sewer line to be installed where the water valve present in the area can be seen and there was no prior coordination done with the water line owner to move the line. If the water line existed in the area and could not be seen and is only found after installation of the water line has started, the reason code for a changed condition should be used.

**Railroad Related:** This reason code should be used when extra costs are incurred related to problems with railroad concerns that should have been able to be foreseen by the designer. An example of this would be if the plans show constructing a temporary railroad bridge and shifting train traffic to the new bridge that will require that there can be no train traffic for 2 weeks while the tie-ins are completed, but the railroad determines that they cannot allow a 2-week shutdown of train traffic at that time. This situation should have been coordinated prior to letting and should have been resolved. This will now cause a delay for the contractor and extra costs to be incurred. In addition, note that these extra costs and the corresponding time extension may potentially be non-participating by FHWA.

**Constructability Related:** This reason code should be used when the plans did not take into account an obvious physical condition that exists on a project and then the condition requires extra costs to be incurred to remedy the situation. An example of this would be where the plans call for common excavation be used to build the required embankments for phase 1 of a project but the common excavation exists under the roadway which will be used to maintain traffic during phase 1 and because of this it is a requirement to pay to bring in borrow on the project and then to remove and waste the common after phase 1 is complete.

- **Scope Changes** - Scope changes are situations where the Department determines that it is necessary to either add items unrelated to the current scope to the contract, delete items related to a portion of the current scope of the contract, or increase or decrease the area over which the current contract scope will be constructed. Scope changes are the responsibility of the Department and consideration of monetary and time adjustments is warranted. Scope changes may not be implemented without the
approval of the PM. Approval from the PM must be included on the allotted section of the Change Order Form. Scanned e-mail or other documentation from the PM is also acceptable.

**Work Outside Construction Limits:** This reason code should be used when work is performed outside of the construction limits of the contract. Outside of the construction limits should be taken to mean off the right-of-way or beyond the station limits of the work area in the contract. Note that traffic control items that are needed for pre-warning are not a part of the discussion under this reason code. This is important because when work beyond the construction limits of the contract is undertaken, this work is outside of what has been approved in the NEPA documents. An example of this would be if concrete patching is required to be added to the contract that is a mile from the end of the contract. Another example would be where the HMA overlay on the project was to be stopped before entering an intersection and it was decided to continue the HMA through the intersection because the pavement was rough. In both of these cases this work should not take place unless approved by the Project Manager.

**Work On Private Facilities:** This reason code should be used when work is performed for items that are not owned by INDOT or the LPA and are not a part of the original contract. An example of this might be where a utility line running through the project is in the way of the work that is needed to be performed but it is decided not to wait for the utility to move the facility, so a decision is made to move it for them (with their permission).

**Project Acceleration:** This reason code should be used when a decision has been made to make up lost time on a project, which could be caused by issues that delayed the project. One example of this would be if a very rainy construction season occurred and a time extension is warranted that would move the completion of the project into the spring but commitments have been made to have the work completed before the end of the year.

**Project Upgrades:** This item code should be used when a decision has been made to add an element to a project or enhance an existing element on a project. An example of this would be to add a conduit to the project in order to place communication cable through it at a later date. Another situation would be if lighting items already exist in the contract but a decision was made to make the light poles decorative in design. It is important for the PM to be involved in project upgrades to ensure that the costs for the upgrades are accepted by the responsible entity.

**Material Related:** This item code should be used when a decision has been made to change a type of material that is being used to construct the contract. An example would be if the road was designed to use an HMA pavement and a decision was made to change the road to PCCP.
**Added Quantities:** This item code should be used when a decision has been made to add additional quantities of an item that would utilize the item in a way or in an area in which it was not approved for use in the original scope of the project. An example of this would be if the original scope of the project included sidewalk on only one side of road and it was then decided after the letting to add sidewalk to the other side of the road as well. This may make sense from a cost standpoint since the Contractor is already in the area and it would not be a challenge to add the additional quantity. However, it should be noted that because the scope of the original project included sidewalk on only one side of the road, adding this would be a scope change and may not get approval from FHWA for participation.

**Deleted Quantities:** This item code should be used when a decision has been made to delete quantities of an item and thus construct a project that does not fulfill the original scope of the contract. An example of this could be when the original project scope included sidewalk on both sides of the road and because of other overruns on the contract it was decided to delete the sidewalk from one side because there is not enough money left to complete the work. However, it should be noted that if the sidewalk is not built on both sides as originally approved, FHWA could consider not funding the entire project since the original scope is not being fulfilled.

- **Changed Conditions** - Changed conditions are defined in Section 104.02 of the Standard Specifications. They include differing site conditions, suspension of work by the Department, and significant changes in the character of the work. Differing site conditions are the most common type of changed conditions encountered in the field. In most situations, it is the contractor that discovers a potential differing site condition and is required to provide notice prior to performing any work at the affected location. It is the Department’s responsibility to verify whether the situation represents a differing site condition and if so, to determine the required work to mitigate the problem. Examples of differing site conditions include the presence of an underground storage tank that is not indicated on the plans, discovery of a peat deposit at a location where peat is not anticipated, and discovery of an existing concrete base under the asphalt pavement on a contract that includes no pay item for pavement removal.

Suspensions of work included in 104.02 are related to suspensions directed by the Department for the benefit of the Department or the motoring public. Examples of these suspensions include those for holidays or community festivals not noted in the contract documents. Suspensions of work related to poor workmanship, contract breaches by the contractor, or operational problems of the contractor are not covered by 104.02.

The most common occurrence of significant changes in the character of the work is related to a major pay item that has its quantity increase or decrease by more than
25%. Typically, increases in quantities usually justify a lower unit price and reductions in quantities normally justify a higher unit price. Consideration for monetary and time adjustments is usually required when changed conditions are encountered on a contract.

**Constructability Related:** This reason code should be used when there is an issue that changes how the project is to be constructed. An example of this would be where the contractor bid to build a bridge with the road closed to traffic and it was determined after letting that the contractor would need to build the bridge under traffic.

**Permits Related:** This reason code should be used when the cause of the changed condition and extra costs are permit related. An example would be if the contract stated that the permit would be obtained so that the contractor could start work on August 1st but it was not obtained until December 1st. This could potentially cause a project delay and extra costs if the work is a controlling item.

**Environmental Related:** This reason code should be used when the reason is environmental in nature. Examples would be finding an underground storage tank, historic artifact, asbestos, contaminated soil or an endangered species, any of which were not known to exist at the time of letting.

**Material Related:** An example would be encountering a different material that anticipated in the plan documents such as rock at an elevation where soil was expected. This would require a change to incorporate rock excavation.

**Right-of-Way Related:** This reason code should be used when the issue is related to the availability of right-of-way on the project. An example of this is when the right-of-way is supposed to be already cleared so that the contractor can access it to work and it is found that it is not cleared and causes a delay or extra cost. It should be noted that delays in availability of right-of-way may not be reimbursable by the FHWA.

**Geotechnical Related:** This reason code should be used when there is an unforeseen geotechnical issue found on the project. An example would be where the soils report and borings do not show peat in an area but it is in found where the end of a tie back is to go and will no longer work and causes delay or extra costs.

**Utility Related:** This reason code should be used when there is a changed condition caused by a utility related issue. For example the contract book states that a utility will be relocated 30 days after the right-of-way is staked and cleared but it takes the utility 100 days which causes extra cost and/or extra time to be needed on the contract.
**Railroad Related**: This reason code is used when extra costs are incurred related to railroad work on a contract where it is a changed condition to the contract but that could not have been foreseen beforehand by the designer under normal due diligence. An example of this would be where the contractor tried to get railroad flagmen as required by the contract but the railroad for whatever reason would not supply them which causes a delay to the contract and thus extra costs.

**Weather Related**: This reason code should be used when the above normal inclement weather days for the year exceed the yearly allotted number days in the Standard Specifications. This would normally be needed for time extension purposes only as weather is normally non-compensable. However, there could be times where the contract may be written that would allow compensation.

**Quantity Related**: This reason code should be used when there is a large change in the quantity of either a major or minor item due to unforeseen circumstances that would allow by specification a change in the unit price for the item. An example of this would be that during a resurface contract it is required to remove the overlay and perform pavement patching and when the overlay is removed, the pavement is in worse shape than the pavement cores led the designers to believe and additional patching work is required.

- **Payment Adjustments** - The reason codes for Payment Adjustments are used when there are credits to the contract or extra payments to the contractor which are either overruns to the $1 items usually found in the beginning of the itemized proposal, with the exception of Liquidated Damages which is a part of Incentive/Disincentive and are self explanatory, Quality Adjustments for HMA, Quality Adjustments for Storm Water Management, Quality Adjustments for Temporary Traffic Control, Quality Adjustments for Failed Materials, Binder Adjustments or Liens, etc. Payment Adjustments will all fall into one of the following reason codes:

  - **Quality Related**: Examples include HMA Adjustments, Storm Water Management Adjustments, Temporary Traffic Control Adjustments, Failed Materials. For example if there are adjustments that need to be made to the payment to the contractor after the pay factors are reviewed in accordance with 401.19 for HMA then this reason code will be used. This would be the same for concrete pavements in accordance with 501.28. Other examples of when this reason code will be used are when either storm water management devices, or traffic control devices do not meet the quality standards within the specifications. The cost associated with this work can be tracked and therefore not counted against the "On Budget" metrics.

  - **Material Related**: An example is Binder Adjustments which are used when the contractor accepts this contract provision at letting time and then the
price for HMA binder goes up or down by enough that the provision is invoked.

**Contract Liens Related:** This reason code is to be used when the item for contract liens is utilized. This item is used when INDOT is required to hold or payout money when there is a lien brought against a contractor because they are not making payments. The non-payment could be to subcontractors, suppliers or others. When this occurs, this code will be used.

- **Incentive/Disincentive** - Incentive and Disincentive language is included in contracts to provide a financial motivation to a contractor to complete work associated with a closure period, an intermediate completion date, or an early contract completion date. If such language is included in a contract, a Change Order is required to incorporate the additional compensation earned by the contractor due to early completion of the required work or a credit to the Department, in the form of Liquidated Damages, resulting from late completion of the required work. In addition, this reason code is also used for Change Orders which are necessary to incorporate a contractor submitted Cost Reduction Incentive, CRI, into a contract as per 109.04 of the Standard Specifications.

**Contract Completion:** This reason code is used when the incentive payment or liquidated damage credit is a result of either completing the contract work before or after the contract completion date shown on the proposal page.

**Intermediate Completion:** This reason code is used when the incentive payment or liquidated damage credit is a result of either completing the contract work required before or after an intermediate completion date as shown on the proposal page of the contract.

**Closure Times:** This reason code is used when the incentive payment or liquidated damage credit is a result of either completing the contract work before or after the allotted number of days for a closure as shown on the proposal page.

**Cost Reduction Incentive:** This reason code is used when an incentive payment is made to the contractor for a percentage of a cost savings to the contract for an idea presented by the contractor. It is made in accordance with 109.04. An example of this would be where a 3 span bridge is to be constructed and the contractor presents a new design for the bridge that uses post tensioning elements and is only 2 spans and results in a savings of $500,000.00. If the redesign is approved then the Contractor and INDOT split the savings and the contractor is paid on a change order using this reason code.

**A+B Contract:** This reason code is used when the incentive payment or liquidated damage credit is a result of either completing the contract work
required on an A + B Contract. The cost associated with this work can be tracked and therefore not counted against the "On Budget" metrics.

**A+B+C Contract:** This reason code is used when the incentive payment or liquidated damage credit is as a result of either completing the contract work required on an A+B+C Contract. The cost associated with this work can be tracked and therefore not counted against the "On Budget" metrics.

- **Standards/Specifications Change** - The Department may elect to incorporate a new standard detail or specifications change into a contract after it is let. In these situations, a Change Order is required to modify the contract to add the new standard detail or specification. There may be monetary or time adjustments associated with these types of Change Orders. This reason code should only be used when the directive for this change comes from Central Office normally as part of a Construction Memorandum. If a change is being made to a specification, special provision or standard by any other means then it would be a changed condition to the contract and fall under another reason code.

- **Final Quantity Adjustment** - This reason code is used on Change Orders which are required when the overruns or underruns for individual pay items result in monetary adjustments that exceed the thresholds included in the Change Order Policy. These are sometimes referred to as balancing Change Orders.

- **Damage to State Property** - This reason code is used on Change Orders that are a result of payments made to the contractor for repairs that are made to State property, normally as a result of a traffic accident. The cost associated with this work can be tracked and therefore not counted against the "On Budget" metrics.

- **Contract Renewal** - This reason code is used when the change order is for the renewal of the contract as allowed in the special provisions. Contract renewals are generally for an additional 365 days at a time for the number of renewals as allowed in the contract. These contracts are usually for mowing and traffic signal and lighting maintenance but could be for other types as well.

- **Maint. Of Traffic Safety Improvements** - This reason code is used for improvements made to the Maintenance of Traffic for the safety of the traveling public and field personnel. The cost associated with this work can be tracked and therefore not counted against the "On Budget" metrics.

- **Emergency Work** - This reason code is used for any repair work that requires immediate attention. This reason code will track costs and should not be considered towards the On Budget metric. The cost associated with this work can be tracked and therefore not counted against the "On Budget" metrics.

### 2.19.6 Recoverable and Non-Recoverable Change Orders and Delta Costs

The PE/S is required to document and classify all errors and omissions, E&O, change orders as either having recoverable or non-recoverable costs. The recoverable/non-
recoverable record entry in SiteManager can be found in the Generic Field under the change order Header Tab. The determination of the additional costs should be made prior to generating the change order.

INDOT Project Managers, PM, should be notified of all E&O change orders to help with resolution and to determine if the Designer/Consultant [“Designer”] may be held accountable for extra costs arising from the E&O. The PM, PE/S, and Designer may jointly collaborate to review and mitigate potential additional costs. If the PM decides the Designer is responsible for the additional costs caused by E&O (also known as the delta or premium costs), these costs are considered to be recoverable and the PM may decide if INDOT will move forward with the collection of those costs from the Designer.

One example of how to figure the delta or premium cost is as follows:

The Designer incorrectly calculated the amount of QC/QA-HMA, 3, 70, Surface, 9.5 required to build the project. It used an incorrect lay rate of 65 pounds per square yard instead of the required 165 pounds per square yard. Because of this mistake, the Designer listed a quantity of 5,910 tons of material needed when in reality the quantity needed/listed in the contract should have been 15,000 tons. The contractor bid $85.00 per ton for the 5,910 tons shown. After a review of this contractor’s bid history for this item, it was found that if the correct quantity of 15,000 tons had been in the contract at time of letting, INDOT should have gotten a bid price of $80.00 per ton for this item. Therefore, the difference in cost of construction of the project is the following: (15,000 tons x $85.00 per ton) – (15,000 tons x $80.00 per ton) = $75,000.00 = delta or premium cost.

The delta or premium cost of $75,000.00 in this case is the potential amount that INDOT could recover from the Designer for its E&O. If this quantity change qualifies under Standard Specification 104.02(c)2 or 109.03 and the price is renegotiated with the contractor, the renegotiated price would need to be reflected in the delta or premium cost to be collected from the Designer.

The cost to add the extra 9,090 tons at the contract unit price, $772,650.00, would need to be placed on a change order with a reason code for E&O, Quantity Related, Major. The change order should be eligible for FHWA participation as long as this extra cost was not caused by “gross negligence”. The change order, along with the information on the $75,000.00 delta or premium cost, should be passed on to the PM for consideration as part of the E&O Process.

Another example of how to figure the delta or premium cost is as follows:

The Designer did not properly coordinate the removal of the utilities present at the project site. The Designer did not take into account that there was a large fiber optic duct bank running where the new drainage system had to go on the project. (In this case it should be noted that it is being assumed that the Designer is the one who did the utility coordination on the project.) Because of the Designer’s lack of coordination/lack of due diligence, the contractor was delayed in starting the project by more than 6 months. As a result, the contractor incurred a substantial increase in its project overhead costs and incurred
escalated labor, equipment and material costs in the completion of the project. The documented additional costs that were incurred amount to $2,000,000.00.

The PM should have involved the Designer early on to see if there was a way to mitigate the problem by possibly redesigning the drainage system or by some other method. In this example, it is assumed that this was done and that the extra costs were unavoidable.

In this case, the calculation is straight forward and the entire $2,000,000.00 is an extra cost to the contract that could have been avoided if the Designer had performed the utility coordination as expected before the letting. Therefore, the entire $2,000,000.00 is the delta or premium cost that INDOT could recover from the Designer for E&O regarding the utility coordination.

This extra cost would need to be placed on a change order with a reason code for E&O, Utility Related, and would be marked as recoverable. In this case, the extra cost would not be considered eligible for FHWA participation.

It should also be noted again that the assumption is being made that, in this example, the Designer is the one who performed the utility coordination for this project. On other projects, the utility coordination could be done by another consultant/coordinator or could be done “in house”. Therefore, it is extremely important to involve the PM early in the process. The PM will know who is performing this function on the contract and the amount and level of coordination that was required under the contract.

If the PE/S is unsure if an E&O is potentially recoverable or if the PE/S is unsure of how to figure the delta or premium costs incurred because of an E&O, the issues may be discussed with the PM, the Area Engineer, the Central Office Field Engineer for the District and/or INDOT’s litigation attorneys.

2.19.7 Change Order Approval Authority
The Change Order Policy assigns Department approval authority based on the magnitude of the overall monetary or time adjustment involved. If a Change Order includes both monetary and time adjustments, the approval authority is the higher authority required for approval of the monetary adjustment or time adjustment if considered separately.

The approval authority for a Change Order is based on the monetary adjustment and time adjustment associated with that document. The Change Order approval authority is based on the adjustments of each individual Change Order and is not cumulative throughout the Contract. It is possible for Change Order No. 1 to require State Construction Engineer approval while it would be appropriate to approve Change Order No. 2 at the PE/S level.

However, in order to meet INDOT goals, once Change Order dollar amounts for a contract cumulatively reach the 4% overrun level, or where time adjustments cumulatively reach the 25 day overrun level, the PE/S will need to forward a draft of the Change Order to the District Construction Director, the Director Division of Construction Management and the Director of Capital Program Management, at the same time that it is sent to the PM. This is done as a way to address the cause of the cost or time overrun and to see if measures can
be taken to correct and adjust as necessary in order to make proper decisions as contracts proceed to completion.

Work associated with a Change Order cannot begin until documented approval is provided by the approval authority and has been coordinated with the PM. In addition to the Department approval authority, LPA documented approval is required for LPA contracts and FHWA documented approval is required on contracts specifying FHWA change order approval.

Where the Change Order document cannot be completed prior to work being performed, a work order and written documentation from the approval authority is required prior to work commencing. When Major Changes are involved, Prior Approval will be required as discussed in 2.19.8.

There are three situations which require the documented approval of the Director, Division of Construction Management in addition to the approval authority based on the magnitude of the monetary or time adjustment. The situations are described below:

- Change Orders which involve work on property, equipment, buildings or other items owned by the State of Indiana and not included in the original or modified contract.
- Change Orders which involve the purchase of equipment that will remain the property of the Department after completion of the contract.
- Change Orders which establish or delete intermediate completion dates, closure periods, etc.

2.19.8 Major Change Order Prior Approval

Prior Approval is required before work can start on changes which are considered Major Changes. Major Changes are significant changes to the cost, character, or scope of a project which require a determination of whether or not the change would benefit from being competitively bid. These are defined as:

- Cost increase of 5% of the contract award amount or $250,000.00, whichever is less
- Time extensions due to scope changes, or
- Changes in scope as given below:
  - Changes in project termini
  - Scope revisions due to a Cost Reduction Incentive proposal
  - Alterations to the intent or scope of the Contract or character of the work
  - Revisions to the geometric design of the mainline roadway, ramps, frontage roads or crossroads
Revisions to the structural section of the pavement, including, but not limited to subgrade, subbase, performance graded binder grade, pavement type, pavement depth, individual pavement courses and aggregate designations, type or quality of materials to be furnished, such as changing the individual aggregate base to an asphalt concrete material

- Additions, deletions, changes or relocations to bridges or structures that affect the functional scope and intent of the approved design

- Revisions that result in new environmental impacts, changes in previously permitted activities or reductions in environmental mitigation measures provided for in the Contract

- Changes to limited access control lines.

All other changes that do not fall under the above categories are processed as minor changes and do not require Prior Approval.

**Prior Approval Procedure.** The PE/S should forward information related to the required Change Order work; the recommended monetary adjustment amount including all affected pay items, quantities, and unit prices; and the recommended time adjustment to the AE and PM via e-mail.

Include information related to how the recommended monetary and time adjustments were determined to be appropriate for the proposed scope of work - i.e. review of bid history, schedule information, backup information provided, etc.

Attach backup documentation provided by the contractor to the e-mail so it can be referenced by the approval authority. If the approval authority is above the AE level, the AE will review the packet prior to sending it to the DCD, and the process will be repeated by the Department approval chain of command until reaching the approval authority. Each individual in the approval chain of command should indicate his or her concurrence with the recommendations until it reaches the final approval authority. This will ensure that everyone who will be involved in the Change Order approval process is informed regarding the situation and supports the recommended solution.

The Department approval authority will review the forwarded packet. If it is acceptable, the approval authority will provide the PE/S with documented approval of the Change Order via e-mail. After receiving Department as well as LPA and FHWA approval via e-mail, if applicable, direct the contractor in writing via a Work Order to begin Change Order work. If additional information is required prior to Change Order approval, the approval authority will notify the PE/S and copy all in the approval chain via e-mail of the desired additional information. Provide the desired information to the approval authority via e-mail and copy all in the chain of command below the approval authority.
If anyone in the approval chain of command does not agree with the recommended Change Order, it will be necessary to notify all individuals who have previously concurred with the recommendation and the PM of the denial and to determine the appropriate course of action. The individual who denied the recommendation may provide an alternate solution or reject the Change Order altogether. It will be necessary to work with the PM to seek the input of the appropriate individuals to verify the adequacy of the alternate solution or whether it will be necessary to perform this work on a future contract.

After all required Department and outside agency documented approvals are obtained, the Work Order sent to the contractor should include the following information:

1. Date
2. Change Order Work Elements
3. Affected Existing Pay Items and Estimated Quantities
4. New Pay Items Established, Associated Quantities, and Unit Prices
5. Estimated Monetary Adjustment
7. Date Work is Expected to Begin.

A sample Work Order is provided in section 2.19.13.

**Verbal Prior Approval** on Major Changes may be obtained if an emergency or unusual condition exists. This verbal Prior Approval will be memorialized and documented by the PE/S with an email.

**2.19.9 Existing Contract Pay Item Overruns and Underruns**
The Change Order Policy allows for individual existing contract pay items to overrun or underrun without processing a Change Order if both of the following conditions are met:

- The overrun or underrun of the pay item does not result from a change in scope of the contract.
- The monetary adjustment associated with the overrun or underrun of the existing contract pay item is less than $20,000.00.

If either of the above conditions is not met, it is necessary to execute a Change Order to document the monetary adjustment associated with the overrun or underrun of the existing contract pay item.

Once a Change Order is executed to document a monetary adjustment related to the overrun or underrun of an existing contract pay item, a subsequent Change Order is not required until an additional monetary adjustment of $20,000.00 related to overruns or underruns of the pay item is achieved unless it is due to a change in contract scope.

**2.19.10 Contract Scope/Design Element Change Orders**
The Change Order Policy requires that Change Orders involving changes to the scope or design elements of a contract are coordinated with the PM and receive approval from the
party responsible for the design element involved in addition to the Change Order’s required approval authority. This is necessary to ensure that contract specific design criteria or Department commitments made prior to construction are not changed without the input of personnel familiar with these issues. The Change Order Policy lists several such items which are considered changes in scope or design elements.

2.19.11 Determination of Required Change Order Work/Work Order Issuance (Rev. 11-28-17)

For situations involving a changed condition (104.02), extra work (104.03), or any other change to the work initially involved in the original contract, it is the Department’s responsibility to grant approval to the Contractor before additional work associated with a change order is performed. A Department signed Work Order is the proper method to authorize a Contractor to perform the work prior to full execution of the official change order document. A sample copy of the Department’s Work Order can be found at the end of this section.

In order to begin the process of generating a change order with correct documentation, and prior to issuing a Work Order, the following steps are required:

- **Notify AE of Need for Change Order** - The AE needs to be notified of situations that could require a change order. Discuss the situation with the AE to determine if additional work and a change order would be necessary. The AE can provide assistance and direction with the change order process and can help determine what documentation will be necessary. They can also provide guidance on proper notification and communication with the PM for the particular situation.

- **Notify PM of Need for Change Order** - In order to properly manage the project, the PM must be notified when change order situations occur. The notification should include the results of the discussions with the AE regarding the work associated with the change order. The PM should be kept informed as the change order work plan is developed and finalized.

In situations where a change order is necessary due to a design error or omission made by a designer, the PM will initiate contact with the designer for input regarding the required change order work. It is important that the PM is notified by the PE/S promptly of the error and omissions situation. The PM will then contact the designer to involve them in developing possible solutions to mitigate the design error or omission condition. The Department’s ability to potentially seek reimbursement from the designer for the additional costs incurred due to the error or omission is based on timely notification of the PM, and the PM making timely contact with that designer.

**Obtain a Change Order Request Form** – Direct the Contractor to complete and submit a Change Order Request form, available from the Department’s website. The completed form should identify unique circumstances, possible mitigating options, and provide an initial summary of the associated costs.
• **Determine the Work Elements for the Change Order** – The change order work element details and associated pay items should be determined based on the PE/S’s understanding of the particular situation, discussions with the AE, PM, Designer, and the information provided within the Contractor’s submitted Change Order Request form. When available, information from other individuals or parties involved in the extra work should also be utilized in determining work elements and pay items.

• **Determine the Change Order Monetary and Time Adjustments** - Once the change order work is determined and all required Contractor submittals are received, it is necessary to establish the monetary and time adjustments associated with the work. For work covered by existing contract pay items, the monetary adjustment is based on the estimated quantities and the existing contract unit prices. For work involving new pay items, the monetary adjustment is based on the estimated quantities and agreed upon unit prices. The copy of the *Change Order Process* available at:


If the Contractor’s proposed time adjustments apply to closure periods, intermediate completion dates, incentive/disincentive dates, etc. as well as the contract completion date, for approval purposes the requested time adjustment is the maximum duration. For example, if a contractor requests time adjustments of 10 days to Intermediate Completion Date 1, 15 days to Intermediate Completion Date 2, 15 days to Intermediate Completion Date 3, and 15 days to the Contract Completion Date, the magnitude of the time extension request is 15 days.

For situations where a time adjustment is necessary to mitigate a delay which is the Department’s responsibility and the mitigation results in application of a portion of the adjustment prior to December 1 and the remainder is applied after March 31 in accordance with the Standard Specifications, the magnitude of the time adjustment is the number of calendar days that the intermediate completion or contract completion date was shifted, including the period starting December 1 and ending March 31. For example, if a thirty day Department responsible delay was experienced on a contract with an intermediate completion date of November 15 and the Standard Specifications permit the exclusion of the period beginning on December 1 and ending on March 31, the remaining fifteen days of the adjustment would be applied from April 1 to April 15. In this situation, the time adjustment requiring approval would be 151 calendar days, or 152 calendar days if a leap year is involved.

• **Perform a Cost Analysis for New Items** – A cost analysis must be performed by the Department on all new items of extra work in accordance with Federal Code of Regulations, 23 CFR 635.120(e). The Department’s Item Bid History spreadsheet should be the first step for the cost analysis process. The spreadsheet can be accessed through the SiteManager Reports page.
a) **Item Bid History** – The Department’s Item Bid History spreadsheet utilizes a data base of winning contract bids for all Department contract items over a span of several years. The Item Bid History’s spreadsheet process and associated filters can be used to obtain a meaningful representation of item unit prices based on particular contract situations. The filtered results can be compared to the Contractor’s submitted price. The process begins by checking the Item Bid History spreadsheet to determine if:

1. There is bidding history for the item. If no bidding history exists, use one of the processes described under “Cost Analysis” explained below.

2. If there is bidding history, then filter the data for contract conditions.

3. If N<30 (where N is the number of data lines returned for a filtered search), the information may not be statistically significant. In this situation, the data should be used as informational. It may be better to use one of the processes described under “Cost Analysis” explained below.

4. If N≥30, (after filtering) the Item Bid History spreadsheet has enough data returns to be statistically significant and can be utilized for cost verification.

An item would compare favorably if the Contractor’s requested unit price indicated on their Change Order Request form is less than or equal to the highest indicated unit price of either the 95% confidence interval, or the forecasted cost. Both values are obtained from the Department’s Item Bid History spreadsheet. Requested unit prices meeting this criteria require no further price justification. Filtered item summary information obtained from the spreadsheet is presented in graphical form on the Summary tab of the spreadsheet and can be saved for easy reference and change order documentation. The PE/S must attach a copy of the Department’s Item’s Bid History summary page to the change order as price verification documentation.

b) **Cost Analysis** – If the Department’s Bid Item History shows limited (N<30) or no bid history, data obtained from the spreadsheet should be used as informational and one of the following cost analysis methods should be utilized for cost verification of requested prices.

1. **Estimated Item Cost Less Than or Equal to $20,000**

   When verifying costs for new items of approved extra work with estimated item costs of less than $20,000 and having insufficient bid history, the Contractor’s submitted Change Order Request form should be reviewed for acceptance by the PE/S and, as needed, the AE. The Change Order Request form should be reviewed for extra work identification and description, mitigating options, and cost accuracy.
2. **Estimated Item Cost Greater Than $20,000 but Less Than or Equal to $50,000**

When verifying costs for new items of approved extra work with estimated item cost greater than $20,000 but less than or equal to $50,000 and having insufficient bid history, the PE/S and, as needed, the AE will perform a cost analysis of the work for comparison with the Contractor’s Change Order Request price. The Department’s cost analysis will be documented on the Change Order Cost Analysis worksheet, available on the Department’s website, and should include consideration and analysis of any unique circumstances of the proposed work. The categories of labor, equipment, and materials should be analyzed and calculated on the worksheet.

3. **Estimated Item Cost is Greater Than $50,000**

When verifying costs for new items of approved extra work with estimated item cost greater than $50,000 and having insufficient bid history, the PE/S, AE, Field Engineer, and the Engineer of Record will work together to provide relevant information in the development of the cost analysis for the Department. All cost analysis input will be documented on the Department’s Change Order Cost Analysis worksheet. The combined cost analysis information will be used to compare with the Contractor’s submitted price.

For any of the cost verification methods described above, if the comparison is not acceptable, the PE/S should direct the Contractor to amend the Change Order Request form to provide additional detail on the uniqueness of the proposed work and the associated justification for the requested item price.

The accepted Contractor’s Change Order Request form along with the Department’s cost analysis should be attached to the official change order as new item price verification documentation.

- **Use of Force Account** - If prices for extra work cannot be agreed upon, change order work can be performed as a force account. The force account option should only be used as a last option to pay for approved extra work. Estimate the monetary adjustment in accordance with force account procedures outlined within the Specifications. When utilizing the force account option, there are discussions with the Contractor that are required to occur prior to the agreement and authorization to perform the extra work. These discussions should establish the specifics on issues such as, but not limited to:

  1. Specific individuals that will perform the extra work.
  2. Hourly rates of pay, including fringes and benefits.
3. Estimated time to complete the extra work including hourly work week and crew size.

4. Specific bond and insurance premium costs for the extra work.

5. Estimated quantity and cost of materials to be utilized, including transportation costs.

6. Individual pieces of equipment to be used for the extra work.

7. Agreement on the specific equipment rates to be paid.

8. Appropriate sub-contracting administrative costs, as per the Specifications, for force account work.

9. Appropriate mark-ups, as per Specifications, for force account work.

If the actual force account costs exceed the initial estimate, a subsequent Change Order can be processed to cover the excess costs.

- **Obtain Documented Approval** - After the monetary and time adjustments for the Change Order are determined, refer to the Change Order Policy to determine the required approval authority for the Department. In addition, obtain documented approval from representatives of the LPA or FHWA, if applicable, prior to issuing the Work Order directing the contractor to perform the Change Order work.

- **Other Change Order Issues** - After documented approval of the Change Order work is obtained, forward information regarding the Change Order scope, affected pay items and quantities, and the unit prices to the District EEO Officer and to the PM.

### 2.19.12 Execution of Change Order Document

After issuance of the Work Order, it is important to execute the Change Order document as quickly as possible. Since contractors cannot be paid for work associated with new pay items included in a Change Order until the document is fully executed, completing the Change Order approval process must be a top priority. In addition, while the Change Order is being processed, verify that the purchase orders associated with the work have sufficient funds to allow for payment of the Change Order work. If insufficient funds remain in the purchase orders, initiate the process to add the necessary funds.

The following instructions are intended to provide points of emphasis regarding the Change Order execution process *(See SiteManager Training Document for more detail)*:

- **Initiate SiteManager Change Order Module Data Entry** - The first step in the execution process is the entry of the necessary data within the Change Order module within SiteManager. The data associated with pay items and quantities must
be entered in accordance with the PCNs under which the work will be performed. Time adjustment data is entered on a contract basis, but separate entries are required for each closure period, intermediate completion date, contract completion date, etc. Complete SiteManager Change Order header data entry and place the Change Order in “Draft” status within two business days of issuance of the Work Order.

- **Assign Appropriate Reason Code** - In order to identify recurring Change Order patterns, it is necessary for the correct reason code to be identified on the Change Order. Criteria for determining reason code categories appear earlier in this document. Within these categories, select the most appropriate subcategory to describe the situation related to the Change Order. All possible reason codes appear on a drop down menu within the Change Order module of SiteManager.

- **Scan Appropriate Change Order Attachments into SiteManager** - The documented approvals received from the Department approval authority, PM, FHWA, or the LPA should be scanned into SiteManager as attachments to the Change Order. In addition, documented approvals required from the Director, Division of Construction Management for the special situations listed in the Change Order Policy should be scanned into SiteManager.

- **Document Cost Analysis Process for Change Orders with New Pay Items** - Change Orders which include new pay items are required by the Federal Code of Regulations, 23 CFR 635.120 to have a cost analysis performed. In order to document that this requirement has been met, a statement should be included in the Explanation Section of the Change Order that indicates that the unit prices for all new pay items have been deemed reasonable based on a review of documents included in the cost analysis file located in the field office. Scan the cost analysis file for new pay items into the header tab of SiteManager.

- **Document Force Account Process for Change Orders** - If force account is utilized, a valid reason must be given for performing the work under force account. A template has been added to SiteManager Explanation tab to provide the reason and can be found by right clicking on the “Pick Std Exp. ID or Enter Text Below” and then search or type in the acronym. The template’s acronyms and statement read, “**FA – Because the Contractor and INDOT could not reach an agreement with respect to the price for the work described in this change order, it shall be performed via FORCE ACCOUNT in accordance with 109.05(b)**” and “**FAE – Because the extent of work could not be determined to establish a unit price, it shall be performed via FORCE ACCOUNT in accordance with 109.05(b)**” Any additional reasons can be added to the general explanation of the change order. Scan all documents required by Standard Specification 109.05(b) for force account into the header tab of SiteManager.

- **Document Time Adjustments for Change Orders** – Contract time must be mentioned on the explanation tab on any change order using one of the three responses detailed in section 2.18.1. The three responses have been added as
templates in the SiteManager Explanation tab. The templates can be found by right clicking on the “Pick Std Exp. ID or Enter Text Below” and then search or type in the acronym. Any time adjustment must be analyzed against the approved schedule and explain how the critical path was delayed. Scan the approved project schedule and any other correspondence into the header tab of SiteManager.

- **Place Change Order in Pending Status** - Prior to beginning the actual approval process, it is necessary to revise the Change Order status to “Pending”. Verify that the noted Department approval authority level is correct. If it is not, contact the District SiteManager trainer for additional guidance. Once it has been determined that the Department approval chain of command is correct, select the appropriate individuals for the AE, DCD, SCE, and DDCM menus as appropriate.

- **Produce Change Order Hard Copy for Contractor Signature** - Since contractors do not have access to SiteManager, it is necessary to produce a hard copy of the Change Order and scanned documented approvals so that the contractor’s approval can be noted by signature. *Do not share any bid history data or operation production data from the cost analysis file with the contractor.*

- **Document Contractor Approval in SiteManager Change Order Module** - Upon receipt of the contractor signed Change Order hard copy, indicate the contractor approval of the Change Order within SiteManager. Scan the contractor signed Change Order hard copy into SiteManager. If no LPA approval is required, maintain the contractor signed hard copy in a project file in the field office.

- **Forward Contractor Signed Change Order Hard Copy to LPA, if Applicable** - LPAs do not have SiteManager access, so forward the contractor signed hard copy to the LPA for signature by the official representatives on LPA contracts.

- **Document LPA Approval in SiteManager Change Order Module, if Applicable** - Upon receipt of the LPA signed Change Order hard copy, if applicable, indicate LPA approval of the Change Order within SiteManager. Scan the LPA signed hard copy into SiteManager and maintain the hard copy in a project file in the field office.

- **Obtain Department Approval** - If the PE/S is the approval authority, approve the Change Order within SiteManager. If the contract has FHWA oversight, notify FHWA that the Change Order is available within SiteManager for FHWA approval via e-mail. If the contract does not have FHWA oversight, the Change Order approval process is complete.

If the approval authority is at the AE level or above, notify the AE via e-mail that the Change Order is ready for approval. If the AE is the Department approval authority, the approval process is complete once AE approval is granted unless the contract has FHWA oversight. For FHWA oversight contracts, the AE notifies FHWA that the Change Order is available for approval within SiteManager via e-mail.
For Change Orders with an approval authority above the AE level, each individual within the approval chain of command will recommend the Change Order for approval and forward it to the next level until the Change Order is approved by the approval authority. Once the Change Order is approved by the approval authority, the Change Order approval process is complete unless the contract has FHWA oversight. If the contract has FHWA oversight, the approval authority needs to notify FHWA that the Change Order is ready for approval within SiteManager.

If anyone in the approval chain requires additional information prior to approving the Change Order, the PE/S will be contacted and notified of the required additional information. While preparing the requested additional information, modify the SiteManager Change Order status to “Draft”. Once the requested additional information is forwarded to the individual that requested it, change the status of the Change Order back to "Pending" and notify the AE that the Change Order and additional information is ready for the approval process.

- **Distribute Copies of Executed Change Order to All Signatories** - After all required approvals have been obtained, supplement the Change Order/attachment hard copy that includes the Contactor signature and LPA signature, if applicable, with a SiteManager generated Department and FHWA approval page to serve as the original Change Order document. Maintain this document and attachments in a project file at the field office. From this original document, produce hard copies of the Change Order and all attachments for distribution to:

1. Contractor
2. LPA, if applicable
3. FHWA, if contract has FHWA oversight
4. District Office file
5. Project Manager

**2.19.13 Documentation Requirements**

Change Order related correspondence which is exchanged between the Department and the contractor should be entered into the SiteManager Correspondence Log. It is acceptable to scan these documents into SiteManager or maintain them in project files in the field office as long as the document location is noted on the Correspondence Log. Following are examples of documents related to Change Orders which should be entered into the Correspondence Log as applicable:

- Contractor Notice of Changed Condition
- Department Issued Concurrence or Denial of Changed Condition
- Correspondence Related to Required Change Order Work
- Contractor Supplied Extra Work Quotes
- Department Request for New Pay Item Unit Price or Time Adjustment
- Backup Documentation
- Contractor Supplied Backup Documentation
- Department Issued Work Order
h. Department Issued Executed Change Order Hard Copies to Contractor, LPA, and FHWA
i. Change Order Signature Page
WORK ORDER

July 1, 2015

Mr. Joseph Contractor
Highway Construction Co., Inc.
1234 Main Street
Anytown, IN 46199

RE: Contract R-39999, Change Order No. 21 Work Order

Dear Mr. Contractor:

Highway Construction Co., Inc. is directed to perform all work as described below:

- **Scope of Work** - Undercut soft subgrade soil material between STA 181+00 “A” and STA 185+50 “A” and backfill excavated area with B Borrow.
- **Affected Existing Pay Items** - CLN 32, Common Excavation - 800 cys; CLN 38, B Borrow - 800 cys.
- **New Pay Items** - None
- **Total Monetary Adjustment** - $24,000.00
- **Total Contract Time Adjustment** - Intermediate Completion Date No. 1 - Ten Calendar Days; Contract Completion Date - Ten Calendar Days
- **Date Work Expected to Begin** - July 1, 2015

Change Order No. 21 will be forthcoming to modify Contract R-39999 in accordance with the above.

If you have any questions regarding this Work Order, please do not hesitate to contact me.

Sincerely,

Thomas Allen
Project Supervisor

Cc: John Adams, P.E., Area Engineer
    William Roberts, Project Manager
    File
2.20 CLAIMS (Rev. 01-21-14)

Situations which result in contractor claims for additional compensation or contract time can be very complicated. It is not possible to provide clear instructions for handling every situation that can potentially result in a claim. Therefore, the following discussion will be limited to certain concepts that are common to situations related to claims.

2.20.1 Changed Conditions

Contractor claims will only be considered when they are related to a changed condition as defined by Section 104.02 of the Standard Specifications. There are three types of changed conditions:

- Differing Site Conditions as described by Section 104.02(a).
- Suspension of Work Ordered by the Engineer as described by Section 104.02(b).
- Significant Changes in the Character of the Work as described by Section 104.02(c).

In most cases, when there is a potential changed condition situation on the contract, it is discovered by the contractor. Therefore, the contractor will be responsible for providing written notice of a changed condition in accordance with Section 105.16(a).

Upon receipt of the contractor’s notice of changed condition, investigate the situation to determine whether any of the provisions of Section 104.02 apply. If necessary, direct the contractor to stop work in the area of the possible changed condition to allow for the investigation. Refer to Section 104.02(d) for timeframe requirements for response to the contractor. If the situation is complex and it is not possible to respond within the stated timeframe, work with the contractor to agree on an acceptable extended deadline.

If it is determined that the situation does not meet the Section 104.02 requirements for a changed condition, notify the contractor of that determination and direct the contractor to proceed with work in accordance with the current contract requirements. This notification should be in writing and e-mail is acceptable.

If it is determined that the situation meets the Section 104.02 requirements for a changed condition, it is also necessary to determine the scope of the work required to mitigate the changed condition. If necessary, contact the AE or PM and request that the appropriate INDOT or consultant personnel are contacted for assistance in developing the required scope of work. Once the scope of work is determined, notify the contractor in writing that the situation is a changed condition and the scope of work required to mitigate the problem. An e-mail is an acceptable form of written communication for this notification.

If the contractor accepts the ruling made by the PE/S, prepare and execute a Change Order in accordance with the Change Order Policy for incorporation of the following:

- Addition of new pay items related to the mitigation scope of work to the contract.
- Adjustment of quantities associated existing pay items.
- Time adjustments associated with the performance of the mitigation work.
2.20.2 Contractor Notice of Intent to File Claim
If the contractor disagrees with any portion of the determination of a changed condition or the mitigation scope of work, a notice of intent to file a claim must be submitted in accordance with Section 105.16(b) of the Standard Specifications. This notice needs to describe the extent of the disagreement with the changed conditions finding so that tracking of the disputed costs and time can be performed. If there is no mention of the extent of the dispute in the contractor notice, request that it be provided as soon as possible.

Once the intent notice is filed and the extent of the dispute defined, the contractor is required by Section 104.02(d) to submit weekly reports while the disputed work is being performed to document the additional costs and time associated with the performance of this work. While this disputed work is ongoing, it will be necessary to track the labor, equipment, and materials used and document this information in the SiteManager diary on a daily basis. On a weekly basis, meet with the contractor to compare the SiteManager diary records to those included on the contractor’s weekly report. At the conclusion of the meeting, note all agreements and disagreements on the contractor report and maintain the report with comments in a file in the field office. If the contractor submits written notice of disagreement with the SiteManager diary entries in accordance with Section 105.16(d), maintain this information in the same file in the field office. The importance of documentation and organization cannot be overstated. “If it is not written down, it did not happen” is a common statement made by individuals experienced in claim review.

Once the disputed work is completed, the contractor must submit its claim within the timeframe included in Section 105.16(b). Review the claim against the documentation requirements of Section 105.16(b) and provide the contractor with written acknowledgement of receipt of the claim. An e-mail is sufficient for this notification and any deficiencies in claim documentation should be noted.

2.20.3 Project Level Review
Perform the project level review in accordance with Section 105.16(c). While performing this review, keep the following in mind:

- Perform the review absent of emotion. The claim is to be evaluated on its contractual merits.
- LPA contracts require involvement by a representative of the LPA and possibly an MPO in the claim review process.
- FHWA oversight contracts require FHWA representative participation in the claim review process.
- The burden of proof for additional compensation or contract time is on the contractor. This concept applies to providing contractual justification for entitlement as well as documentation of the magnitude of the additional compensation or contract time to which entitlement is demonstrated.
- Claims may ultimately result in litigation. It is important that the claim review process is performed in accordance with contract requirements and in a professional manner. All claim reviewers may be asked to testify under oath in a deposition or at trial.
• The AE and Division of Construction Management Field Engineer assigned to the District are available resources for the claim review. Complex situations may require the involvement of the Division of Construction Management Claims Administrator.

• The review should focus on the following:

  a. Entitlement - Is the contractor contractually entitled to monetary or time adjustments for performance of the disputed work? If there is no contractual entitlement, it is not necessary to evaluate the impact or cost aspect of the disputed work.
  b. Impact - Did the event that necessitated the disputed work impact the contractor’s controlling operation or critical path?
  c. Costs - What is the magnitude of additional costs and time incurred by the contractor due to performance of the disputed work?

Upon conclusion of the project level review, prepare a written ruling and forward it to the contractor. The ruling should include contractual justification for the ruling, if possible. For situations where the contractor does not demonstrate contractual entitlement, it is acceptable to cite this as justification for denial.

If the project level ruling indicates that the contractor is entitled to a portion of the monetary or time adjustments being sought, prepare and execute a Change Order in accordance with the Change Order Policy to settle as much of the claim as possible. If the contractor’s representative will not sign the Change Order because the contractor intends to pursue the denied portion of the claim, notify the AE for guidance.

2.20.4 District and Central Office Reviews, Mediation, and Litigation
Section 105.16(c) of the Standard Specifications also includes detailed requirements for the contractor and Department for reviews above the project level. There are situations where all higher level reviews are performed in the District Office and there are others where Central Office review is required.

If the contractor provides notice that a District Office review is desired, forward the claim originally submitted by the contractor and the project level ruling to the District Office. While the District or Central Office review is ongoing, provide any additional information requested.

If the claim or any portion is resolved at any of these levels, prepare and execute a Change Order in accordance with the Change Order Policy to facilitate payment of the monetary adjustment or modify the contract time in accordance with the time adjustment.

2.20.5 SiteManager Documentation Requirements
SiteManager includes a Claims/Liens module which allows for tracking the status of claims. When a contractor claim document is submitted, input the required information regarding the claim into the module. Contractor submittals of Notice of Changed Condition, Notice of Intent to File a Claim, or submittal of weekly claim forms do not warrant data entry into the Claims/Liens module. SiteManager automatically numbers each
When executing a Change Order that incorporates the claim settlement into the contract, the Change Order Header includes a data entry blank to associate the Change Order with a claim. Input the claim number into this Header data entry blank when inputting data into the Change Order header.

There may be situations where claims are partially resolved at various steps in the claims resolution process. When partial resolutions are reached, prepare and execute Change Orders to incorporate the partial settlement into the contract. Input the claim number in the appropriate Change Order Header data entry blank to associate the Change Order to the claim. It is necessary to keep track of the monetary and time adjustments associated with each partial resolution outside of SiteManager until the claim is totally resolved. At that time, input the sums of all monetary and time adjustments into the SiteManager Claims/Liens module to complete the data entry associated with the claim settlement.

2.21 COST REDUCTION INCENTIVES  
Contractors may propose to modify contract documents to reduce construction costs without impairing essential functions, characteristics, and timing of the project. A contractor’s proposal must be in accordance with the Specifications.

There are 3 components of payment for a CRI that has been accepted by the department.

1. Contractor’s Reasonable Design Cost for the CRI proposal  
2. Cost of the work  
3. Fifty percent of the department’s net saving, as defined in standard spec 109.04:

\[
TNS = OCW - RCW - CRDC - DC
\]

Where:

- \( TNS \) = Total Net Savings
- \( OCW \) = Original Cost of the Work required by the original contract
- \( RCW \) = Revised Cost of the Work
- \( CRDC \) = Contractor’s Reasonable Design Cost for the CRI proposal
- \( DC \) = Department’s Cost for investigating, evaluating, and implementing the CRI proposal.

**EXAMPLE:**

The Original Cost of the Work (\( OCW \)) required by the original contract is: $200,000. 
The Revised Cost of the Work (\( RCW \)) is: $100,000. 
The Contractor’s Reasonable Design Cost (\( CRDC \)) for the CRI proposal is: $20,000. 
The Department’s Cost (\( DC \)) for investigating, evaluating, and implementing the CRI proposal is: $10,000.
The PE/S would make a payment for the CRDC of $20,000 after approving the formal proposal.

Total Net Savings (TNS): $200,000 - $100,000 - $20,000 - $10,000 = $70,000.

The Contractor’s 50 percent share of the net savings: $70,000/2 = $35,000.

Total CRI Payment to the contractor: $20,000 + $35,000 = $55,000.

The contractor’s reasonable design cost for the CRI proposal, as well as the costs incurred by the department in evaluation and modification of the plans and contract, will be deducted from the total estimated savings of an accepted proposal. The PE/S should work with the Project Manager and the designer to determine the Department’s Cost, as well as determining if the contractor’s Design Cost is reasonable. The resulting net savings is split equally between the contractor and the department. Time savings resulting from the CRI should not be included in the calculation of net savings.

The intent of the CRI specification is that the PE/S writes a change order to compensate for contractor’s reasonable design costs just after approving the formal proposal. In cases when the department has not initially paid the contractor for development costs, or when the timeframe between the development and completion of work is very short, the design cost and savings payment can be performed under one single change order. It is important that all costs are carefully documented on the change order. Whether done under separate change orders or one change order, the development costs and the payment for 50% of department savings to the contractor should be paid using the pay items in 109.04. The change order should adjust contract time and/or interim completion dates, if necessary.

2.22 DEMOLITION WORK (Rev. 09-08-09)

If the contract involves demolition work, the PE/S must give the contractor written notification when parcels become available for demolition. This information will be furnished to the DO by the Land Acquisition Division. The contractor should be assessed liquidated damages when they do not commence demolition work within 5 calendar days and complete it within 60 calendar days, in accordance with Section 108.07 of the SS. Inspection and testing for asbestos presence, or filing a notification with the IDEM will be considered as part of the work. Copies of these (dated) filings must be included in the Final Construction Record. The contractors “Notice to Proceed with Demolition Work” should be like the following:
NOTICE TO PROCEED WITH DEMOLITION WORK

Contract # __________________

District # ___________________

Contractor _________________________________________

Gentlemen:

This is to inform you that the demolition on parcel(s) _____________________ can begin on _______________________. This date constitutes your official written notification in accordance with the standard specifications. Work is to commence within 5 calendar days after the date specified above. Liquidated damages will be assessed beginning on the 6th day.

____________________________

Project Engineer/Supervisor

cc: District Construction Engineer
    Final Construction Record
    File
3.1 STORM WATER MANAGEMENT (Rev. 05-25-18)

The specifications require the contractor to schedule and conduct its operations to minimize erosion of soils and to prevent sediment from reaching streams, irrigation systems, lakes, reservoirs, etc. The discussion of storm water management must be included in all pre-construction conferences. The requirements to schedule seeding and sodding operations as the construction progresses, instead of waiting until the final stages of the project, should be stressed when discussing these operations with the contractor.

Indiana Administrative Code Title 327 IAC 15-5 (Rule 5), defines the State’s regulations governing storm water management for land disturbing activities affecting one or more acres. These regulations are the responsibility of IDEM to enforce. Regulation compliance is the responsibility of the contractor and INDOT.

The PE/S should have a thorough understanding of good storm water management, and the best management practices (BMP) utilized by the Department. The PE/S should also understand the processes by which the Department obtains approval from IDEM to perform construction projects under Rule 5 and the requirements placed on the contractor for storm water management by the contract documents.

The Department’s storm water BMPs are defined within the Standard Specifications, the Standard Drawings, the contract plans, and the Department's Storm Water Management Field Guide. The PE/S should review this information to understand the purpose and scope of erosion and sediment control established for the contract. The IDEM Storm Water Quality Manual also provides excellent reference information for review by the PE/S to ensure the project is in compliance with Rule 5. It is advised that the PE/S retain a copy of Rule 5 for review and reference.

3.1.1 Purpose

The purpose of storm water management is to minimize or eliminate the potential for soil erosion and off-site sedimentation. At its core, storm water management has two basic processes.

The first core process is erosion control. Erosion control measures are designed to maintain the soil on the ground, to keep the soil within the construction area, and to minimize its movement. Erosion control measures are more cost effective than trying to manage sediment after it has begun to move. Minimizing water or wind produced movement of soils from stockpiles, new embankments or ditch lines would fall within the erosion control category.

The second core process is sediment control. Sediment control measures are designed to slow the movement of water to allow time for sediment particles carried by the water to settle and drop out of suspension. Sediment control measures are generally more expensive, require more maintenance, and are a less effective storm water management tool.
management of soil particles moving with storm water during a rain event would fall within
the sediment control category.

3.1.2 INDOT’s Storm Water Pollution Prevention Plan
The Department's Environmental Services Section (ES) works with the designer and IDEM
to obtain approval to publish the Notice of Intent (NOI) prior to letting a contract that will
disturb one or more acres of land. INDOT’s designer develops an initial Storm Water
Pollution Prevention Plan (SWPPP) to address anticipated land disturbing activities within
the construction limits during the contract. Prior to contract letting, the plan is reviewed by
ES, and occasionally by IDEM. Revisions are made as necessary to provide a workable
plan that ultimately becomes part of the contract documents.

3.1.3 Contractor’s Storm Water Quality Control Plan
Plans are incorporated into the contract to address the anticipated needs for storm water
management during the different phases of the construction contract. However, since
INDOT’s designer, ES, and IDEM cannot foresee the exact methods and sequence of
operations the contractor may use on a given project, the Specifications require the
contractor to develop and submit for acceptance a Storm Water Quality Control Plan
(SWQCP) to the PE/S describing the sequencing, prosecution, and phasing of the work for
each stage of the construction contract. The SWQCP shall be prepared and stamped by a
licensed engineer that holds a current certification for a Certified Professional in Erosion
and Sediment Control (CPESC), CPESC-In Training, or an approved equal.

INDOT’s design developed SWPPP and the Contractor’s developed SWQCP shall work
in coordination with each other to complete the requirements of Rule 5.

The SWQCP, or any phase of the SWQCP, shall be submitted 14 days prior to the start of
any earth disturbing activities for that particular phase. The SWQCP must address:

(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 washouts.

The SWQCP must also include a written plan for the collection, storage,
and disposal of concrete washout waste water. The capacity of the washout
containers must be adequate to accommodate the size of the concrete pour.
A secondary container shall also be kept on site. The container or pit shall
be lined with a continuous sheet of plastic that is a minimum 10 mil thick.
The material must be leak free and cannot be overlapped. Soils that are
contaminated by spills shall be excavated and disposed of in accordance
with 202.08. All costs for work shall be the responsibility of the Contractor.

(c) Proposed construction sequence and phasing of the erosion control
measures.
(d) Locations of all construction entrances where vehicles and equipment will enter and exit the site.

(e) Material handling and spill prevention plan, which includes a listing of expected materials that may be present on the site during construction and the written plan of how those materials will be handled to minimize their potential for entering the storm water runoff from the site.

(f) Statements that the Storm Water Management features used shall, at a minimum, be inspected on a weekly basis and within 24 hours of every 1/2 inch rain event.

(g) Monitoring and maintenance plan for erosion and sediment control measures.

Additional contractor responsibilities within the SWQCP process include:

(a) Designating a trained employee as the Storm Water Quality Manager (SWQM) to oversee and be in responsible charge of the contractor’s storm water management operations.

(b) Ensuring that the signed and dated SWQCP is submitted 14 days prior to any earth disturbing activities.

(c) Following their accepted SWQCP.

(d) Completing inspections of all installed BMPs at the correct frequency and documenting the inspections on the Storm Water, Erosion and Sediment Control Inspection Report.

(e) Amending and resubmitting their SWQCP as necessary to address changes during the construction of the project.

The Storm Water Quality Control Plan is a “living” document and is required to be amended by the contractor as new situations occur or as the plan of operation changes.

Once the SWQCP is received from the contractor, the PE/S will perform the following:

(a) Review the SWQCP within 14 days of receipt utilizing the process outlined in ITM 803, Section 15 and the SWQCP checklist within Appendix I.

(b) Contact their Area Engineer for clarification and utilize the ES Permit Coordinator as an information reference for the SWQCP review.

(c) Sign and date the SWQCP to document the review of the methodology and approval of the content.
In addition to the work covered by the contract documents and the SWQCP, the contractor may also need to operate offsite borrow and disposal sites. Environmental permits for these sites are solely the responsibility of the contractor and are not covered in any part by the Department’s SWPPP, the plans, or the contract permits. A copy of the Contractor’s offsite operations, NOI for items such as offsite stockpiles, borrow sites, waste sites, or storage areas shall be submitted to the PE/S prior to operations at those sites.

3.1.4 Installation, Inspection, and Maintenance
As defined within the Standard Specifications, the contractor is responsible for the proper installation, inspection and maintenance of all storm water management measures. In accordance with Rule 5, storm water management inspections are required to occur at a minimum frequency of once every 7 days, and by the end of the next business day following each measurable storm event equal to or greater than 1/2 inch of rainfall.

Inspection findings, both good and bad, shall be documented and recorded on the Storm Water, Erosion and Sediment Control Inspection Report. The report can be accessed from http://www.in.gov/indot/2735.htm.

The PE/S is responsible to make sure that the contractor’s SWQM has submitted inspection reports correctly, in a timely manner, and in accordance with Rule 5 requirements. Any additional storm water management features suggested by the contractor’s SWQM in the Storm Water, Erosion and Sediment Control Inspection Report should be evaluated and either accepted or denied by the PE/S on the inspection report. Evaluations of any proposed new storm water management features should include discussions with the AE and the ES Permit Coordinator. They can help determine and ensure that the contract continues to meet the intent of the specifications, maintains economic value, and maintains compliance with all requirements of Rule 5.

As with any plan, it is not uncommon for changes to be made in order for the plan to work properly. Similarly, the storm water management measures in the contract must be used to their best advantage to accomplish the job. Therefore, some storm water management item quantities may overrun and some may underrun. The PE/S must use their best judgment and work with the contractor, AE, and the ES Permit Coordinator to adapt the best plan to fit the actual conditions of each project while still being as efficient as possible with the use of BMPs. All of the initiated changes should be documented as amendments to the SWQCP.

The references and Department websites discussed within this section can be found in the Department’s Storm Water Management Field Guide.

3.2 BORROW AND DISPOSAL SITES (Rev. 08-10-17)
The contractor must submit proposed borrow and disposal site locations to the PE/S for approval. Form IC 203, Request for Approval of Borrow or Disposal Site, is available on the Department’s website and must be completed by the contractor for each proposed site and submitted to the PE/S for approval. The form requires the contractor’s signature certifying that they have complied with all environmental laws and regulations required to perform the planned operations at the site. The PE/S will review the form and sign it if
properly completed. A site must be approved before the contractor can begin operations at
the site.

Requirements for different types of sites shall be in accordance with 203.08.

The primary reason for the need to review and approve borrow and disposal sites is to help
prevent contractors from inadvertently dumping in a wetlands area or disturbing an
archeologically sensitive site. As the owner of the project, INDOT is responsible to take
measures to prevent these occurrences.

There are many different situations that can arise when determining whether a borrow or
disposal site is acceptable; however, the specifications are intended to give the PE/S the
tools necessary to reasonably ensure that the contractor has taken appropriate measures to
prevent borrow or disposal operations from becoming a violation of environmental laws.

In some cases, such as existing commercial operations where the entire area has previously
been developed, there can be consideration made as to whether the requirements for a
wetlands delineation or archeological investigation are appropriate. There are areas on
form IC 203 for the contractor to explain why certain permit requirements may not apply
to a given situation.

The PE/S must use their best judgment to reasonably determine when a given area may or
may not require all environmental work to be done. However, it is the contractor who is
ultimately responsible for ensuring compliance with the laws. By contract, the
Department’s approval of borrow or disposal sites does not relieve the contractor of any
obligations or penalties under the law. The Department will hold the contractor responsible,
not the PE/S, if an approved site turns out to be in non-compliance with any law or
regulation. It is not the intent of the Department’s procedures to place the PE/S in a position
of responsibility for the contractor’s compliance with the laws, rather only to provide a
means for the PE/S and the Department to be aware of the contractor’s planned sites and
to obtain the contractor’s certification that they are in compliance with the laws. If the PE/S
has questions about a given site, they should contact the AE for further guidance.

3.3 GENERAL (Rev. 09-24-09)
Unless advised to the contrary, no restrictions should be placed on the contractor by the
PE/S as to where it shall commence work, except that where the alignment follows an old
road, the road must not be in disrepair during the winter months.

A contractor must not be allowed to construct earth cofferdams, earth causeways or other
earthen structures in a stream. For non-earthen cofferdam and causeways, the contractor is
required to submit a drawing for approval. If the cofferdam or causeway is not included in
the permits obtained by the Department for the contract, the contractor must obtain any
necessary permits or addenda prior to starting the work.

Construction of drainage facilities and performance of other contract work which will
contribute to the control of erosion and sedimentation must be carried out prior to, in
conjunction with, or as soon thereafter as practicable with earthwork operations. The
contractor may be required to construct temporary berms, dikes, slope drains, or sedimentation basins to prevent sedimentation before the permanent erosion controls are placed.

To help prevent erosion, sodding and seeding of cut and fill slopes should be accomplished as construction progresses instead of waiting until the end of a construction season. Temporary seeding should be required if areas of disturbed earth will be open for more than 7 days. Special consideration should be made to manage earth disturbing activities such that temporary/permanent seeding or sodding can occur prior to the end of the growing season, so as to prevent a winter long E&SC problem.

As provided in the SS, the contractor is responsible for the repair and restoration of any damaged sodded and seeded areas prior to final acceptance. This includes the work necessary to comply with the requirements of erosion control.

The procurement of soil samples, representative of the soil to be incorporated in embankments, should be one of the first activities of the PE/S. The samples must be sent to the District Testing Laboratory as soon as possible in order to expedite the return of the results to the PE/S. This data is necessary to perform density tests. The samples must be properly tagged and identified.

3.4 STAKING AND CONSTRUCTION ENGINEERING (Rev. 09-24-09)
Staking is done almost exclusively by the contractor and paid for under the items and specifications for construction engineering. The following instructions apply only in cases where construction engineering by the contractor is not included in the contract or if it is determined that additional staking is required and it will not be added to the contract by change order.

When staking is performed as part of a construction engineering pay item, the contractor will frequently use GPS surveying equipment to establish and control grades on the project. This “stakeless” surveying does not lend itself to checking of grade by the PE/S. However, it should be noted that the SS require the contractor to furnish all staking necessary for checking of the work. This is a topic that should be discussed with the contractor at the pre-construction conference.

If the contract does not have a pay item for construction engineering, the PE/S should determine, as soon as possible, at what point on the project the contractor intends to start work and start setting grade stakes at that point. The rough grade stakes should then be set for the balance of the project as rapidly as possible. This procedure will expedite the moving of utilities and fences which is a feature that quite often causes delays in grading operations.

Rough grade stakes should be of such length and type that will serve the intended purpose and will last for the duration of the work. They should be planed on two sides to facilitate marking. They should be set on each side of the road on the right-of-way line, at each station, at 50 ft intervals on all horizontal curves over four (4) degrees, and on all vertical curves where the algebraic difference of gradients is greater than six (6). Normally, grade
stakes set on the right-of-way line serve to denote the limits of the right-of-way. Therefore, a stake should be set at any break in the right-of-way to facilitate the erection of fences and relocating of utilities. If Department personnel have set the grade stakes, the contractor should not be allowed to remove rough grade stakes except with PE/S permission. Negligence in preserving grading stakes should not be tolerated.

Before and after setting the stakes, the plans and cross-sections should be carefully examined to make sure that sufficient right-of-way has been shown on the plans. Particular attention should be given to special ditches, relocation of streams and ends of structures in narrow channels. Stakes should be driven at least 1 ft into the ground and station number and distance marked on them. In some locations it is advantageous to set the rough grade stakes flush with the ground and place guard laths with station and distance. Elevations should be taken on the top of stake and the ground at centerline so that grade sheets can be prepared. Grade sheets must show the vertical distance from the top of the grade stake to a specific grade at centerline. This specific grade may be to finish grade on regraded sections, subgrade of subbase, subgrade of a base or surface course, or finished surface grade; however, the grade used must be noted somewhere on the sheet.

Any change in grade or any correction made subsequent to issuing the grade sheet should be shown on a revised grade sheet with corrections or revisions noted thereon. Taking elevations of all grade stakes should START FROM A BENCHMARK AND TIE INTO A BENCHMARK EACH TIME ANY ELEVATIONS ARE RUN. Rod readings are read to hundredth of a foot (thousandth of a meter). All recorded notes must be kept.

Upon assignment to a project, the setting of stakes should be pursued until the entire project is staked. If the stakes are set during the winter months, elevations should not be taken on them until the contractor is about ready to begin grading or until the frost has gone out of the ground. Stakes set in the winter should be driven lightly again before taking elevations. Stakes on which elevations were taken during the winter must be rechecked in the spring.

Since the construction work will disturb the alignment, control points such as a P.O.T., P.C., P.T., etc. must be referenced to stakes or objects that will not be disturbed. There are a number of methods used in referencing points and consideration should be given to the availability of the reference objects after the grade has been completed. These references must be recorded in a permanent field book and not in a hub book or loose leaf book.

3.5 CHECKING ORIGINAL CROSS SECTIONS (Rev. 05-25-18)
When there is a pay item for construction engineering in the contract, the contractor must take complete cross sections at 500 foot intervals and verify that the planned alignment and grades will match the existing conditions.

If an item for construction engineering does not exist, then the PE/S must make the cross section checks.
checked with those on the plans. If they do not check satisfactorily, or vary consistently more than 0.2 ft from the original sections, the reason should be found and the investigation continued to determine the correct original cross sections. It may be necessary to re-cross section the project. In case of doubt, consult the AE.

3.6 SLOPE STAKES (Rev. 05-25-18)
This work is typically required to be done by the contractor as part of the construction engineering pay item. If a pay item is not included in the contract, the PE/S must perform the staking required.

Slope stakes should be set at each station for both cuts and fills throughout the entire length of the project including additional slope stakes for special ditches. The distances from the centerline to the slope stakes shall be shown on the grade sheets with the slope shown in the “Cross Section” column. In preparing to set slope stakes, the cross sections should be studied to note planned variations from the typical cross section and slopes.

The slope stake book should contain notes as to cut or fill, distance from centerline and elevation at which the slope stake was set. The elevation at which the slope stake was set is useful in tying final cross sections and in plotting the slope stakes on the original cross section sheets.

When rock is encountered in a cut with an overburden of earth above it, the cut shall be made by excavating the earth far enough back so that a shoulder or shelf will be left on top of the rock between the base of the earth cut and the top of the rock cut.

In cuts where it is not known or cannot be determined with certainty how far the rock is below the surface of the ground, the slope stake shall be set as if the entire cut consisted of earth. The overburden would then be excavated on the normal earth slope to the top of the rock. After the overburden has been stripped from the rock, the top of rock is slope staked for the typical rock section or to slopes designated by the PE/S. A separate or supplemental grade sheet should then be completed. The distance to the top of the rock slope and designating the cross section to be constructed should be shown. Where rock cuts are very short, construct the typical earth cross section.

3.7 CLEARING RIGHT-OF-WAY (Rev. 05-25-18)
The PE/S upon assignment to a contract should request copies of the right-of-way grants from the DO and compare the right-of-way distances on the grants with those on the plans. The DO should be notified of any discrepancies that are discovered. All buildings, gasoline pumps, etc. shall be removed from the right-of-way. A time limit for the removal of buildings from the right-of-way is usually incorporated in the right-of-way grant. If there is difficulty in getting them removed, the matter should be taken up with the DO. It is easier to remove all encroachments at this stage of construction rather than just prior to final acceptance.

Right-of-way grants must be checked for special commitments. When shown, these commitments must be fulfilled. Right-of-way commitments may be fulfilled within the existing or future contracts, or the property owner may have been compensated during
Vegetation and trees between the construction limits and the right-of-way line must be preserved as much as possible. The environmental permits for the contract often do not cover work outside of the construction limits. Before the contractor starts clearing the right-of-way, the trees to be removed should be marked. Occasionally, right-of-way grants contain provisions for leaving certain trees on the right-of-way. These trees must not be disturbed. The contractor should be notified of the exception. The District Landscape Supervisor should be advised of any proposed tree trimming by utilities.

Before trees, stumps, rubbish, or other material can be deposited beyond the right-of-way limits by the contractor, it will be necessary for the contractor to submit a waste disposal plan as provided in the Specifications. After the contract has been completed, the contractor should obtain signed property releases (Form IC 149) for the disposal areas, borrow pits, plant sites, etc. A copy of these releases must be included in the final construction record.

On pre-graded projects, paving contractors on pre-graded projects are required to mow weeds and clean up the right-of-way without compensation in the same manner as on a grading or a grading and paving project.

3.7.1 Temporary Right-of-Way for Private Drives
All right-of-way matters except temporary right-of-way for private drive extensions will be handled by authorized right-of-way agents. Where additional right-of-way is necessary for planned construction, constructing outlet channels, peat disposal, authorized grade changes, etc., sketches of the additional right-of-way with the property owner’s names should be made and submitted to the DO for acquisition.

3.7.2 Temporary Right-of-Way for Building Removal
Many of the road and bridge plans indicate TEMPORARY RIGHT-OF-WAY FOR BUILDING REMOVAL. In numerous instances the property owner cannot utilize the remainder of his property until the building has been removed and the temporary right-of-way formally released by INDOT. In some instances the courts have been critical of the delay in making the temporary right-of-way available to the owner. In view of the above, the Land Acquisition Division has requested that their office be promptly notified when the building or buildings, on any individual tract or parcel of temporary right-of-way that was acquired for building removal purposes, have been removed. The Division of Construction Management should be advised when such temporary right-of-way may be formally released to the property owner. Construction Management will in turn inform the Land Acquisition Division. It is suggested the removal of buildings located on temporary right-of-way be considered at the pre-construction conference or early in the life of the contract. Every reasonable effort should be made to expedite the removal of those that fall...
outside the permanent right-of-way. Conducting business in this manner will contribute to a more favorable public opinion.

3.7.3 Sign Encroachments
The owners of outdoor advertising signs located within the right-of-way should be advised, either by personal contact or by letter, to remove their sign. If the sign is of material value and the owner does not desire to salvage or relocate it, a letter should be secured from the owner so indicating. Once the letter is received, the contractor can then proceed to remove the sign in accordance with the provisions of the SS. If the sign is of material value and the owner refuses to remove the sign, the DO must be contacted for guidance.

3.7.4 Archeological Artifacts & Historic Features
If archeological artifacts or historic features are found, work must be stopped immediately in the area of the discovery. Section 3.22 provides guidance on how to proceed.

3.7.5 Disposal of Timber
The following procedures apply to the disposition of merchantable timber within the construction limits:

(1) Section 201.03 of the SS provides that “All merchantable timber in the clearing area which has not been removed from the right-of-way prior to the beginning of construction shall become the property of the Contractor, unless otherwise provided.” This will be the procedure in most cases.

(2) In the event the Land Acquisition Division has arranged with the property owner, as a part of the right of way settlement, for the property owner to retain and remove the timber, this information will be included in the contract special provisions.

3.8 CUTS (Rev. 09-24-09)
The typical sections will indicate the normal slopes based on the minimum right-of-way and width of roadway. A different typical section will be used for rock cuts than that used for earth slopes. The cross section sheets should be checked for exceptions to the normal slopes. Terrain or soil conditions may also necessitate deviation from the typical slopes. Flat slopes provide additional safety, can reduce erosion, are easily maintained, and greatly improve the appearance of the road by blending in with the adjacent topography. In deep cuts, interceptor ditches should be cut at the top of slopes when right-of-way width permits.

It is standard practice to flare out the side ditches at the end of cuts to avoid spilling side ditch drainage onto a fill slope. The additional excavation required for flaring ditches is authorized excavation, and slope stakes should be set accordingly.

Special ditches shall be located as close to the right-of-way lines as possible in order to eliminate the hazard of deep ditches near the shoulder line. Special ditches should be aligned to provide a smooth alignment but not necessarily parallel to the centerline. The flow lines of special ditches with flat gradients should be staked for final finishing.
Where dirt is left in place for shoulders, transverse trenches shall be cut through the shoulders at sufficient intervals to maintain the subgrade in a well drained condition. The center of the roadway shall also be crowned to provide drainage. Cuts should be excavated so that water will not pond at the face of the cut. Dirt for shoulders shall not be left so high as to interfere with surfacing or finishing operations.

Where backslopes for cut sections are made in material which is not suitable for the growth of vegetation, the PE/S can authorize the undercutting of such slopes and the back-filling of the same with suitable material, as set out in Section 203.09 of the SS, for encasement.

No trees outside the slope-stake limits are to be disturbed, damaged or trimmed unless permission is granted by the PE/S.

Instructions pertaining to the grading of approaches are included in Section 18 of this manual.

3.9 EARTH CLASSIFICATION
The different classes of excavation are outlined in the Specifications. It is imperative that all classes of excavation be measured in their original position and an accurate set of notes kept which will show the quantities of each class. Original cross sections for rock are taken after the overburden is removed, and are taken for each section in the plans plus any necessary supplementary sections. Check shots for minimum depths below pavement are made after the rock is removed and before the cut is backfilled.

It is important that the field notes be complete with title, closed bench circuit and dates. The time to do this with any necessary explanatory notes is when the work is being performed.

Two copies of the Soil Report and Soil Profile are furnished to the DO. One of these sets should always be furnished to the PE/S for information and guidance during construction of the contract. This set should be kept in the project field office.

3.10 EMBANKMENTS
The Specifications provide that after embankment areas have been cleared of all perishable materials such as trees, stumps, sod, weeds, cornstalks, etc., the upper 6 in. of the natural ground shall be well compacted with an approved compaction equipment. Dirt piles from structure excavations should be removed and if suitable, incorporated in the embankment in layers. Weeds and brush should not be placed in the toe of slope. Sound stumps and non-perishable solid objects may be left a minimum of 3 ft below subgrade or slope of embankments provided they are as nearly flush as possible, but they must not extend more than 4 in. above the ground line or low water level. Sound stumps may be cut off at ground level outside of the toe of the slope.

Earth embankments must be constructed in layers of the thickness specified, leveled, disked and thoroughly compacted. When using a three wheeled 10 t roller or pneumatic tired roller, the layer must not exceed 8 in. before compacting. When using a sheepfoot roller, the depth of the loose dirt must not exceed the length of the tamper feet. If the
material is of a granular nature, a heavy crawler type tractor may be used, but the depth of
the layer must not exceed 6 in. For areas inaccessible to the above equipment, such as
structure backfills, the material must be placed in 6 in. layers and compacted with
mechanical tamps or vibrators. To maintain these maximum depths of lifts, it is essential
that each layer or lift be leveled, preferably by a grader. It is impossible to get a uniform
compaction unless the fill is reasonably level.

The base of fills shall be constructed to the full width between slope stakes. On high fills
the width should be checked occasionally as the fill progresses. Side casting to bring the
fill to section should be avoided since side casting usually develops a fill slough or slide.

After clearing of the embankment area and prior to embankment placement, all pronounced
depressions left in the original ground shall be filled with suitable material and compacted
in accordance with 203. Proofrolling of the natural ground surface shall be performed in
accordance with 203.26 within all areas where new fill is to be placed. Original ground that
cannot be compacted sufficiently shall either be replaced or dried with a soil modifier as
described in 203.09.

The grading should be watched closely in regard to unsuitable material. Roots should be
removed and disposed of properly. Frozen material must not be used in the fill and a lift of
dirt must not be placed upon a frozen layer. The frozen layer may be removed or bladed
over the side of the fill.

As noted in the specifications, rock lifts or layers are variable in height depending on the
amount of rock, topography, type of rock and mixtures of soil and rock. There should be a
minimum of voids in rock fills. Bridging by slabs of rock should be avoided by judicious
use of a bulldozer.

When aggregate is used for embankment construction that has such a large top size as to
make it impractical to perform stiffness tests, the PE/S may approve equipment and
methods described in 203.25 of the SS. The PE/S may want to consult with the AE prior to
making this determination.

The critical point of any grade is the junction of the cut and the fill. If not properly
constructed, a weak spot in the finished grade will result. In many cases, especially where
there is a quantity of topsoil, it is advisable to undercut the beginning or ending of a fill
into the cut and replace with suitable material.

Attention must be given to methods of building embankments on steep side hill slopes as
outlined in the specifications. Plowing is not a pay item but benching may be paid for at
the classification encountered. In general, benching should be considered if the slope is
steeper than 4:1, as per Section 203 of the SS.

Where an existing fill will not accommodate the full width of the new pavement, the
existing fill shall be excavated and the material, if suitable, used in the new embankment.
This work is authorized excavation. The handling of embankments over existing pavement
is explicit in the specifications.
Broken concrete or brick pavement may be disposed of in fills, at least 24 in. below subgrade elevation. They must be spread in such a manner as to fill the voids with soil and the layers thoroughly rolled.

Embankments around the end bents of bridges must be constructed at the same time and in the same manner as the approach fills and before piling in the end bents are driven. Intermediate bents or piers which fall within the toe of the approach fill must be back-filled to the original ground line with B borrow. The fill above the original ground line at these bents shall be kept balanced on both sides of the bent and carefully compacted. Care should be exercised in order to prevent displacement of the piers or bents.

Density and moisture tests must be performed and documented as required.

Compaction tests are based on dry weights. The moisture content must be controlled as per the SS or as recommended by OGE. In actual practice, excessive moisture in the soil is obvious. A practical solution is to disc and aerate the lift of earth until it has dried sufficiently to compact satisfactorily. Soils that are too dry to compact to the minimum density can be disked, wet down and re-compact ed. However, it is the contractor’s responsibility to determine the methods to obtain the proper moisture content of the soil. Wetting the grade without disk ing has been found to slightly help density.

The specifications provide for aeration of embankment material if the material is too wet and the embankment is not satisfactory. This moisture provision was adopted to protect INDOT from having to accept fills that passed the density specification yet were obviously unsatisfactory as evidenced by excessive rutting under the construction equipment. The aeration provision is to be used when the embankment is not satisfactory but not to be used merely because the material is over optimum moisture. The contractor must keep the grade properly drained. If necessary, payment should be withheld on grade work done but not properly drained.

Section 203.23 of the SS states that "If the embankment material is too wet or too dry, either the material shall be aerated to remove excess moisture or watered and disked to increase the moisture content, until in either case the moisture content is within the specified range." The determination of whether or not a fill is satisfactory is a matter of personal judgment in addition to the required density and moisture tests. Some degree of deformation of the fill under the heavily loaded equipment can be tolerated providing the fill is dense, well compacted and not developing permanent ruts. The definition of excessive permanent rutting involves personal judgment. As a general guide it would seem that as much as 3 in. of rutting could be tolerated under the modern, large capacity, heavily loaded equipment and still not be detrimental providing the fill meets specifications. This guide depth is relative to the original top of fill. Equipment should not be allowed to “follow the leader” in the same track.
3.11 GRADING OVER PEAT MARSHES (Rev. 09-24-09)

Every attempt is made during the design phase to locate all peat marshes. Soils surveys normally make investigations regarding types of soil and sub-grade conditions, and from these investigations compile their findings and recommendations. The soil information is normally incorporated into the plans.

The PE/S should review the soil report to help assure that its recommendations are incorporated into the plans.

Unless otherwise instructed, peat should be excavated and treated in accordance with the methods set out in the specifications. The width of the excavation should extend to the limits shown on the typical sections as determined by the depth and to the bottom of the peat bed or firm foundation. If the bottom of the peat slopes transversely, consideration should be given to excavating to a greater width on the deepest side in order to minimize subsequent lateral displacement and settlement. In cases of transverse slopes on the bottom or when questionable material is encountered, the PE/S should contact the AE.

Cross sections must be taken before the peat is excavated and again before the backfill is placed, or as outlined in Section 203 of the SS.

3.12 MEASUREMENT OF PEAT EXCAVATION (Rev. 09-24-09)

The contract should provide for payment of peat excavation. The typical sections included in the plans for peat excavation should show the limits of excavation, backfill, and disposal. The embankment is to be built with a 2:1 slope from the shoulder point of the roadway down to the original ground line with compacted soil. From that point on the OG, a 1:1 slope should be constructed down to the lowest elevation of peat excavation. This established point determines the lower limit of peat excavation. The pay quantities for peat excavation will be limited to the volume of peat lying between the vertical neat lines for peat excavation from the lower limits to the OG. B borrow is to be deposited in the excavation left by the peat removal and paid for as shown in the contract.

Peat may be deposited in the side slopes of the embankment outside the 2:1 slope shown on the typical section to the finished side slope. Peat may also be placed and graded to drain outside the backslope of side ditches to the construction limits. Also temporary R/W for peat disposal will typically be shown on the plans.

When peat is removed by complete excavation, the volume will be computed from final cross sections taken after complete excavation and before placing granular backfill. Normal cross section methods and field notes should be used.

When peat removal by displacement is necessary, the volume will be computed from final cross sections derived from test holes through the completed granular treatment. A bid item for Cased Test Holes will be included in the contract for this purpose, unless otherwise specified in the SP. An external pipe of a diameter chosen by the contractor will provide the outside casing. Water pumped through a smaller diameter inner pipe will facilitate sinking of the casing and determination of the depth. Color of the wash water and material rising to the top indicates the change in material at the bottom of the casing. Therefore, the
contractor should arrange the two pipes and water pressure such that the wash water rises between the pipes rather than outside of the larger pipe.

A record of the cased test holes must be kept in a project field book. An example is shown in Section 28 of these instructions. Cross sections from test holes should generally be taken at stations 50 ft apart, or more frequent if necessary; with a minimum of five test holes per cross section. The maximum spacing of test holes for cross section purposes should be 50 ft. A line of stakes should be placed on centerline and at the right and left edges of the treatment. All stakes should be graded to the same elevation, if possible. The HT can determine the elevation of the top of the B borrow by stretching a string across the three hubs and measuring down to the B borrow. As the HT observes the borings, the depth of penetration into the B borrow and trapped peat, if any, will be recorded. If there is any trapped peat, the pay length of the boring would be the sum of the depth of B borrow and trapped peat.

3.13 SLIDES

One cause of slides is free water. When free water is introduced into a cut bank or embankment in a quantity sufficient to reduce the angle of repose to less than the angle of cut or fill slope, a flow of soil or a slide occurs. Slides also occur when the surface of an impervious stratum is tilted to such an angle that it will not offer sufficient resistance or friction to withstand the weight or pressure of the overlying material. Another type of slide or slough that occurs in fill sections is caused by not rolling to the edges of each lift or by side casting material to bring the slopes to the proper cross section. Benching of hillside fills in potential slide areas should be checked with the AE.

A review should be made by the PE/S of cuts where the natural slope of a hillside has been intercepted by a steeper slope. The presence of terraces adjacent to the project indicates former slides. If this equilibrium is disturbed, further sliding can be anticipated. Usually, the first indication of a slide in a complete or incomplete cut section is a bulging of the backslope with cracks parallel to the roadway appearing in the original ground on top of the backslope. It is at this stage the sliding plane, if any, can be observed. The PE/S should note this sliding plane by elevations and distances as an aid in determining the correction plan.

Should a slide occur in a cut section, the PE/S will extend the original sections immediately. In the event of any slide occurring on the project, advise the DO. The OGE will propose a plan of correction. For additional information see Section 203 of the SS.

3.14 EXCAVATION FOR SMALL STRUCTURES AND CHANNEL CHANGES

No payment is made for any class of excavation necessary to construct pipe, box, or slab top structures up to and including 20 ft span, or miscellaneous structures unless the structure is relocated from the location shown on the plans or the flow line lowered. Notice that this refers to additional excavation and is usually determined by cross sectioning the planned site and the relocated site. Neat lines as established are to be used in this comparison.
Unsuitable material which is authorized to be excavated below the planned elevation of the bottom of footings of the structure is treated the same as above. When the undesirable material is removed in conjunction with adjacent excavation below grade, the entire volume shall be paid for at the contract unit price for the classification encountered and not considered as additional structure excavation. If selected material is used to backfill the excavated area, this material shall be paid for at the contract unit price for the material selected. No payment is to be made for material excavated below grade and backfilled for the convenience of the contractor in stabilizing a normally stable foundation.

No payment is made for excavation within the right-of-way limits to construct a new or old channel to the grade and width shown on the plans or to the width of the new structure. Before starting channel change excavation that is a pay quantity, the cross sections should be checked for adequate coverage of the area and if necessary, additional sections taken.

3.15 SINKHOLES (Rev. 05-25-18)

Sinkholes occur in limestone areas of the state and are the result of surface drainage through a hole or crevice in the top of the rock, a flow of water on top of the rock, or drainage through narrow, horizontal seams. The surface of the ground often appears as saucer shaped depressions that vary in size from a few feet to possibly 400 ft in diameter. The actual fault in the rock may be from zero feet to as much as 35 ft below the bottom of the depression, that is; the opening may be exposed or it may not be apparent.

Sinkholes are environmentally sensitive features and each much be addressed as a separate problem. If the excavation, capping and backfilling of a sinkhole is not directly addressed by the contract documents or if a sinkhole is discovered that isn’t shown on the plans, the AE and the Office of Environmental Services must be contacted for guidance before any work is done. When excavation, capping and backfilling of a sinkhole is planned or approved, the following procedures should be followed.

Before starting the excavation of a sinkhole, original sections must be taken of the sinkhole site. If the hole or crevice is not exposed, it is suggested that the original sections cover an area beyond right-of-way to right-of-way and a comparable distance from the sinkhole each way on centerline.

The fault or crevice in the rock strata may be quite some distance laterally from the opening in the soil overburden. The additional area covered by the cross sections should anticipate this lateral drift or provide for a long crevice.

When the opening in the rock is exposed, the dirt overburden adjacent to the hole is excavated and the rock prepared for the cap. If the rock is not exposed and an opening occurs in the overburden, the opening must be followed to the rock. The following method is recommended when a sinkhole with no apparent opening is encountered. First, the low point must be determined by observing after a rain, leveling, or by observing the location of heavy vegetation. Using a scraper type of grading equipment, light parallel cuts need to be made through the area.
This will usually disclose a small area of soil that is darker than the surrounding soils and/or an accumulation of small stones. The dark soil and stones should be followed with shovel or crane type of equipment to the top of rock. If the contractor elects to use scraper type equipment after the initial cut, neat lines of excavation must be established and the contractor notified. As excavation proceeds, authorized neat lines of excavation must be noted in the project field books.

When the opening in the rock is revealed, the dirt is cleared for a distance of 2 ft to 3 ft on each side of the opening. It is often necessary to remove rock adjacent to the opening to obtain a satisfactory seal. The immediate area should be checked for secondary openings. The cap is then laid out to have a bearing of approximately 2 ft to 3 ft on the adjacent rock. It is unnecessary to have the cap in the form of a square or rectangle as indicated on the plans, but should conform to the figure required to cover and seal the opening. If the opening is a crevice, the cap shall extend a sufficient distance to provide adequate protection to the road; as determined in the field after consultation with the AE.

Immediately after the cap is formed or not later than the morning after the cap is placed, it shall be measured, sketched in the project field books, and checked for computability. Final cross sections are then taken of the entire excavated area but payment is made only to neat lines previously established or authorized.

As soon as a flexural strength of 480 psi is obtained for the concrete cap based on beam breaks, consideration is given to the method of backfilling. When the cap is below top of rock or a drainage cap is designed, B borrow should be limited and its use discussed with the DCD. When the excavated area is within the roadway area, ramps should be excavated parallel to centerline to eliminate abrupt changes in fill depth. A 3:1 slope is recommended for the ramping. Since ramping is paid for at the contract unit price for the class of excavation encountered and sinkhole excavation at 3 times the contract unit price for the classification encountered, the cross sections must clearly indicate this separation. No payment is made for backfill except for authorized B borrow. The backfill must be placed in accordance with the specifications and thoroughly compacted.

### 3.16 BORROW

Borrow is a satisfactory material obtained by the contractor from locations outside of the right-of-way to complete the planned grading section.

Material such as muck, cinders, or a soil mixture with a high organic content shall not be used. Should the material be questionable, the AE must be contacted.

When borrow is necessary, the contractor must make the arrangements for obtaining the material. The PE/S must be notified of the location of the proposed borrow pit and an IC 203 must be submitted for approval of the location prior to beginning earth disturbing activities.

If the location, planned excavation, and material comply with our specifications, the contractor may proceed with clearing the borrow pit site. Soil samples of the pit are then taken and forwarded to District Testing. Before any pay material is removed from the
borrow pit, The PE/S must establish a base line and take original cross sections for the pit. The base line should be established through or near the proposed borrow pit with the extremities of the line staked and referenced outside of the area that will be excavated.

Precautions are to be taken to insure that the stakes or references are not disturbed. In establishing a base line, consideration should be given to the topography, the line of the cross sections, and the possibility of extending sections, if necessary. If the borrow pit involves a large area, it is suggested that an auxiliary line be run parallel to the base line to properly align the cross sections. Borrow pits that are adjacent to the right-of-way often involve excavation within the right-of-way. No material excavated within the right-of-way is considered as borrow. In such case, a rod reading and distance from the base line at the point each cross section intercepts the right-of-way line must be taken. This will aid in computing the separation of the borrow quantity from the Common Excavation quantity. A sketch must be made of the borrow pit layout in the permanent field notes immediately preceding the original cross section notes. A description of the location of the borrow pit is placed on the sketch, such as, the number of feet right or left of a roadway station. The name of the property owner is also placed on the sketch.

If the borrow pit is in close proximity to the project right-of-way, a benchmark should be established near the borrow pit and the elevation of it tied into the project level circuit.

**Specifications must be read carefully relative to the location of borrow pits.** Proximity to the right-of-way, elevation, drainage, erosion control, etc. must be evaluated.

Since the contractor selects the source of borrow material, it is responsible for compliance with all environmental regulations that may govern the borrow site. The PE/S must evaluate the submitted IC 203 to determine if the contractor has complied with the requirements.

**3.17 B BORROW (Rev. 04-22-14)**

B borrow consists of suitable crushed stone, sand, gravel, or other materials meeting the requirements of Section 211 of the SS. This material is used for constructing fills over peat marshes, up to the elevation of 2 ft above free water, as backfill for certain structures, or other places where settlement might seriously affect the finished work. B borrow should not be used at places other than indicated on the plans, unless approved by the AE.

The preferred method of placing B borrow is in specified lifts and compacted. At locations that are inaccessible to heavy compacting equipment such as tractors, rollers, etc., vibrators or mechanical tamps are to be used. B borrow should not be used indiscriminately. Factors to be considered in choosing locations where B borrow is to be used should include practicability of compaction and the type of pavement surface being constructed.

Should there be material within the project limits that substantially meets the specifications for B borrow and is readily available, this material must be used in lieu of the planned B borrow within the project. This material is in that event, paid for as Common Excavation.
For certain locations such as Catch Basins, Inlets, and Manholes, as defined in the specifications, no payment is made for structure backfill for these structures.

When the contract proposal contains a pay item of “B Borrow”, payment will be made on the basis of limits as shown on the plans or as adjusted for authorized changes, provided the material comes from outside the permanent right-of-way. The provision for adjustment by authorized changes is included to allow for adjustments due to plan error or omissions and changes in the structures in the field, either of which are of substantial quantity. In those cases where an adjustment in the plan quantity is required, the theoretical amount should be computed for the individual structure in the normal manner and these computations kept in the project file for inclusion in the FCR. Before completion of the FCR a Change Order containing the adjustments required for B borrow should be submitted for approval.

The method of payment for B borrow should be discussed with the contractor at all pre-construction conferences.

**3.18 PLAN QUANTITY PAYMENT FOR COMMON EXCAVATION** *(Rev. 09-24-09)*

Section 203.27 of the SS states that the quantities of excavation to be paid for will be those shown in the contract, unless extra work has been performed or either party disagrees.

The following procedure will apply to all contracts or portions of contracts that involve payment for Common Excavation on the basis of plan quantity:

New original cross sections are to be taken at 500 ft intervals and plotted to check the accuracy of the original sections. (See section on Staking and Construction Engineering).

Final cross sections are to be taken at 500 ft intervals. Cross sections should be complete sections in cuts and from the shoulder break out in fills. These final sections should indicate substantial conformance with the planned cut slopes and ditches, and will be used to determine if earthwork deductions are required.

Spot checks must be made of the cross-section areas shown in the plans. The number of spot checks should average one for each 2,000 ft with the locations concentrated in areas of the major excavation. Additional area checks should be made to determine whether the plan quantity should be adjusted if any of the areas checked varies more than 10% from the area shown on the plans. If the average deviation of all the areas checked varies from the total planned areas at the same location by more than 2%, a more detailed check will be required on those areas or balances showing the highest deviation.

Form IC 615 could be used to make the area checks as indicated above and must be included in the Final Construction Record. This form should have the heading “Comparison of Planned and Final Cut Areas for Check of Plan Quantity.” The form could
then be divided into five columns with headings of: Station, Planned Area, Checked Area, Percent Deviation, and Remarks. The Percent Deviation column would be totaled algebraically and the average Percent Deviation would be listed.

The computation of the volume from the planned areas of one balance should be checked. In general this should be the largest balance in the contract. Any other questionable balances should also be checked for volume computations.

Any other pertinent facts that would justify using plan quantity or indicating the need for adjustments should be considered. In addition to the above steps, the FCR should have a statement over the PE/S’s signature as follows:

“Volume computations and check sections of original and final cross-sections indicate that the planned quantities are accurate enough to justify payment on the basis of plan quantity as adjusted by approved Change Orders as compiled herein.”

3.19 DEDUCTIONS (Rev. 09-24-09)
The policy concerning deductions in excavation and Borrow quantities is covered in the Final Construction Record Guide. It is important that the PE/S and contractor be familiar with such policy. It is essential that all notes and computations be accurate and complete to support any deductions made in accordance with the established policy. Should circumstances justify waiving deductions, a full explanation should be written into the notes, on the cross section sheets and signed by the PE/S.

When payment is made on the basis of plan quantity or computer facilities used for computation of pay quantities, sufficient documentation must be included in the FCR to indicate whether deductions are required. Sections plotted at 500 ft intervals should be used to verify whether deductions according to standard procedures are necessary. The completed project should be visually inspected to determine whether there are other locations which warrant cross sections to check for deductions such as; areas bounded by interchange ramps, areas between variable median sections, etc. When deductions are indicated, additional sections must be taken at the necessary stations to compute the deductible materials. A statement should be included in the Final Construction Record over the PE/S signature that the above check has been made.

3.20 SETTLEMENT STAKES AND PIEZOMETERS (Rev. 05-25-18)
When the geotechnical investigation indicates a large or uneven settlement of the foundation soil under a proposed embankment is expected, fill movements during and after grading must be reviewed. This review is specified mainly for three reasons:

1. To detect foundation soil failures in early stages to prevent costly reconstruction.

2. To verify predicted settlement.
3. To determine when embankment settlement has slowed to the point that paving can be done without being excessively distorted by continued uneven settlement.

The checking of fill movement can be accomplished through installation of settlement plates, lateral stakes, and shoulder stakes. When any of these are required, details of their construction and use are set out in the SP. These details should be carefully followed so that desired results will be obtained.

Settlement plates are for observation of vertical movement of the original ground beneath a fill during and following embankment construction.

The PE/S will determine the plate elevation and the elevation of the top of the first section of pipe at the time the plate is set. As additional sections of pipe are added their effective length must be carefully measured. Observations are to be made every 7 days to determine movement of the plates. These observations should start about 7 days after fill construction has started.

Results of settlement observations on the plates are to be reported weekly. This weekly report series should start with the first observations after fill construction has started. During winter months and periods of job suspension, the frequency of observations and reports may be decreased with proper approval. Observations and reports should continue until a written release from observation responsibility has been secured from the OGE.

In the event that the vertical or lateral movement indicates that material beneath the embankment is being displaced rather than consolidated, work should be suspended and the OGE should be notified.

Settlement stakes may be required for observation of movement of the original ground along side the new fill construction or movement of any given portion of finished fill. These stakes may be used to measure either, or both, horizontal and vertical movements.

Centerline stakes should be set as soon as the embankment has been constructed to approximate subgrade elevation. Observations should be made on these stakes at the same time that settlement plate observations are made. Toe stakes should be set, before embankment starts, near the toe of the slope (usually about 5 ft from the slope stake) at a location where they are least likely to suffer construction damage. Where a special ditch is to be constructed, they should be on the fill side of the ditch. Another row of stakes should be installed as far from the fill as practical (usually along the right-of-way) to be used as reference stakes. Every 7 days, measurements are made between the reference stakes and the stakes near the toe of fill to check for possible movement. These measurements are taken to the nearest 0.01 ft. If more than 8 ft of fill is placed between two consecutive observation dates, an additional set of observations should be taken. **These measurements and observations should be continued until the OGE gives a release.**

When stakes are specified in the contract to be placed along the shoulder of the completed embankment, they are used for the purpose of detecting both horizontal and vertical
movements. Measurements are taken every 7 days to determine the amount of movement. These measurements are taken to the nearest 0.01 ft.

Prior to the embankment construction, a definite pattern should be established for obtaining settlement data. At least two permanent benchmarks should be established for each group of settlement plates. These benchmarks must be located well beyond the influence of any fill settlement but close enough to require only a minimum amount of instrument turns. When taking settlement readings, the instrument should be set up at the same location each time and readings taken in the same sequence as done in the previous period. This will reduce the possibility of instrument error. A self-leveling instrument has proven to give more reliable readings than the conventional level or transit and should be used if available.

Piezometers are specified to measure pore water pressure in saturated compressible material beneath an embankment, before, during, and following construction. Their construction and use is described in the SP. The 4 in. pipe specified is a minimum size. Larger pipe may be required if the number of piezometers in one pipe make it necessary.

A report on the construction of each piezometer is to be made. This is a graphical sketch of the piezometer and should be submitted upon completion of the installation.

Piezometers should be read daily after placement and before any embankment is constructed to determine the stabilized in-place ground water elevation at the given piezometer location.

Piezometers should be read daily during embankment construction and weekly upon completion of embankment. If the “Critical Pore Pressure” is approached, embankment construction should be halted and the data analyzed by the OGE. The “Critical Pore Pressure” is that pressure at which foundation and embankment failure may occur. This information for each Piezometer should be on the project site and is available from the Geotechnical Report or the OGE.

Piezometer reports should be submitted as soon as possible after readings are obtained.

Piezometer observations and reports, like those of settlement plates and stakes, should continue until the responsibility for reporting is released. When it appears to the PE/S that reporting responsibility should be terminated he should inform the DO. If the DO concurs they should so inform OGE by letter and request that a review of the data be made.

The Division of Construction Management should be furnished a copy of the letter.

After consulting with the Chief Geotechnical Engineer, a letter releasing the PE/S from the reporting responsibility will be written.

3.21 SUBGRADE TREATMENT (Rev. 09-24-09)
Section 207.06 of the SS contains the requirements for subgrade treatment. In most cases, the contractor may choose from two or more options for subgrade treatment.
3.22 ARCHAEOLOGICAL ARTIFACTS (Rev. 01-21-14)
An archeological artifact may be a fragment of historic or prehistoric pottery, chipped stone tools or flakes, ground stone tools, prehistoric or historic housing material, or burial objects such as headstones or even human remains. Other types of historic features may be a prehistoric garbage pit or cooking pit, the remains of a prehistoric house, a privy, well, canal features, building foundations, etc. Burial objects are of particular concern, because they suggest the presence of human remains.

If any archaeological artifact or historic feature, including human remains, is found during construction, work must immediately stop within 100 feet of the site and the site must be left undisturbed.

For artifacts other than human remains, the PE/S must coordinate with IDNR to mitigate impacts to the discovery. Work at the site cannot resume until written consent is received.

If human remains are encountered, the local law enforcement agency must be contacted first, and then OES must be notified. The law enforcement agency will contact the County Coroner. Although human remains may appear archaeological or historic, they may actually represent a modern or historically recent crime scene. This is why the County Coroner always documents the remains. It is very important to leave the area of the discovery as undisturbed as possible.

3.23 REGULATED MATERIALS (Rev. 08-10-17)
Hazardous materials are considered to be regulated materials and must be handled in accordance with applicable environmental laws, regulations, and rules. Sections 104.06 and 202 of the SS clearly address all the requirements that the contractor must deal with when working with regulated materials. However, disposal of bridge painting debris shall be in accordance with 619. The PE/S is required to see that the contractor follows those specifications.

When materials suspected of being regulated are encountered on the project site and are identified in the contract documents, the contractor must cease all operations in the immediate vicinity and the PE/S must notify the AE. If the situation warrants an immediate emergency response, the procedures as outlined in Section 104.06 of the SS must be followed.

The DCD will work with the District Environmental Scientist concerning any necessary handling, cleanup, testing, transportation, and disposal of such materials. They may contact the OES for further guidance and coordination with IDEM.

A private consulting company may be necessary for testing of suspected regulated materials. This consultant may be acquired and paid by the contractor or the state. OES and/or IDEM would review the results of any such tests. The PE/S should be advised, through the DCD, of procedures for the contractor to follow. The contractor may be advised of any required handling, storage, cleanup, additional testing, transportation, or disposal of hazardous materials.
The contractor should not resume work in any affected area until notified that conditions and the area have been rendered safe for resumption of work.

Payment for the contractor’s work related to storage, cleanup, testing, transportation, or disposal of any such materials should be in accordance with Sections 104.06 and 202 of the SS.

Removal of Underground Storage Tanks (UST) shall follow Section 202 of the SS. The Contractor and PE/S must maintain accurate records of all operations. The Contractor shall submit two additional copies of the compulsory completed report distributed to IDEM UST Branch (Notification for UST & UST System Closure Site Assessment Report) to the Engineer within 30 days after closure. One copy shall be forwarded to the OES, in CO. The second copy is retained in the project file. In addition, a copy of all detailed pay item costs with justification and calculations relating to the UST removal will be submitted to the OES, in CO. This documentation is needed so INDOT may submit to IDEM for cost reimbursement from the Excess Liability Fund (ELF) for the removal of the UST’s.

### 3.24 ASBESTOS CONTAINING MATERIALS (Rev. 01-21-14)

The contractor is required to comply with all applicable laws and regulations concerning the inspection and testing for, and removal of, asbestos material. Asbestos containing materials are considered to be regulated materials and must be handled as such. Sections 104.06 and 202.06 of the SS explain in detail what procedures the contractor must follow when handling this type of material. Such regulations require an inspection for the presence of asbestos in buildings, bridges, and pipes to be demolished or renovated. The inspection must be done before the start of demolition or renovation operations. Renovation in this law is defined as the disturbance of any load-carrying member. In bridges this has been defined as any substructure element.

Persons who inspect for asbestos containing materials must have a current certificate of accreditation, issued by IDEM. Also, only accredited asbestos removal contractors, supervisors, and workers can be employed on asbestos removal operations. Listings of accredited inspectors, and asbestos removal contractors and persons, can be obtained from IDEM’s Office of Air Management.

IDEM requires written notification 10 working days prior to the start of renovation and demolition operations, even if no asbestos is found during the inspection. IDEM’s notification form must be filled out completely and accurately. The start of work date must be as accurate as possible. If work will not start on the date shown on the form for some reason, a new notification must be made. Copies of the same form may be used to satisfy the notification requirements of the US Environmental Protection Agency, and the Indianapolis Air Pollution Control Division for such operations in Marion County. There are specified waiting periods between notification and asbestos stripping or removal that must be followed.
3.25 MECHANICALLY STABILIZED EARTH RETAINING WALLS  
(Rev. 09-24-09)

Inspection for mechanically stabilized earth walls must include field verification that the wall is being constructed in accordance with specifications and plans. It will include monitoring the foundation preparation and wall erection.

The inspection of the foundation preparation typically will verify that the foundation is level, at the correct elevation, is appropriate sized, and the foundation soils are adequate. The foundation must be graded level to a width equal to or exceeding the length of the soil reinforcement, proof rolled, and any unsuitable material removed and replaced. If a concrete leveling pad is used, then the appropriate level tolerances will be verified. Concrete must cure for 12 hours prior to the placement of any wall panels.

Structure backfill (the reinforced soil) must be tested prior to placement to ensure the 34° angle requirement. B-borrow may be used for backfill beyond a theoretical 1:1 slope behind the reinforced soil.

The inspection of the wall erection will include checking all tolerances and alignments of the wall as it is constructed, monitoring compaction of the backfill and placement of soil reinforcing, verifying that the face panel-to-soil reinforcement connections are correctly made, and monitoring the placement of soil reinforcement in and around the appurtenances. The soil reinforcement must be pulled taut during backfill placement to remove any play in the connection between the face of the panel and the soil reinforcement.

The checking of the tolerances and alignments will include verifying that the face panels are plumb within specification over the entire height of the wall. Alignments and tolerances should be checked at every layer of panels after the backfill behind the panels has been compacted, and the results recorded. Hardwood wedges used for alignment must be removed after the panels are complete and in place. The horizontal alignment of the wall and the elevations of the top and bottom of the wall will be checked against the plans and specifications. All joints between panels must be covered with geotextile on the backfill side of the face panel. Proper placement of geotextile over the panel joints is critical in preventing loss of backfill.

Proper compaction is critical to the appearance and performance of the mechanically stabilized earth wall. Compaction will start at the back of the facing panels and progress towards the reinforced soil mass. Lightweight compaction equipment is to be used with 3 ft of the face panels to minimize lateral movement. Ensure that the maximum lift thicknesses are adhered to. If a lift fails compaction requirements, no additional fill can be placed until the lift meets specifications. All compaction equipment must have smooth compaction surfaces to avoid damage to soil reinforcement. Compaction efforts that distort the soil reinforcement must not be allowed.

Soil reinforcement must not be field cut, nor deviate from being placed normal to the face panels unless specifically called for in the plans. If unexpected conflicts arise, the wall designer must be notified for plan revisions.
SECTION 4 – SMALL DRAINAGE STRUCTURES

4.1 GENERAL (Rev. 10-22-09)
The construction of well built structures that will adequately take care of drainage, both surface and subsurface, is an important responsibility. Failure in our road surfaces and innumerable complaints from property owners along the highway will result if this part of the work is not given careful attention.

If time permits, the PE/S may obtain a copy of the drainage design calculations and check for errors or discrepancies in information such as land use. An examination of existing structures after a heavy rain or reviews of local inquiries as to the adequacy of the existing structures are two sources of valuable information.

Recommended changes should be reviewed with the designer, through the Project Manager, and any changes agreed upon should be implemented by a Change Order.

4.1.1 Structure Sump Requirements
The Indiana Department of Environmental Management (IDEM) requires small structures to be constructed so that after construction natural stream bed material will be naturally deposited along the flowline of the stream and within the structure limits.

To achieve this requirement, pipe structures, box culverts and 3-sided culvert structures are designed with a specified sump depth. The sump depth is a defined depth below the designed flowline at which the invert of a pipe structure and the top of scour protection for culverts is to be placed. Figure 4.1 shows a typical section through a 3-sided culvert that includes the sump depth. The PE/S should review the plans and Standard Drawings for a better understanding of the sump depth and for the specific depth requirement for each structure.

Since the intention is that natural stream bed material is desired to be deposited along the stream channel, the PE/S should ensure that the sump of a structure is constructed correctly. Upon completion of the work, this will leave the structure in a condition that
accumulates water in the sump area. This is the intent and no material should be placed during the project to fill the sump unless otherwise directed.

4.2 COUNTY DITCHES (Rev. 01-01-02)
Legal drains, whether open ditches or piped, have legal flow lines that have been established by the county authorities.

Before any structures under the roadway are staked, the location of the county ditches and the legal flow lines thereof should be obtained from the County Surveyor. Where a legal flow line can be established, the datum on the county ditch should be equated to that on the road plans. The flow lines of pipes or boxes should be placed at or below the legal flow lines.

4.3 STAKING STRUCTURES (Rev. 01-01-02)
Structures should be staked at plan location and flow line. Minor changes are frequently necessary to fit existing ground conditions and should be approved by the PE/S prior to installation. The upstream end of structures under the roadway should be 0.2 ft to 0.5 ft below the lowest ground, ditch, or tile ditch to be drained. The grade then should be approximately straight to the point where the water will leave the right-of-way. The minimum distance from the edge of pavement to the inner face of headwalls on boxes, and under fill slab tops shall meet clear zone requirements. Headwalls and handrails should be parallel to the pavement, and if they are visible to traffic, the top should be parallel to the grade of the pavement. Pipe structures parallel to the centerline at intersecting roads shall be constructed according to the standards for the type of intersection shown on the plans.

4.4 FOUNDATIONS (Rev. 01-01-02)
Structures should be placed on stable foundations. Our specifications provide that unstable material excavated below the planned foundation of the structure be paid for at three times the bid price for the class of excavation involved providing the additional amount involved at the structure exceeds 10 cu yd. This additional excavation should usually be backfilled with B Borrow and paid for as a separate item. Tests should be made of foundations for slab top culverts, and if the foundation is unstable, piling will be required unless the unsuitable material is shallow enough that it may be excavated and the footing lowered. If large quantities of unstable material are encountered, the AE should be contacted for approval of the method required to stabilize the structure foundation.

Structures should never be placed on frozen ground.

4.5 BUILDING FORMS & PLACING STEEL (Rev. 01-01-02)
Before each concrete pour, both forms and steel should be carefully and thoroughly checked. Forms should be checked for stability and strength as well as dimension. All lumber in contact with the concrete shall be free from knot holes, splits, warps, and other defects. Forms for the portion of the structure that is to be finished by rubbing should be lined with plywood or other approved material that will leave a surface free of board marks. Exposed edges should be checked for correct size of bevel or chamfer strips.
The specifications provide that forms are tied together with a combination tie and strut, the outside 1 in. of which can be removed and its hole filled with mortar. A wall form properly tied will not need wood struts. Wire ties shall not be used.

Footings or floors should be thoroughly cleaned before abutment or wall concrete is placed on them.

Reinforcing steel should be secured so that it will not shift during the placing of concrete. Steel which has a detrimental scale or rust shall be cleaned, but in no case shall steel be used which is rusted deeply or pitted. New steel can be maintained in good condition by storing it on skids and covering it as provided by the specifications. Any dirt or other foreign material should be removed from the steel before placing concrete.

4.6 CONSTRUCTION JOINTS (Rev. 01-01-02)
Horizontal and vertical construction joints shall only be placed as shown on the plans or as approved by the designer.

4.7 PLACING STRUCTURAL CONCRETE (Rev. 04-07-09)
The contractor should not be allowed to start a concrete pour until forms and steel have been checked by the PE/S.

The specifications require a slump between 1 and 4 in. (except for foundation seal concrete or when using specialty concrete). Between these limits the concrete should have as low a slump as will flow into a mass free of honeycomb. A greater slump will be required for thin box walls than for footings of a slabtop.

In order that concrete can be properly consolidated, the specifications require that wall sections be placed in not more than 24 in. layers. Each succeeding layer should be placed before the previous one has initial set. The specifications require the use of vibrators. The vibrator should follow immediately behind the placing of each lift of concrete, being slowly lowered and directly lifted out at about one foot intervals. Vibrators should not rest against the forms or reinforcing steel. Vibrations transmitted to partially set concrete seriously impair its strength. Excess vibration is to be avoided.

A set of test beams should be made for each barrel pour of a box culvert and each floor pour of a slabtop culvert. The beams should be subjected to the same curing as the structure. Forms may be removed from vertical surfaces not less than 12 h after the concrete has been poured unless prevailing weather conditions require a longer period. Forms under floors are to remain in place for five days or until the flexural strength is 390 lb/sq in. Traffic will not be permitted on any structure for 15 days or until the test beams show a flexural strength of 550 lb/ sq in. All flexural strength results are obtained by third-point loading.

4.8 PLACING STRUCTURAL CONCRETE--COLD WEATHER (Rev. 04-07-09)
The specifications require that when concrete is placed at or below an atmospheric temperature of 35°F or when the temperature may fall below 35°F within the curing
period, the water, aggregates, or both shall be heated and suitable enclosures and heating devices shall be provided. This entails heating the concrete both before and after placing. The temperature to be maintained is specified in Section 702 of the SS.

The contractor should keep a watchman on the job, during the heating period, to insure the maintenance of proper temperature and to see that the concrete is not damaged by fire. Any concrete placed when the air temperature is at or below 35°F will be at the contractor’s risk.

The use of admixtures to accelerate setting or to prevent freezing of the concrete are not permitted.

4.9 FINISHING  (Rev. 04-07-09)
All concrete surfaces must be given a finish in accordance with the specifications after removal of forms. Attention should be paid to filling air holes and irregularities. All joints and chamfers must be power ground to a smooth finish.

4.10 SKEWED STRUCTURES  (Rev. 01-01-02)
Where box culverts are placed on a skew, the dimensions of the box as shown on the plans are measured perpendicular to the centerline of the structure. On skewed slab top structures, the span as shown on the plans is measured parallel to the road centerline.

4.11 PIPE CULVERTS  (Rev. 11-14-16)
The trench in which the pipe is to be laid shall be cut to conform to the bottom of the pipe thus insuring a uniform even bearing on solid compact earth being sure to “recess” for all bells so there will be no bearing on the bell.

The contractor must use proper construction methods when laying pipe culverts. It is important that the State personnel inspecting this work is familiar with the requirements of the specifications and see that the methods outlined therein are complied with.

Under certain conditions, corrugated metal pipe must be strutted. Refer to the SS to determine the applicable provisions for strutting. This strutting is done prior to shipment of pipe and should be left in place until the entire fill over the pipe is compacted.

Before the final inspection of the project, all pipe structures must be inspected for damage to the bituminous coating or paved invert.

4.11.1 Inspection of Pipes
All pipes, except underdrains, must be visually inspected no sooner than 30 days after completion of the backfill for indications of joint failures, excessive deflection or other damage. If a pipe cannot be visually inspected, then the contractor must provide for video inspection of the pipe.

The PE/S should review the contract quantity for the video inspection pay item and use the quantity to provide inspection for those sections of pipe that present the most risk if they should have joint failures, excessive deflection or other damage. Section 715 of the
SS covers video inspection of pipes.

For more information regarding the below items and pipe inspection, refer to the Inspection Manual for Pipe found on the Materials and Management website.

- Pipe Structures
- Pipe Placement
- Measurements of Pipe Items
- Manholes, Inlets, and Catch Basins
- Structure Backfill and Inspection
- Relining Existing Pipe Structures
- Calculating Pipe Lengths
- Concrete Pipe
- High Density Polyethylene (HDPE) Pipe
- Metal Pipe
- Metal Pipe Structures
- Polypropylene Pipe
- Polyvinylchloride (PVC) Pipe
- Reinforced Thermosetting Resin Pipe
- Utility Pipe.

4.11.2 Mandrel Testing of Thermoplastic Pipe

For the purposes of these instructions as well as the SS, the terms nominal diameter, pipe pay item diameter, and pipe pay diameter are synonymous. The SS require that thermoplastic pipe be in accordance with either AASHTO or ASTM specifications. The nominal pipe size or nominal pipe diameter, the AASHTO or ASTM designation, as well as other identifying information, (the product marking line) is required to be stamped on the pipe at regular intervals. The PE/S should use this information to ensure that the correct material is being used on the contract.

Thermoplastic pipe (HDPE or smooth wall PVC) that is 36 in. or less in nominal/pipe pay diameter must be mandrel tested after the visual or video inspection has been completed and reviewed. The pipe materials that fall into the thermoplastic pipe category are polyethylene and smooth wall polyvinyl chloride pipes that are in accordance with SS 907.19, 907.20, 907.21, 907.22, or 907.23, with the following exception: mandrel testing is not required for profile wall polyvinyl chloride pipe that is in accordance with both 907.22 and ASTM F 949 unless visual or video inspection indicates possible deformation.

A mandrel is a device with arms or prongs that is pulled by hand through a pipe to check that the pipe does not exceed the maximum deflection criteria allowed by the specifications. Prior to a mandrel test, the inspector must check the mandrel to ensure that the diameter of the mandrel should be 95% of the nominal pipe diameter that is stamped on the pipe. The mandrel test is a pass or fail test.
Form IC 715, Mandrel Testing of Pipe Structures, is to be used by field personnel to document mandrel testing of thermoplastic pipes. A copy of this form is included at the end of this section and is also available on the Department’s website.

The following procedure is to be followed for mandrel testing:

- Determine which pipe structures will require mandrel testing and note them on an IC 715 along with the pipe material specification reference (i.e. – 907.19), nominal/pipe pay diameter and pipe structure length.
- Note the date that the backfill is completed for each structure.
- Visually inspect the pipe no sooner than 30 days after backfill is completed. Look for obvious damage, such as excessive deflection or joint failures.
- If the pipe cannot be visually inspected, require the contractor to perform a video inspection of the pipe. Review the results of the video inspection for damage.
- After the visual or video inspection, require the contractor to perform the mandrel test. Note the mandrel requirements in the specifications and check the mandrel to ensure that it has a diameter that is no less than 95% of the nominal/pipe pay diameter.
- Note the date of the mandrel test on the IC 715.
- Have the contractor pull the mandrel through the pipe by hand.
- Record the result, either pass or fail, on the IC 715 for each structure tested.

If the pipe fails the mandrel test or the mandrel causes obvious damage to the pipe, require the contractor to remove and replace the deficient portion of the pipe. The deficient portion should be removed and replaced to the nearest pipe joint or structure, such as a manhole or inlet.

Lengths of pipe replaced must be mandrel tested in accordance with the procedure outlined above. A note should be made on the IC 715 that the test is being made for a replacement pipe.

Forms IC 715 are to be kept in the project file and a copy sent to the Division of Construction Management.

4.11.3 Thermoplastic Slip Lining Existing Pipe
In certain situations, the plans may indicated that existing pipes be rehabilitated by slip lining with a thermoplastic liner rather than replacing the structure. The plans will indicate whether a circular or deformed liner will be used as well as the maximum number of joints and the corresponding maximum length of each section of liner pipe. The contractor may submit a written request to use a liner pipe that is longer than indicated in the plans. The contractor’s written request must also address the change in the number of joints associated with the requested liner length. The contractor must select the liner pipe from the Department’s list of approved Plastic Pipe and Pipe Liner Sources, or provide a certification, in accordance with 907.25 and ITM 804 sections 4.23 or 4.24, for liner pipes not on the approved sources list. All liner pipe must be submitted for review prior to installation.
(a) Materials
When circular liner pipe is shown on the plans, the choices for lining the existing pipe structure include solid wall HDPE liner pipe; profile wall HDPE liner pipe; or profile wall PVC liner pipe.

When deformed liner pipe is shown on the plans, the only choices for lining the existing pipe are solid wall HDPE liner pipe or profile wall HDPE liner pipe.

The cellular grout used for the filling of the annular space between the inside of existing pipe and the outside of the liner is accepted in accordance with the Frequency Manual under the heading of Cellular Concrete Grout.

(b) Quality Control
The contractor is required to submit a quality control plan (QCP), in accordance with ITM 803, for acceptance by the PE/S prior to the start of the lining operation. The QCP should be contract specific and contain a description of the proposed work in the lining operation including the following:

1. Name of the QCP Manager, their qualifications, contact information, and duties
2. Sequence of the pipe lining operations
3. Equipment and method to deform liner pipe
4. Destructive test method for welded, butt-fused, or joined liners
5. Method to calibrate the cellular grout pump gauges
6. Methods to achieve proper placement of the cellular grout
7. Identification of potential problems with the lining operations, including possible grout leakage, and the proposed resolutions.

A quality control representative is required to be on-site for the initial testing of the first welding or fusing of the liner pipe at each installation location and for the joining, welding, or fusing of the liner pipe at each location.

(c) Joints
Liner pipes have the option to be joined using a variety of methods including:

- Bell and spigot
- Screw type
- Grooved press-on
- Butt fused
- Extrusion weld
- Other joint as recommended by the liner pipe manufacturer.

Welded liners shall have a continuous weld bead both inside and out. The welding bead shall be smooth, protrude no more than 3/8 in. into the interior of the liner, and not adversely affect the hydraulic capacity of the liner.

The operators performing welding, butt-fusing, or joining for the liner pipe shall be
trained and certified by either the liner pipe manufacturer or the welding, butt-fusing, or joining equipment manufacturer. The PE/S shall be provided a copy of the operator’s current and valid certification prior to the beginning of any joint work.

A demonstration of the method described within the QCP for destructive testing of the joint should be performed by the operator for all welded, butt-fused, and joined liner pipe. The operator shall perform the destructive test at the beginning of each day’s joint operations.

All pipe liner joints shall be in accordance with the manufacturer’s recommended procedures, and be visually inspected before acceptance. Any joints that do not pass the visual inspection should be removed and a new joint should be fabricated. The re-fabricated joint will be visually inspected prior to acceptance.

(d) Installation
Installation of the liner pipe begins with the cleaning of the interior of the existing structure and the repair of all deformities. After cleaning, a walk through should be performed in order to visually assess the condition of the existing structure. If a walk through cannot be performed, the contractor shall perform a video inspection. The PE/S should receive a copy of the video. If the contractor believes that the work cannot be performed as planned after the visual inspection, the PE/S must be informed immediately and discussions with the designer must occur.

The contractor may desire additional area for their installation operations beyond the right-of-way limits provided in the contract. In this situation, the contractor should pursue agreements from adjacent property owners in accordance with 107.14.

After cleaning of the existing pipe, the contractor should check the size of the liner pipe to verify that the required cross-sectional area can successfully be placed inside the existing structure. If problems are found to exist before the installation, the contractor must submit a substitute liner pipe plan to the PE/S for approval. If problems are not discovered until installation has begun, the contractor is required to remove the portion of the liner pipe already installed and submit a substitute liner pipe plan to the PE/S for approval.

All visible and obvious cavities outside the existing structure should be filled with non-removable backfill in accordance with 213 prior to the start of the lining operation. If the contractor’s QCP indicates that the cavities are to be filled in conjunction with the grouting operation, cellular concrete grout should be used in lieu of non-removable backfill.

Prior to filling the annular space between the existing structure and the liner pipe with cellular grout, bulkheads should be built on each end of the structure. The bulkheads should be free of leaks and should be strong enough to withstand the pressure of the injected grout. The bulkheads should extend from the end of the existing structure inward to a minimum thickness of 18 in. The exterior surfaces of the bulkheads should be given a smooth troweled finish.
The injection method used to place the cellular grout shall be explained within the contractor’s QCP and should be monitored during placement so that the grout completely fills the annular space between the existing structure and the liner pipe. The grout injection methods must not cause distortion of the liner pipe, nor cause the liner pipe to float. Within the QCP, the contractor shall explain the methods to be used to regulate and maintain injection pressure. These methods should be based on the liner pipe manufacturer’s recommendations.

Any storm water management features installed, including pump arounds, should be monitored during the cellular grout injection operation. Grout will follow the path of least resistance in its attempt to fill existing voids and reduce injection pressure. If the grout is found to be leaking into any adjacent body of water or other potential problematic areas, operations should be stopped, and the leakage identified and corrected prior to re-starting the operation. After the restart, all adjacent areas should continue to be monitored for grout leakage.

Any existing drainage structures connected to the structure being lined must be perpetuated and kept free of the injected cellular grout.

(e) Payment
Payment for the total length of thermoplastic liner pipe will include the measured length of the existing pipe that has been lined plus a maximum of 8 in. beyond the end of the existing structure. For example, if a thermoplastic liner pipe is used to line an existing 20 ft cross structure, the total payment for the liner would include the measured length of the existing cross structure plus the 8 in. length extending beyond each end of the existing pipe [20’ + (2 x 8”)].

In some cases, the design may indicated that specific types of end sections are to be installed on the liner pipe. These specific end sections may be indicated as a separate pay item. For the special situations in which a separate pay item has been included for the end sections, payment should be made for the specified end sections in addition to the payment of the liner pipe.

Payment for the liner pipe is intended to be all inclusive, except when end sections are identified to be installed as described above. The payment should take into account all necessary work and all incidentals for the work required. Perpetuation of existing structures connected to the existing pipe are required to be paid separately for each pipe perpetuated.

4.12 PRIVATE ENTRANCE STRUCTURES (Rev. 04-07-09)
Private entrance structures shall be placed where such structures are shown on the plans or wherever private entrances or drives definitely existed prior to the award of the contract and drainage structures are needed.

Approaches shall not be graded at private drives or entrances beyond the right-of-way at State expense unless specifically called for on the plans. Approach grading is discussed
further in Section 19 of these instructions. It is the policy of the Department to perpetuate access to all properties although the plans may not provide for the same number or same location of drives. If any property is not being given access or existing drives are shown to be eliminated, contact your AE to determine how to proceed. Any changes in locations of private drives to satisfy the property owner should be requested in writing by the property owner. Discuss such requests with the AE and, if the change is in contradiction with the special provisions of the right-of-way grant, or could otherwise become a controversial matter.

4.13 TILE DRAINS *(Rev. 04-07-09)*

Accurately locate all tile drains crossing the project or affected by the construction, and make adequate provision for taking care of them. This can be accomplished only by consulting with the property owners and by making a careful study of the ground. The latter is very necessary because property owners frequently do not know the tile location, particularly when tile drains were placed by former owners.

Where farm drains cross the road, every precaution should be taken to preserve them in at least their original state of efficiency. Tile drains shown on the plans, which are to be left in place, but are damaged by carelessness on the contractor’s part, must be replaced by the contractor. Tile drains, which are discovered before any work is done, but which are not shown on the plans, should be marked on the As-Built plans. In general, farm tile 6 to 10 in. in size, which are 4 ft or less under the ground surface, should be replaced with sewer pipe when the tile lays under the roadway. Farm tiles 12 in. or larger crossing under the pavement should always be replaced with pipe that meets current standards for structures under pavement.

Drain tile paralleling the roadway, but not under it, may be replaced in kind.

When a farm tile is intercepted by ditches that provide adequate drainage for the tile, at least two sections of sewer pipe and a sod collar should be placed on the outlet end. The balance of the tile under the road shall be removed if they are 12 in. in diameter or larger.

If necessary to excavate for locating underground drainage, the accepted cubic yards involved will be paid for as per Section 203 of the SS.

Sometimes tile will be intercepted which appears to be abandoned or no longer used as a drainage medium. Do not assume that such tile is “abandoned” or need not be replaced until a thorough investigation has been made to determine its status.

4.14 SUBSURFACE DRAINAGE *(Rev. 04-07-09)*

The locations of subsurface drains are shown on the plans. The grades for these drains may or may not be shown on the plans. In any event, it is necessary to coordinate the grades with the grades of culverts under the pavement. Wherever practicable the cross structures should be low enough to outlet the drains. Otherwise the drain should be low enough that the culvert will not lay directly upon it.

On some projects the OGE makes specific recommendations for subsurface drainage,
other than the subbase drains through cuts referred to above. These recommendations along with the conditions observed as cuts are opened up should be reviewed with the AE relative to modification with respect to actual field conditions.

Perforated pipe is placed with the perforations down. This assists in the prevention of infiltration of silts, gravel and other solids that might clog the line and destroy the effectiveness of the system. It is very important that the perforated lower segment is placed in a manner that the rows of holes are symmetrical with respect to the vertical axis of the pipe.

The laying of pipe or tile and its backfilling is adequately covered in the SS and these provisions should be carefully followed. In addition, care must be taken to insure that the top of the backfill is clean and free of any foreign material when the subbase material is placed over the subsurface drain aggregate.

4.15 GEOTEXTILES USED WITH UNDERDRAINS (Rev. 04-07-09)
A filter fabric (geotextile) is normally used where silty soil is encountered within the immediate subgrade. The fabric, when specified, should be placed along the sides and bottom of the trench before placing any aggregate backfill. Fabric should not be used on the top of the trench.

Storage and handling of geotextiles should be in accordance with the manufacturer’s recommendations, except that in no case should the geotextile be exposed to direct sunlight, ultraviolet rays, temperature greater than 140°F, mud, dirt, dust and debris, to the extent that its strength, toughness or permeability requirements are diminished. Each geotextile roll shall be labeled or tagged to provide product identification sufficient for inventory and quality control purposes. At the time of installation, the geotextile should be rejected and replaced with no additional payment if defects, rips, flaws, deterioration or damage incurred during manufacture, transportation, or storage is evident.

The surface on which the geotextile is to be placed should be excavated to design grade to provide a smooth, graded surface free of debris and large cavities. After excavating to design grade, the geotextile should be cut to a width to provide for “non-tight” placement in trenches and overlaps of the ends of adjacent rolls.

The geotextile should be placed with the machine direction (length) in the direction of water flow in the drainage system. It should be placed loosely, but with no wrinkles or folds. The ends and edges of subsequent rolls and parallel rolls should be overlapped a minimum of 1 ft. The upstream geotextile should always be overlapped over the downstream. Either sewing or overlapping shall join seams required in the longitudinal direction. Overlapped seams shall have a minimum overlap equal to the width of the trench.

Care should be taken during construction to avoid contamination of the geotextile. If it becomes contaminated, it must be removed and replaced with new material.

Placement of drainage aggregate should proceed immediately following the placement of
the geotextile, if required, and the underdrain.

4.16 SEWERS (Rev. 04-07-09)
In general, manholes are placed at the junction of sewers and at every change in grade or alignment of the sewer. This means that sewers should ordinarily be straight between manholes to facilitate inspection and repairs.

Due to the fact that in all instances the survey party cannot determine the exact location and elevation of existing sewers, utilities, and other underground installations, it is desirable that the PE/S make investigations as may be necessary. It is often possible thereby to avoid costly delays or revisions in sewer installation. Do not postpone investigating the underground installations until sewer construction actually starts.

Catch basins and curb inlets are provided for admitting storm water from the streets to the sewer. In general, curb inlets are placed where they may drain into a catch basin, and the catch basin may drain into a manhole. DO NOT PLACE CATCH BASINS IN THE LINE OF A SEWER, OR DRAIN CURB INLETS INTO A MANHOLE.

4.17 SEPTIC TANK DRAINS (Rev. 04-07-09)
In small towns and rural communities, frequent requests are made from property owners for the privilege of connecting septic tank drains to our highway drainage system, underground or surface. In some instances, our improvement eliminates an open ditch formerly used for such purpose, and the property owner assumes they have the right to perpetuate the arrangement.

The normal type of septic tank used in residential applications does little more than liquefy the sewage. A filter bed or soil filter is needed before the effluent is safe in an open ditch. However, the local public health official is usually better qualified to pass judgment on the efficiency of such treatment and the purity of the effluent. We do not permit septic tank drainage into our storm sewers or side ditches. If you find that sewage is drained onto State highway right-of-way, contact the appropriate local public health official for further investigation and action.

4.18 EARTH DITCH TYPE CATCH BASINS AND INLETS (Rev. 01-01-02)
On rural projects earth ditch type catch basins or standard pipe catch basins are often specified.

Except in special cases such catch basins should not be located in the line of tile, but should be offset to one side of the tile and connected to the tile by means of a “Y” or “T” connection.

The outlet of pipe catch basins should be of smaller diameter than the catch basin. The outlet for a 2 ft x 2 ft concrete catch basin should not be larger than 15 in. Where a larger outlet pipe is required a 4 ft x 4 ft concrete catch basin should be used.

It is not our policy to place catch basins or inlets on private tile lines, nor to carry surface drainage into private tile systems. When special cases are encountered requiring deviation.
from this policy, they should be discussed with the AE.

4.19 STRUCTURE REMOVAL (Rev. 01-01-02)
Normally no payment is made for removal of existing structures unless the contract contains an item of “Removal of Structures and Obstructions.” If a contract price is not listed in the proposal, the cost of removal is included in the various pay items of the contract.

4.20 RECORD OF STRUCTURES (Rev. 04-07-09)
Complete notes of a structure will consist of a sketch showing the exact location of the structure, and stakes set for it, elevations of stakes, cuts furnished by the contractor and a record of all pay quantities placed in the structure. These notes are recorded by the contractor if they are performing construction engineering, otherwise they must be done by the PE/S. A record of the concrete required and the concrete used should be included. The amount of structure backfill used and paid for should be entered in the structure notes although the documentation for payment is kept elsewhere. See Section 3, Article 15 of these instructions pertaining to payment of structure backfill. Sketches should be made of all structures or parts of structures that are not built to standard designs.

Allow ample space in the structure book for each structure so that complete data may be entered pertaining to it. This data should include structure number, stationing, type of pipe, kind of pipe, sizes, and quantities placed.

In order for Department maintenance personnel to have a record of underdrain outlet locations, the PE/S is to prepare a table when the project is complete that shows the stationing of each underdrain outlet. The best method for preparing the table is to use the underdrain table in the plans and indicate the as-built locations of the outlets. A copy of the as-built table is to submitted to the District Operations Engineer when the Final Construction Record is submitted.
INDIANA DEPARTMENT OF TRANSPORTATION
Mandrel Testing of Pipe Structures

Contract No. ______________________               Sheet _____ of _____
Prime Contractor ____________________________  Pipe Contractor ___________________________

<table>
<thead>
<tr>
<th>Pipe Str. No.</th>
<th>Pipe Mat'l. Spec.</th>
<th>Pipe Pay Dia. (in)</th>
<th>Str. Length (ft)</th>
<th>Date Backfill Completed</th>
<th>Date of Mandrel Test</th>
<th>Pass (P) or Fail (F)</th>
<th>Remarks (Note if this is a “Replacement” pipe)</th>
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Inspector’s Name:  _____________________________________ Title:  __________________________
Inspector’s Signature:  _________________________________________________________________

REFERENCE: General Instructions to Field Employees, Section 4.11.2
SECTION 5 – BRIDGES

5.1 INTRODUCTION  
When assigned to a bridge project, the PE/S must become familiar with the SP, plans and specifications governing the project. A review should be made to contemplate work so as to anticipate and discuss with the AE anything that is not understood. Project personnel should keep themselves informed as to the contractor’s program and the rate of progress so that the project is completed within the time that is specified and to the least inconvenience to the general public and other projects in the same area. A PE/S should feel free at all times to take up their problems with the AE. The PE/S in the study of the contemplated work should check all elevations between the substructure and the superstructure in relation to the details on the plans. A check of all vertical and horizontal controls should be made bringing to the attention of the AE and the contractor any discrepancies discovered.

Frequent and continuous references to the specifications and SP are a practice that the PE/S must follow. As each phase of the work begins, the PE/S should refer to that portion of the specifications covering such work. If the contractor questions your interpretation of the plans, SP or specifications, consult your AE. A contractor’s statement that something was permitted on another job should not affect your judgment or decision if it is contrary to the specifications.

Inspection of the work in all of its phases is desirable. The time to correct improper work is at the beginning. Do not wait until the work has been completed. The PE/S should not issue instructions directly to the workers or in any way act as a foreman on the work. Instructions should be given directly to the prime contractor or to its representative in charge of the work.

The provisions of the specifications are to be enforced, but a PE/S should remember that the management of the work is the responsibility of the contractor. If the contractor attempts to use any method which the PE/S has a reason to believe will impair the quality of the work, it should be communicated with the AE.

It should be borne in mind that it is not within the scope of the authority of the PE/S to alter or enlarge upon the plans or specifications. Consent to any violation of them should not be given under any circumstances. If conditions should arise, which would indicate that it is impractical to enforce the specifications to the letter, or if instructions are disregarded, the PE/S should get in touch with the AE.

5.2 SAFETY  
One of the basic requirements when working on bridges, as well as other construction projects, is to have a thorough knowledge and understanding of safety precautions to be used for the particular phase of work involved. Be alert to the activities around you and keep your attention centered on the safety precautions necessary for your own activity.

5.3 STAKING OUT THE WORK  
Section 105.08 of the SS outlines construction engineering. Regardless of who is staking
the work, control stakes for bridges should consist of sufficient control for the centerline of the roadway, centerline of the piers and bents, and the neat lines of abutments. It may be desirable to stake curb lines and any other permanent working lines that may affect the horizontal control of the units of the structure. Particular attention must be given to setting horizontal control stakes for structures that are located on curves or structures on which the centerline does not coincide with the centerline of the road approach. After the structure is properly located, permanent hubs that shall be available at any time should be set beyond the limits of the work and properly protected. The crew staking the work must check the horizontal and vertical leading measurements of substructure against the measurements of the superstructure to ensure the work will fit satisfactorily.

After the centerline of the road is established for a railroad grade separation, the stations of the piers and substructure units should be located. The location of the piers shall be made with a direct measurement of the dimensions given on the plans starting at the centerline of the track in each direction to the centerline of the adjacent piers.

A temporary benchmark should be established and located conveniently near the bridge site for use during construction. As soon as the first bridge seat or top of pier is established and completed the elevation for all other points on the structure shall be established using the first completed substructure unit as a benchmark.

When the structure is a grade separation the clearance points as shown on the plans should be checked and recorded in the Field Book, and if necessary, the elevation of this structure shall be adjusted to maintain the proper clearances. The DO should be consulted in regard to any minor adjustments necessary. They in turn should advise the CO whenever an adjustment is necessary.

Upon completion of the work, a sketch shall be recorded in the Field Book showing the actual measured horizontal and vertical clearances.

Before any elevations are set, a check should be made between two benchmarks and if more than one is not available, a check should be made between the available benchmark and an object of known elevation.

**5.4 BRIDGE SEATS (Rev. 01-01-02)**

The elevation of the bridge seats is one of the most critical elevations governing vertical control of the construction and they must always be checked before they are established.

The first step in determining these elevations is to determine the profile grade elevation for the intersection of the centerline of beam or girder with the centerline of the bearing.

For structures on a curve, this grade elevation should be determined for the intersection of the edge of the beam at the side where the floor is the lowest and the centerline of the
bearing.

The following items should be considered in finding the difference between profile grade elevations and the bridge seat elevations:

1. Amount of crown or superelevation.
2. Depth of floor.
3. Depth of beam or girder (Minus thickness of top flange if it is encased).
4. Splice plates (on older structures with beams spliced over piers)
5. Shims.
6. Height of shoe assembly.

5.5 FOUNDATION EXCAVATION (Rev. 01-01-02)

Poor foundations are a potential cause of bridge failure. A careful examination must be made of the foundation soil at the location of each footing. Where pilings are not used, the foundation soil should be firm and unyielding. In general, any soil which does not require the use of a pick in removal should be regarded with caution and before proceeding with the placing of the concrete for the footing, the use of piling should be discussed with the AE. The CO should be consulted before any consideration is given to redesign the footing.

In general, excavation shall be carried to the elevation shown on the plans. If solid rock is encountered at a higher elevation than shown on the plans, the excavation should be stopped and an investigation made to determine the advisability of revising the elevations given in the plans. If solid rock is encountered either at a higher or a lower elevation than anticipated, or if the bearing value of the supporting subsoil appears inadequate, a thorough investigation will be made. A report, along with direct recommendations to properly correct the conditions, will be sent to the CO for approval.

When foundations do not require piling and excavation in clay soils is being made by mechanical methods, extreme care should be exercised so that the soil below the bottom of the foundation is not disturbed. Generally, the lower portion of the excavation should be completed by hand methods. Clam buckets with long teeth will loosen material to a depth of several inches and special care must be exercised so that they do not disturb the material below the bottom of the footing.

Before foundations that do not require piling are poured, the contractor shall make sufficient tests holes in accordance with Section 206.08 of the SS showing the subsoil conditions below the bottom of the footing elevation. In addition to the nature of the subsoil encountered, the bearing value of the soil conditions can be estimated in accordance with the following table and the PE/S’s estimated value of the soil should be
noted. If the foundation conditions encountered are such that it appears as if a footing redesign may be required, the AE will be contacted.

Before piling are driven in foundations requiring piling, soundings (normally a rod may be driven) in lieu of test holes shall be made in accordance with Section 206.08 of the SS showing subsoil conditions below the bottom of footing elevation. This information can be placed on the back of the pile driving record.

<table>
<thead>
<tr>
<th>Character of Soil</th>
<th>Safe working loads in tons per square feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loam, silt or quicksand</td>
<td>(1/2 to 1)</td>
</tr>
<tr>
<td>Soft or wet clay</td>
<td>(1 to 2)</td>
</tr>
<tr>
<td>Fine sand or medium clay</td>
<td>(2 to 4)</td>
</tr>
<tr>
<td>Hard dry clay, gravel or coarse sand</td>
<td>(4 to 6)</td>
</tr>
<tr>
<td>Hardpan or very dry clay</td>
<td>(6 to 8)</td>
</tr>
<tr>
<td>Cemented gravel</td>
<td>(8 to 10)</td>
</tr>
<tr>
<td>Rock (poor brick masonry)</td>
<td>(5 to 10)</td>
</tr>
<tr>
<td>Rock (best brick masonry)</td>
<td>(10 to 20)</td>
</tr>
<tr>
<td>Rock (best ashlar masonry)</td>
<td>(20 to 30)</td>
</tr>
<tr>
<td>Very hard bedrock</td>
<td>(30 to 100)</td>
</tr>
</tbody>
</table>

5.6 COFFERDAMS (Rev. 04-08-09)

The purpose of a cofferdam is to provide a protected area within which an abutment or a pier can be built. A cofferdam in general is a structure consisting of steel or wooden sheeting driven into the ground below the bottom of the footing elevation and braced to resist pressure. It should be practically watertight and be capable of being dewatered.

Foundations adjacent to railroad tracks generally require cofferdams. The extent and strength required, if not set out on plans, should be discussed at the pre-construction conference with representatives of the Railroad. The contractor’s drawings for cofferdams on railroad grade separations must be approved by the Railroad before work is started. The contractor will submit these drawings to the Railroad for approval.

Per Section 206.09 of the SS the requirement to prepare working drawings for cofferdams is the responsibility of the contractor and they must be signed and stamped by a professional engineer. The contractor must obtain the approval of the Engineer for the proposed cofferdam plan and installation procedure prior to the start of cofferdam construction.

5.7 DRIVEN PILING (Rev. 10-23-09)

5.7.1 Introduction

Driven piling is covered by section 701 of the Standard Specifications and any applicable special provisions that may be included in the contract documents.

Inspection of pile driving operations is a critical part of the construction of bridge
structures and other structures requiring deep foundations. For pile driving operations for permanent structures or temporary structures that will carry live traffic, full time, on-site inspection and documentation of pile driving operations is expected unless otherwise directed. The person responsible for inspecting pile driving operations must be very familiar with the portions of the contract documents and these instructions that apply to pile driving and must understand how to inspect and document the work done by the contractor.

The Department has previously used the load factor or allowable stress design method for structures and the required capacity of a pile was referred to as the ultimate pile capacity or ultimate bearing capacity. Load resistance factor design, LRFD, is now used and the capacity of a pile is referred to as the nominal driving resistance. The terms bearing capacity and nominal driving resistance will be used interchangeably throughout these instructions.

The length of piling shown on the plans is an estimate based on soil boring data and historical information from surrounding jobs with similar soils. The contractor is responsible for furnishing sufficient lengths of piling to obtain the required penetration and bearing or nominal driving resistance specified.

Pile driving operations are to be documented on form IC 225, Pile Driving Record.

This section will first discuss piling operations in general and then specific instructions for inspection will be given.

5.7.2 Types of Piling
The two most common types of piling used for permanent bridge structures are steel pipe piles, also known as steel shell piles, and steel H-piles. Steel pipe piles are usually filled with concrete after being driven.

Other types of piling used are steel sheet piling, timber piling and precast, prestressed concrete piling. Steel sheet piling is typically used for temporary earth retention and for cofferdams. Timber piling is typically used for temporary bridges and other temporary works. Precast prestressed concrete piling was installed on a few projects; however, it is not currently in use in Indiana.

The contractor must provide mill test certifications for steel piling prior to driving. The mill test certifications should be delivered to the job along with the piling and a mill sticker should be attached to each pile (see Figure 1). The heat number shown on the sticker should match a heat number shown on the mill test certifications.

Timber piles have a stamp in the shape of the State of Indiana hammered into their ends to indicate they have been inspected and accepted. Untreated timber piles are stamped on one end while treated timber piles are stamped on both ends.

Before use, all piling delivered to the jobsite should be inspected for damage and rejected if necessary.
5.7.3 Pile Driving Equipment

Piles may be driven with gravity, steam, air, diesel, hydraulic, or vibratory pile hammers. The limitations and uses for each type of hammer are described in the Standard Specifications section 701.04. The most commonly used type of hammer is the single acting diesel hammer. Figures 2 and 3 show a sketch and photo of a single acting diesel hammer.

The typical pile hammer will include the striker plate (impact block), hammer cushion (pad), the helmet (drive head or cap), and the leads. Other items, or appurtenances, that may be used include followers, jets, collars (on timber piles only), and pile tips. Each of these items is described in detail in section 701.04.
5.7.3.1 Approval of Pile Driving Equipment
At least 15 days before pile driving begins, the contractor must submit data about the proposed pile driving equipment for approval to the Office of Geotechnical Engineering, OGE and the PE/S. Form **IC 740, Pile and Driving Equipment Data**, is to be used by the contractor for this submittal and is available on the Department’s website. The OGE will return approved forms to the contractor and the PE/S.

The OGE will use either the Wave Equation Analysis Method or the Alternate Method as described in **701.04** to determine if the proposed pile driving system is acceptable for use. The contractor may only use an approved pile driving system. No changes to the approved system may be made without written approval from the OGE. When applicable, the OGE will also send an approved pile driving chart to the PE/S for use in determining the bearing of driven piling.

The pile hammer should have a data plate attached to it that provides the name of the hammer manufacturer, the hammer model, the hammer serial number, rated energy of the hammer (foot-pounds or Newton-meters), hammer weight (pounds or kilograms), and ram weight (pounds or kilograms). A sample data plate is shown in **Figure 4**. Check the information on this plate against that data submitted on the approved IC 740. The website **www.pilebuck.com** has links to several pile hammer manufacturer websites and may also be used to check pile hammer information.

![Figure 4. Pile Hammer Data Plate](image)

### 5.7.4 Test Piles
Test piles are driven and used to determine the required driving criteria for other piles in the same foundation or structure.
There are 3 methods used by the Department to determine the driving criteria for piling:

1. Dynamic Formula – An indicator pile is driven to the planned tip elevation or bearing, whichever occurs first. This provides an estimate of the pile capacity and the driving criteria for the remaining piling is set based on the results from the indicator pile.

2. Dynamic Pile Load Test (PDA) – A test pile is monitored during the driving operation to obtain measurements of the actual stresses in the pile and the energy imparted to the pile by the hammer. This method provides a more accurate estimate of the pile capacity than the dynamic formula.

3. Static Load Test – A pile is driven and then loaded to failure to determine the actual capacity of the pile. When used in conjunction with a PDA test, this provides the best means of estimating pile capacity and determining driving criteria.

The information obtained by a PDA test or a PDA and static load test can be used to refine the estimated pile lengths shown in the plans, and in many cases can be used to reduce the required pile length. There are additional costs associated with dynamic load and static load testing, so it is not used in every contract. The OGE evaluates each site and determines which pile testing methods are appropriate.

Test piles are typically also used as production piles, except that they are longer per 701.05. If no test pile is indicated on the plans or contract documents, all piles must be driven to the nominal driving resistance using the dynamic formula and driving criteria provided by OGE.

Each type of test pile is discussed in further detail below.

5.7.4.1 Indicator Test Piles
When the method for driving piling is specified as the dynamic formula, an approved pile driving chart will be provided to the PE/S by the OGE along with the approved IC 740, Pile and Driving Equipment Data Form. The pile driving chart is project specific because it is tied to the hammer and job specific criteria. Nominal driving resistance or bearing can be determined from the chart by observing the hammer stroke height and the length of pile penetration per 20 blows.

If an indicator test pile is shown on the plans, it must be the first pile driven at the particular bent or pier. The pile used as the indicator test pile is usually driven in a production pile location and, if it remains in satisfactory condition, it is subsequently used as a production pile. The indicator test pile is driven to the estimated tip elevation or nominal driving resistance, whichever occurs first. The nominal driving resistance is recorded using the approved pile driving chart.

When the estimated tip elevation or nominal driving resistance is reached, pile driving is stopped and a minimum wait time for restrike, as defined in the contract, begins. The
indicator test pile must not be cut off before restriking. Before restriking, it is important that the hammer is warmed up by striking a fixed object at least 20 times. The goal of the restrike is to determine if the indicator pile has gained or lost capacity due to soil setup or relaxation. The restrike ends when the pile has been struck 20 times, or when the pile has penetrated an additional 3 in., whichever occurs first.

The restrike nominal driving resistance is then determined from the supplied pile driving chart. If the nominal driving resistance observed during restrike is equal to or greater than that required on the plans, the nominal resistance obtained when the pile was first driven will be used as the criteria for production piles in that bent or pier.

If the nominal resistance observed during the restrike is less than that required on the plans, the contractor must continue to drive the pile until the required nominal resistance is obtained. The restrike procedure is then repeated. If the required nominal driving resistance observed during the second restrike is still less than that required on the plans, pile driving operations must stop and the OGE should be contacted for further guidance. This process is repeated for each indicator test pile shown in the plans.

5.7.4.2 Dynamic Load Test Piles

When the method for driving piling is specified as the dynamic pile load test (PDA testing), then measurements will be taken of acceleration and strain near the pile head as it is driven in order to evaluate the performance of the pile driving system, to determine pile integrity, to calculate pile installation stresses, and to estimate static pile capacity.

A PDA test is typically performed on the first pile that is driven on the contract. Additional tests may also be required in the contract. A pile used as a dynamic test pile is usually driven in a production pile location and, if it remains in satisfactory condition, it is subsequently used as a production pile. Typically, the OGE will arrange for a pile driving analysis consultant to perform much of the testing and analysis required for a PDA test. The PDA testing equipment is attached to the pile by either the PDA consultant or the contractor, either before or after the pile is placed into the leads. An example of the PDA equipment attached to a pile and the PDA data collector are shown in Figures 5 and 6.

Figure 5. PDA Gages attached to Pile                                                                 Figure 6. PDA Data Collector
The pile used in the dynamic pile load test is driven until the PDA consultant directs the contractor to stop driving. The pile must not be cut off at this time. The pile is then restruck after waiting the minimum time defined in the contract. After the restrike is completed, the PDA consultant will provide the contractor and the PE/S with the final driving criteria to be used, usually within two business days. After completion of the initial PDA test, the PDA consultant will provide preliminary driving criteria and the contractor may drive production piling before the final driving criteria has been received. However, any piles driven during this time are at the contractor’s risk and may need to be re-driven if the final driving criteria are not met. A good example for when this may occur is if the piles are deep enough that they will need to be spliced. The contractor could drive the bottom sections before the final driving criteria have been received.

5.7.4.3 Static Pile Load Test
When the method for driving piling is specified in the contract as a static load test, then 3 types of tests will be performed on the pile: axial compression, axial tension, and lateral load.

A static pile load test is performed on a pile in a location indicated on the plans. This type of test is only occasionally specified in contracts and is done prior to driving any production piling. For the static pile load test, the contractor must design and submit for approval a reaction frame capable of placing the required load on the test pile. Some example setups are shown in the referenced ASTM D 1143; a copy of which may be obtained from the District Testing Engineer. A PDA consultant will direct and analyze the loading of the static test pile. Before the static pile load test begins, the PDA consultant will analyze the static test pile as it is driven by means of a dynamic pile load test as described previously.

The pile used for the static load test is not able to be subsequently used as a production pile as it is loaded to failure as part of the test. However, up to 2 of the piles used in the reaction frame may subsequently be driven and used as production piling, provided they remain in satisfactory condition.

5.7.5 Pilot Holes
Pilot holes, if required in the contract, are made prior to driving piling. There are three types of pilot holes: prebored, predrilled, and cored. Each is further described below.

5.7.5.1 Prebored Holes
Prebored holes are typically specified when difficult driving conditions are anticipated. Prebored holes are slightly smaller than the dimension of the pile being driven and are paid by the linear foot.

5.7.5.2 Predrilled Holes
Predrilled holes are typically used to reduce or eliminate downdrag forces from acting on the piling. They are also used when driving piling through newly constructed embankments. Predrilled holes are slightly larger than the dimensions of the pile being driven. The cost of predrilled holes is included in the cost of the piling items unless specified otherwise in the contract.
5.7.5.3 Cored Holes in Rock
Cored holes in rock are done to accommodate pile placement through rock and are paid by the linear foot.

5.7.6 Production Piles

5.7.6.1 Layout and Preparation
Once the bottom of the footing is prepared, the location of the piles is laid out. Piling is required to be driven in a certain order within a foundation as described in section 701.09. This is necessary to minimize disturbance and heaving of previously installed piling.

In some instances, water infiltration may be a problem, and a cofferdam and possibly a foundation seal may be required in order to provide a relatively dry work area. Figure 7 shows a cofferdam with the locations of piles marked.

![Figure 7. Pile Locations Marked at the Bottom of Footing](image)

Prior to driving, the contractor must mark the piles in 1 ft increments. This allows the inspector and the contractor to determine the approximate length of penetration and to determine the penetration per given number of blows while driving. Figure 8 shows a pile marked in 1 ft increments.
The ground can be used as a reference for measuring penetration, but there are also other options. Using the ground can be difficult and inaccurate if the surrounding soil heaves as the pile is driven. The pile gate may also be lowered and obstruct the view of the pile. A better way to measure penetration is to use a fixed point on the leads as a reference. One thing to be aware of when using a mark on the leads is that the leads tend to jump around as the pile is driven if they are not toed firmly in the ground. Another method that is commonly used to measure penetration is to drive a lath a few inches away from the base of the pile being driven. The lath can be pushed toward the pile to the point where it is actually touching the pile as it penetrates. This provides for a solid reference to measure penetration. The inspector should have a good idea how far the production piles will be driven based on data obtained from the test pile.

**Figure 8. Steel H-Pile Marked in 1 ft Increments**

**5.7.6.2 Alignment**

Piles are driven either vertically plumb or battered to a specified angle. The batter angle will be shown on the plans and is typically a rate of 1 horizontal to 4 vertical. Steel H-piling must be oriented as shown on the plans since it has a weak axis and a strong axis and is designed with a specific orientation for those axes. Steel pipe piling and timber piling may be driven without consideration given to their orientation. Tolerances are provided in the specifications for pile alignment.

**5.7.6.3 Pile Tips**

Generally pipe piles are fitted with an end plate or a conical tip welded to the bottom. H-piles sometimes require pile shoes. Conical tips and pile shoes are paid per each. End plates are not paid separately. Check to verify that the pile shoes provided meet the specifications. **Figures 9 and 10** show pile shoes.
5.7.6.4 Driving

Pile alignment must be checked by the contractor during the first several feet of driving so that corrections can be made as necessary. **Figure 11** shows checking of the vertical alignment with a four foot level.

Piling must be driven until the required bearing is obtained in accordance with the driving criteria. All piling must also be driven to the minimum tip elevation, if given, or to a minimum penetration of 10 ft below the bottom of footing elevation. If driving conditions are encountered that make this difficult, the PE/S should contact the OGE for guidance.
Single acting diesel hammers are equipped with graduated rings or grooves on the ram in order to visually determine hammer stroke. **Figure 12** shows the piston extending from the top of the hammer. A dark ring is on the piston for reference. Communicate with the contractor before driving to make measurements and understand the reference rings on the ram while the pile hammer is still on the ground.

![Figure 12. Piston Extending from the Top of the Hammer. (Note ring on the piston)](image)

Beginning at least 10 ft above the estimated pile tip elevation, the blow counts per each foot of penetration are to be recorded on the IC 225. Driving can be stopped once the pile has reached both the minimum tip elevation and the blow count for the required nominal resistance.

**5.7.6.5 Practical Refusal**  
On occasion, the pile will reach practical refusal before the minimum tip elevation can be reached. Practical refusal is defined in **701.08** as a minimum of 20 blows per inch of penetration. Driving must be stopped when a pile reaches practical refusal in order to avoid damaging the pile.

**5.7.6.6 Soil Heave**  
Soil heave occurs when driving a pile causes upward movement in the surrounding soil.
Some soil types, particularly loose granular soils, are more susceptible to soil heave. Soil heave can cause upward movement in previously driven piles and can also reduce the bearing capacity of those piles. The contractor is required to take elevation readings on the piling to determine if soil heave is occurring. Any pile that has heaved more than 1/4 inch must be re-driven to the required bearing and tip elevation.

The geotechnical report can be referenced to determine if soil heave is anticipated for a given foundation.

5.7.6.7 Splices and Cut-offs
Depending on the depth of driving, piling may need to be spliced. The Standard Drawings show approved pile splice methods. All welds must be done in accordance with AWS D1.5 and welders must have a valid AWS welding certification. The welder must knock the slag off of the weld so that it may be visually inspected, but ultimately the contractor is responsible if the splice fails.

Piling should not be cut off, unless necessary to drive other piling in the vicinity, until any restrike required has been successfully performed and the PE/S is satisfied that the piles have not heaved or that any heaving has been taken care of by re-seating the pile. Figure 13 shows the contractor cutting off the pile to the required elevation.

![Figure 13. Pile being cut off at the plan elevation.](image)

Once all of the piling in a footing has been cut off to the plan elevation, as shown in Figure 14, the next step is to form up the footing, place the reinforcing bars, and place the concrete.
5.7.7 Inspection Procedures
The PE/S must ensure that an inspector is on-site during all pile driving operations and that the inspector is familiar with these instructions and the specifications that cover the type of piling operation that will be inspected. The following is a summary of the required inspection procedures.

5.7.7.1 Preparation
Check that the materials to be used in the operation are approved and that any required certifications have been submitted.

Obtain a copy of the approved Pile and Driving Equipment Data form, IC 740 and check that the pile hammer and appurtenances are the same as on the approved form.

Obtain a copy of the approved pile driving criteria for determination of bearing values.

For piling being controlled by PDA or static test results, the driving criteria will specify the number of blows per foot for a given length of piling and a given stroke of the hammer. The PDA driving criteria will be provided by the PDA consultant.

For piling being controlled by either indicator test piles or strictly by the dynamic formula, The OGE will provide the driving criteria. Typically the criteria will specify the maximum penetration required for 20 blows at a given hammer stroke to obtain a given bearing value.

Prepare a copy of the IC 225, Pile Driving Record for the specific structure and foundation where the piling will be driven. A separate IC 225 must be completed for each pile in a foundation.

5.7.7.2 Test Pile Inspection
Ensure that the correct type and size of piling is being placed. Check the orientation of
the pile as required. Ensure that the piling has been marked in 1 foot increments for its entire length.

If PDA testing is being done, discuss with the PDA consultant how the operation will proceed and what their responsibilities and the inspector’s responsibilities are.

For indicator piles, PDA test piles and PDA driving done as part of a static load test, record the number of hammer blows per each foot for the entire length driven. Record the bearing values, the total length driven, penetration depth, and other information as required on the IC 225.

During the driving operation, ensure that the contractor checks for proper alignment of the pile and makes adjustments as necessary.

As the test pile approaches the required minimum tip elevation or bearing, record the number of blows per inch of penetration.

During the test pile restrike, record the number of blows per inch for either 3 inches or 20 blows, whichever occurs first.

Require the contractor to obtain elevations to check for soil heave as necessary and record the data on the IC 225.

### 5.7.7.3 Production Pile Inspection

Ensure that the correct type and size of piling is being placed. Check the orientation of the pile as required. Ensure that the piling has been marked in 1 foot increments for its entire length.

Obtain the measurement for each section of piling before it is placed in the leads and record the measurement to the nearest 0.1 ft.

Determine the approximate length of each pile to be driven. This approximation can be made from the lengths shown in the plans or from test pile results.

Observe the pile driving operation and when there is at least 10 ft of the pile remaining to be driven, based on the approximate length previously determined, record the number of blows per foot of penetration on the IC 225. Note that in some cases, the number of blows per foot of penetration for the entire length of the pile may be required to be recorded.

During the driving operation, ensure that the contractor checks for proper alignment of the pile and makes adjustments as necessary.

If a minimum tip elevation is shown in the plans, ensure that the pile has also been driven to at least this minimum elevation. If a minimum tip elevation is not given, ensure that the pile is driven at least 10 ft below the bottom of footing elevation.
Direct the contractor to stop driving once the pile has obtained both the minimum bearing value, based on the driving criteria, and the minimum tip elevation.

Require the contractor to obtain elevations to check for soil heave as necessary and record the data on the IC 225.

5.7.7.4 Splices and Cut-offs
Ensure that welding is performed by an AWS certified welder.

Observe splicing and cut-off operations to obtain lengths of piling added or removed. Record the information on the IC 225 in order to obtain the final pay length for each pile.

5.7.8 Inspector’s Documentation
Note any driving problems, such as misaligned or damaged piles, unexpected length of piling driven, inability to obtain minimum bearing, practical refusal prior to minimum tip elevation, soil heave or any other unanticipated conditions on the IC 225.

Complete all required information on the IC 225.

5.7.9 Measurement and Payment
Measurement and payment for driven piling and associated items of work is to be done in accordance with the Standard Specifications. Further clarification is provided below for payment of test piles.

For a test pile, whether it remains as a production pile or not, the cost to supply and drive the pile is paid by the linear foot of piling, regardless of the pile type. The cost of the portion of the testing work the contractor is responsible for is paid for by each for the type of test performed. When a restrike of a test pile is required, the cost of the restrike work is paid for by each for each pile restruck. Example 1 below is given to provide clarification of measurement and payment for a test pile.

Example 1

A dynamic pile load test is required for H piling on the first pile driven in a foundation. Pile tips are also specified. The estimated length of each pile is 95 ft with a minimum tip elevation of 624.00.

The test pile is driven and accepted in accordance with the specifications. However, the required bearing is not achieved until the tip elevation reaches 618.00. In order to reach this length, it is necessary to splice on a second section of H pile. 120 ft total of H pile are placed in the leads. The pile is driven in a location within the foundation for a planned production pile. The final length of piling cut-off total 18.7 ft. Pile driving records, including the required restrike, are kept on an IC 225. The following items are the final measurements and pay items for this test pile:

- Dynamic Pile Load Test – 1 Each
- Test Pile, Dynamic, HP 14 x 84, Production – 101.3 ft (120.0 – 18.7)
5.8 FILL AROUND STRUCTURE (Rev. 04-08-09)

The use of unsatisfactory material and the improper placing of fill material at the end of structures will produce rough riding surfaces and may cause damage to the structure. Rigid inspection should be given at the time of backfilling and while the approaches to the structure are being constructed. Because of varying types of soil, moisture content, topography at site and other variables each structure presents a different problem in securing properly compacted embankments and backfill. It is the responsibility of the PE/S to see that all fills are placed and compacted to a density that will preclude further settlement.

Abutment type structures and arch structures usually require that structure backfill be used for backfill and for fill around the structure. The PE/S should see that the material conforms to, and that it is placed as per specifications.

No fill should be placed around the structure until the walls have been inspected and approved by the PE/S. Fill to required finished grade in front of the abutments, wings, and retaining walls must be made simultaneously with the fill behind them.

In filling over arches, great care must be taken to see that the fill is placed symmetrically from haunches to crown so that the loading on the arch is equally distributed while fill is being placed.

The approach embankment at pile end bents of “spill-through” type structures may be constructed before or after end bent piles are driven. If construction of fill is made before piles are driven special attention should be given to assure the maximum compaction of fill. Coring of holes to receive the piles should be carefully located and drilled to approximately the elevation of the original ground. Any voids around the piling after it is driven should be filled with fine granular material.

The PE/S must give special attention to intermediate bents that fall within the limits of the spill-through slope. Heavy earth moving and compaction equipment will cause sufficient pressures on bents of structures as to cause tipping of the bent. The longitudinal alignment of such bents must be checked as spill-through slopes are constructed.

5.9 FALSEWORK (Rev. 08-10-17)

The contractor must prepare working drawings which are signed by a Professional Engineer fixed with the contract number, for any falsework, including stay in place (SIP) deck forms, cofferdams, coping falsework, deck falsework, superstructure falsework for reinforced concrete slabs, and designs for temporary bridge structures on runarounds. These should be submitted to the PE/S for distribution to the appropriate reviewers. Questions about review of shop drawings should be addressed to the AE. The Department’s approval of shop drawings in no manner relieves the contractor of the responsibility to construct falsework to support the loading to line and grade.
Several bearing joints of timber upon timber will result as falsework is constructed. These joints will crush together as they are loaded. Anticipated timber crush should be taken into consideration when setting elevations for falsework. In addition, the falsework grades should be set to provide for concrete dead load deflection as given in the plans.

The PE/S shall perform a general check of the falsework, as it is being placed, to determine that it is being placed in substantial compliance with the approved falsework drawings. A general check shall include checking falsework bents, falsework piling bearing capacity, size and spacing of materials, connections and/or joints, and the fit of it. In many cases, it may not be possible to perform a complete and detailed check of the falsework. However, the PE/S should instruct the contractor to correct any observed deviations from the approved falsework plan and to comply with safety requirements.

Stay-in-Place (SIP) Forms for concrete bridge decks can cause bridge deck cracking when not properly installed. SIP forms must be checked to insure the vertical leg of the support angle does not extend above the top of the SIP form (pan) line.

If the vertical leg of the support angle does protrude above the SIP deck line, the Contractor should be notified to take corrective action to rectify the problem.

Figure 15a. SIP Form attachement to steel members
Inset of Figure 15a indicates a correct SIP angle support placement in relation to the top of the SIP deck form line. The vertical leg of the support angle does not protrude above the SIP deck form line.

Figure 15. SIP Form attachment to concrete members

If a maximum soil pressure is specified for mudsills on which falsework bents are to be placed, a subsoil investigation must be performed as outlined in Section 5 of these instructions. If a maximum settlement of these mudsills is specified, the CO must be notified prior to mudsill placement.

5.10 FORMS FOR CONCRETE (Rev. 04-08-09)
Forms must be checked for proper dimensions, plumbness or required batter, alignment,
bracing, tightness, and for the required form lining on exposed surfaces. The Engineer’s checking of the forms should be done progressively as they are built and not wait until they are completed before making necessary inspections for approval before pouring. Copings, curb lines, and handrail or parapet wall forms should be very carefully checked for alignment and for smoothness in a vertical plane. Joints in sectional forms should be smooth and rigid to prevent irregularities in exposed surfaces.

The vertical and horizontal alignment of curbs, copings, and other exposed lines should be carefully checked during the placing of concrete and any improper alignment corrected before completion of pour.

Surface smoothness and alignment of the finished concrete should be secured by proper attention to form work.

Wall forms must be thoroughly and securely tied and braced to insure against bulging surfaces and poor alignment.

Forms should be treated with form release agent in such a manner that the agent does not come in contact with the reinforcing steel. If form lumber will be in close proximity with reinforcing steel already in place, it should be pretreated with the releasing agent before it is placed.

No welding of attachments of any kind for form supports will be permitted on flanges of steel beams or girders in the areas where flanges are designed to carry tensile stress. On simple spans the upper flange will not be in tension. On continuous steel spans the top flange is designed for tension over all piers to points of contraflexure and welding will not be permitted within this area. Due to variations in combinations of span lengths it is impossible to establish a “rule of thumb” method of establishing the location of tensile stress in the flange. The PE/S assigned to construction of a project of continuous steel spans should determine, as early as possible, the proposed method of attaching supporting formwork to the structural steel. If welding of attachments is proposed, the contractor should then make a request through the PE/S for a determination of the limits where welding will be permitted. No form construction requiring welding of attachments to beams shall be permitted at any location on the structural steel until the restricted limits are established.

The gutter line at the base of a curb is the location that gets the full force of drainage and de-icing solutions causing disintegration. Every effort should be made not to destroy the homogeneous mixture of the concrete at this location when removing the curb board supports. The curb board supports must be designed of metal so that their removal will cause no damage to the concrete, and their removal must be accomplished and holes carefully and fully patched before the concrete has set. Wooden legs are not permitted. The removal of the curb board should be made as soon as possible after the concrete has set sufficiently to hold its position. This should be done so that the gutter line may be given a smooth grade and irregularities in the face or top of the curb aligned and smoothed.
5.11 GRADE CONTROLS FOR BRIDGE FLOORS (Rev. 04-08-09)

Control grades are required along each beam line to establish the floor bottom elevations, top and bottom of coping elevations, and the finished floor grade at the beam lines. If screed grades at the beam lines and the coping have not been provided in the plans, the PE/S should obtain the floor screed grades by contacting the designer of record. These grades will have been computed for dead load deflection.

As soon as the beams or girders are set in their final positions, elevations should be taken along the beam lines at the screed locations. These elevations subtracted from the screeds give the dimension the floor grade or coping must be set above the point on the beam.

On continuous steel beam or girder units, all the elevations for the entire length of the continuous portion of the bridge must be taken before any concrete floor is poured and all screeds and copings are thereafter set to the dimensions computed. Note that the elevations of the beams and top of screeds at any point will vary as each unit of floor is poured and will not reach their correct final grade elevation until the entire floor is poured. Refer to instructions on the plans for continuous steel beam or girder structures.

If the bridge seats (bearing areas for girders or steel shoes) have been constructed to the correct elevation and the steel properly fabricated, this screed data will produce a smooth floor of correct thickness.

Because floors on steel beams and girder bridges are generally 8 in. in thickness, it is important that bridge seats (bearing areas) be poured to the correct elevation. In practice, a tolerance of plus or minus 1/4 in. in these bridge seat elevations will be satisfactory. Errors in elevations in excess of this tolerance must be corrected. The PE/S should discuss the method of correction with the AE.

Elevations for longitudinal screeds on concrete bridges (slabs, girders, rigid frames, simple spans or continuous spans) are computed in the same manner as described above. However, since this type of bridge is supported on falsework, screed elevations are generally set by direct leveling.

There is always some deflection in each span of the supporting falsework and generally a small amount of settlement (timber take-up in the horizontal joints of the various members) at each falsework bent. Generally some consideration and allowance must be made for such deflection in the falsework, in forming, and in setting the screeds. Since choice of design of falsework is with the contractor, no definite rule as to the exact amount of deflection can be established.

In setting longitudinal screed elevations by direct leveling, control points at 8 to 10 ft centers are usually sufficient. For concrete spans which vary from 20 ft to 60 ft, from...
three to five control elevations are usually sufficient in each span. The controlling elevations are set at each bearing point, the center of span, and 1/4 points of the span. Other points are obtained by stretching a chalk-line or wire over the control points and working out a smooth curved screed line. In many cases it is advantageous to select control points over the falsework bents.

The PE/S should check each screed or exposed line by carefully sighting directly along the line several times during the placing of the concrete. Any appreciable variation from the smooth line can be seen and corrected. In order to check deflection in falsework during the pouring of any span, the contractor should take rod readings on the control points just before starting the pour, and make frequent checks of each falsework bent after it has received its full load and before the final pass of the strike-off over that bent. If deflection or settlement is in excess of that originally allowed for, the screed should be wedged up as may be necessary to provide a smooth riding floor. However, care must be taken not to increase the floor thickness more than 1/2 inch as this will increase the dead load on the structure, potentially reducing the life of the structure and the ability to add a future wearing course.

5.12 PLACING REINFORCING STEEL (Rev. 01-01-02)

The protection of materials delivered to the project that are to be incorporated in the project is a fundamental good construction practice. It is important that we insist on compliance with the specifications in regard to maintaining clean materials so that they perform their proper function. It is necessary that we place special emphasis on our inspection and engineering control to require the contractor to protect reinforcing steel in accordance with the SS, keeping it above the surface of the ground on platforms or skids or other supports, and covered as protection from moisture and other detrimental effects. Supports for the reinforcing bars should be placed at such intervals that long bars will not sag into the ground at the ends and short bars are not permitted to fall through the supports to the ground. As the steel is used the PE/S shall require that the portions remaining for future work shall not be thrown off the supports but shall be restacked and covered. Careful handling of epoxy coated bars is required in order to reduce the amount of nicking and scuffing of these bars.

Reinforcing steel shall be placed in accordance with plans and shall be in place before any concrete is poured. Vertical bars projecting from footings shall be located with extreme care and held in position while concreting is in progress by fastening them to a supporting frame. Frequent inspection should be made during the pouring of concrete to see that bars are not displaced.

Reinforcing bars shall in all cases be held securely in place and care shall be taken to see that no steel comes in contact with the forms. The provisions of the Specifications “Placing and Fastening” must be adhered to. In case there is a delay in depositing concrete, an inspection of the reinforcing steel should be made and when necessary it should be cleaned.

It is essential that we maintain the positioning of reinforcing steel in the deck for compliance with the plans. The PE/S shall check the clearance of the top reinforcing steel
to the finished grade to verify that the steel will have the specified coverage of concrete. This shall be done by passing the strike-off or finishing machine along the screeds and directly measuring the clearance to the steel. This clearance must be checked and the measurements recorded in a field book. An acceptable minimum number of transverse locations are at the centerline of the structure, lane lines, edge line, and gutter line. These transverse locations must be checked every 10 to 15 ft longitudinally. When the top and bottom mats of steel are not tied together with crankshaft bars, it will be necessary to tie the top mat to the forms to prevent longitudinal and lateral movement of the steel.

As soon as the concrete is placed and struck off on the deck and while still plastic, an adequate number of measurements (suggested every third location) shall be taken and recorded in a field book showing the actual depth of concrete over the reinforcing steel. Any movement and any upward lift of the reinforcing steel will cause the reinforcing to be too close to the surface and immediate steps shall be taken to provide additional tie-downs to the forms.

5.13 MIXING CONCRETE (Rev. 04-08-09)
Tests must be made during each pour to determine the slump, air content, and the yield tests as per the current Frequency of Sampling and Testing.

A continual policing of transit mix operations is required. The specifications require that the mixing speed of truck mixers shall be in accordance with the manufacturer’s rating, and that the number of revolutions of the drum at mixing speed shall be not less than 70 nor more than 100. When transit mix trucks are used, the following items must be checked:

1. Manufacturer’s rating plates are legible and in place
2. Revolution counters are attached and in operating condition
3. Mixing speed and number of revolutions are in compliance with the specifications and manufacturer’s recommendations
4. Trucks are being used at or below rated capacity
5. Wash water properly drained from the drum
6. Capacity of water storage, old concrete build-up, and general condition of equipment

5.14 PLACING CONCRETE (Rev. 04-08-09)
The specifications provide that concrete shall be placed in such a manner so that it has no more than 5 ft of free fall within the forms. Particular attention must be given to methods of placing the concrete in the forms to avoid segregation.

On the first load of concrete, a determination of the air content must be made. The frequency schedule and requirements for the concrete tests must be reviewed thoroughly
before pouring begins.

When belt conveyors or pumps are used, sampling, for air, slump, and yield will be done at the discharge area of the pump or conveyor. In each case, material shall be permitted to drop to the forms where it will then be shoveled into the testing apparatus. As a matter of caution, concrete pumps work under extreme hydraulic pressures; therefore, making of beams and other activities must take place away from these pieces of equipment. Pumping of concrete shall be in accordance with Section 702 of the SS that also requires the contractor to submit a description of its pumping procedures at least 24 hours before concrete placement.

The preparation and the curing of test beams must receive close attention so that the results from test beam breaks will be truly representative of the pour that they represent.

It is sometimes practically impossible to remove all water prior to placing footing concrete. Placing concrete in still water up to 6 in. deep may be allowed. In this case concreting should start at one end of the form and be placed until the surface of the concrete is well above the surface of the water. The concrete should be allowed to work itself forward displacing the water with as little help as possible. The concrete should never be dragged through or shoveled into the water. Just sufficient pumping should be done to keep the surface of the water at the desired depth. The depositing of concrete in running water should never be allowed. The placing of concrete in more than 6 in. of water should be done only with special permission.

5.15 FINISHING CONCRETE SURFACES (Rev. 04-08-09)
All concrete surfaces must be finished in accordance with Section 702 of the SS.

The PE/S must give special attention to the construction and finishing of bearing areas of bridge seats and sliding joints. Bearing areas must be finished level and in a true plane (unless otherwise provided) and to the elevation shown on plans. The areas of the bridge seats or tops of piers between bearing areas shall be constructed with a small slope or crown to provide drainage.

5.16 FINISHING BRIDGE DECKS (Rev. 04-08-09)
It is the responsibility of the construction personnel to ensure that the deck construction, including the workmanship and materials, is all performed in accordance with the contract documents, specifically Section 704 of the SS.

Items of importance are:

1. Placing and positioning of reinforcing steel, including specified coverage.
2. Uniformity of the concrete with respect to air content and slump.
3. Adequate and immediate curing.
4. Independently supported runways to prevent movement of the steel.
5. Addition of surface water during finishing only when absolutely necessary, and in accordance with specifications.

If possible, the PE/S should be present for a part of the time on all deck pours, preferably at the start of the pour.

To help alleviate the plastic cracking which follows a pattern directly over the reinforcing steel, it will be necessary for the contractor to provide walk boards along adjacent sides to the bulkheads so that pedestrian traffic during the placing of concrete will not be moving the reinforcing steel which extends through the bulkheads. These walk boards shall be so constructed that they will be resting on the forms and not on the reinforcing steel.

Usually some hand finishing on a bridge deck is required to produce a smooth riding surface and to achieve proper profile grade and transverse crown section. However, excessive hand finishing tends to reduce the air content at the surface of air-entrained concrete that leads to spalling, cracking, and other undesirable faults that affect the life of the deck.

The PE/S will make careful observation during the placing of the concrete to ensure that dehydration caused by atmospheric conditions is not causing stress planes or cracks in the fresh concrete.

The concrete surface will be checked with a 10 ft straightedge immediately after the finishing is completed. Particular attention must be given to straightedging at transverse bulkheads and at expansion joints.

Required curing shall be provided immediately after the finishing operation.

After a minimum curing period of the bridge deck or a section thereof, the PE/S will straightedge the previous pour, paying particular attention for irregularities at transverse bulkheads and expansion joints. Any irregularities not within the limits of the specifications shall be corrected. The straightedging will be performed with a 16 ft steel straightedge.

5.17 FINISHING CONSTRUCTION JOINTS (Rev. 04-08-09)
Where construction joints are shown on the plans or the Engineer authorizes their location they will be placed in accordance with Section 702 of the SS.

Construction joints as designated on the plans for structures are so located with considerations given to relief of shrinkage stresses in the concrete and workability for finishing operations. The construction joints located for reasons of design stresses are essential and shall be constructed in accordance with plans. Certain construction joints may be marked as “Optional.” The use of these joints is optional to the contractor with considerations given to capability and capacity of the contractor for placing and finishing the concrete in accordance with the specifications. All joints not marked as optional must be placed as shown, unless approval is obtained for relocating or eliminating these joints.
The top edges of a longitudinal construction joint on a bridge deck are not to be rounded with an edging tool. These joints should be carefully worked so as to produce as near a watertight joint as possible.

Horizontal construction joints in piers, abutments, wingwalls, arch skew backs, and similar joints should be cleaned of all laitance (cement residue) and thoroughly wetted before placing new concrete on that already in place.

5.18 CURING CONCRETE (Rev. 04-11-09)
Proper curing for the specified length of time is essential to produce acceptable strength and durability in concrete. Attention should be given to obtain curing in accordance with Section 702 of the SS.

Test beams to be used for control of application of loads on concrete must be cured in the same manner and for the same time as the concrete that they represent.

5.19 CONCRETING IN COLD WEATHER (Rev. 04-11-09)
The provisions of Section 702 of the SS should be followed for concreting in cold weather. If the contractor elects to use High Early Strength Concrete instead of the specified mixture, the heating and curing period is controlled by test beams. The heating period will be extended, if for any reason the required temperature is not maintained. If test beams control field operations, the discontinuance of heating and curing can be permitted when the modulus of rupture for concrete reaches the value as provided by Section 702 of the SS.

Details as to heating and housing must be discussed in advance of the operation with the contractor and concreting should not be permitted until suitable means for heating and housing have been provided. If a space heater with a blower is used, the extreme hot air should not be blown directly onto the forms or green concrete. A baffle to spread the hot air should be used. Suitable provisions should be made to prevent premature drying of concrete during curing period. Sudden changes of temperature are common in Indiana and it is good practice for the contractor to be prepared for severe conditions.

5.20 EXPANSION JOINTS (Rev. 04-11-09)
Expansions joints must be in a true plane and not in a warped surface. The location of the expansion joint should be carefully checked to see that no coping or other projection is so located as to be cracked or broken off by subsequent movement of the structure.

The expansion surface between the bridge deck and the top of the mudwall should be checked carefully just before placing concrete in the deck so that you can be assured that the joint material is properly in place.

Note that many structures are currently designed with integral or semi-integral end bents. These type structures do not have expansion joints since the expansion is taken up in the rotation of the end bents and movement of the approach slabs.
5.21 WATERPROOFING (Rev. 04-11-09)
Waterproofing is not normally required on bridges. If waterproofing is called for it shall be in accordance with the applicable sections of the SS.

5.22 STRUCTURAL STEEL ERECTION (Rev. 04-11-09)
Structural steel that is delivered to the site has been inspected during fabrication and should be handled with proper care during shipment. Occasionally errors in fabrication do occur and escape detection by the shop inspector or some pieces are damaged during shipment. The PE/S should inspect the steel after it has been delivered to the job site and take whatever action is necessary to assure that the steel is satisfactory before it is erected.

The following schedule should typically be applied for payment of structural steel I-beams and girders as construction progresses:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>when erected</td>
</tr>
<tr>
<td>5%</td>
<td>when bolting is complete</td>
</tr>
<tr>
<td>2%</td>
<td>when all welding and bolting is complete</td>
</tr>
<tr>
<td>3%</td>
<td>when painting is complete</td>
</tr>
</tbody>
</table>

If painting is a separate item, then payment should be completed when all welding and bolting is completed.

Partial payment made for steel stockpiled but not erected will be as per Section 111 of the SS.

5.23 STRUCTURAL STEEL CONNECTIONS (Rev. 04-11-09)
It is essential that the elevation of the splice joints is established before permanent connections are made.

High tensile bolts and hardened washers are used in field connections of structural steel. It must be noted that with this type of connection the stress in the steel is transmitted through the splice by friction of the plates rather than shear in the bolts. It is important that the contact surfaces of plates are free of rust, oil, burrs, or any other materials that would prevent a tight contact of the metal surfaces. Tightly adhering paint is acceptable.

The PE/S must verify that the bolts are High Tensile Bolts. High Tensile Bolts are manufactured of ASTM A325 high strength carbon steel. They may be easily identified by the markings on the head of the bolts. Bolt heads are marked with three radial lines 120 degrees apart and the symbol A 325. Nuts are marked on one face with three similar circumferential markings 120 degrees apart or, alternatively, with C, 2, D, 2H, or DH. Bolts, nuts and washers delivered to the project must be in containers clearly marked with the contents and must be stored to prevent damage and rust.

It is necessary to ensure that the high-strength bolts used in structural steel erection meet all testing requirements prior to their use.
It is important that all bolts are properly and uniformly tensioned. Generally such bolts are tensioned by use of an impact wrench. The contractor must provide such control of the impact wrenches as is necessary to uniformly tension the bolts to the proper tension as set in Section 711 of the SS.

Impact wrenches and manual torque wrenches must be calibrated at least once each day in a device capable of indicating actual bolt tension in accordance with Section 711 of the SS.

The specifications outline the procedure for inspection of bolted connections.

Occasionally it is necessary to tighten a bolt from the head of the bolt rather than by the nut. In these cases the hardened washer shall be placed under the bolt head. This procedure is to be permitted only when space does not permit wrenches on the nut. The washer is to be placed under the portion of the unit that is to be turned by wrenches.

Beveled washers shall not be used except to correct for bearing surfaces having a slope of more than 1:20 with respect to a plane normal to the axis of the fastener. When beveled washers are necessary they shall conform to Section 910 of the SS.

No pin bolt fasteners shall be installed to breaking tension until the structural steel has been erected and adjusted for transverse and longitudinal positioning, and for elevations at splice joints. A sufficient number of erection bolts and full size drift pins and/or loose pin bolts shall be used to hold joints in correct position until solid tight pin bolts are installed. The installation of pin bolts shall start at the center of a joint and progress concentrically to the outer edges of the connecting plates.

Each fastener shall be installed to a minimum tension in accordance with Section 711 of the SS.

Installation tools used to install pin bolt fasteners to the tension specified shall be tested in the presence of the Engineer by installing a sample fastener in a calibrating device capable of indicating actual bolt tension.

**5.24 PAINTING STRUCTURAL STEEL (Rev. 04-22-14)**

**5.24.1 Introduction**

Painting of structural steel is covered by section 619 of the Standard Specifications along with any applicable special provisions that may be included in the contract documents.

Proper inspection of structural steel painting is critical, not only to ensure that the steel is protected from corrosion which can weaken the structural members, but also to ensure compliance with laws regarding hazardous materials. On-site inspection and documentation of painting operations is expected to be done at all critical junctures of the operations and should be supplemented by random site checks during the operations.

Note that the structural steel painting industry tends to use the term “coating” for
protective coverings applied to steel components since the coating may not always be paint. For purposes of these instructions, the terms “painting” and “coating” will be used interchangeably.

5.24.2 Types of Paint Systems
The Department uses two systems for painting structural steel members:

1. Structural Steel Paint System – Defined in section 619.09(a), this system is used when an entire structure will be painted. This system consists of an inorganic zinc primer, an epoxy intermediate coat, and a polyurethane top coat.

2. Partial Paint System - Defined in section 619.09(b) is used when only portions of a structure will be painted. This system consists of an organic zinc primer and a waterborne finish coat.

The two paint systems are not interchangeable and each coat of paint in the respective system must be of a color to produce a distinct contrast with the next coat that is to be applied.

5.24.3 SSPC Certification
The Society for Protective Coatings, SSPC, is a non-profit professional society concerned with the use of coatings to protect steel structures. The organization publishes standards that are recognized world-wide by the coating industry. The Department references these SSPC standards in the Standard Specifications.

For a painting contractor to perform structural steel painting on a Department contract, they must have a valid certification on file with SSPC. The type of certification required for a given structure is based on whether the structure may have a coating that contains hazardous components, such as lead or chromium. Two SSPC certifications are recognized by the Department:

1. A QP 1 certification is the minimum SSPC certification required for work on structures with existing coatings that do not contain hazardous materials.

2. A QP 2 certification is required for work on any structure with existing coatings that do contain hazardous material. A QP 2 certification is also acceptable for QP 1 work.

The pay items in the contract for cleaning the bridge structure will indicate the level of certification required for that particular structure. If the pay item does not indicate the QP level required, contact the AE for further guidance.

A copy of the contractor’s QP certificate should be provided at the preconstruction conference; if not, the PE/S should request a copy. The SSPC certificates typically are valid for one year and there is a phone number for SSPC on the certificate that the PE/S
may use if the validity of the certificate is in question. If work is to continue past the expiration date of a QP certificate, a new certificate is required to continue work past the expiration date. There is no carry-over or “grandfathering” of QP certification.

The contractor must not perform any cleaning or coating work until a valid certificate is provided and the contractor’s QCP is approved.

5.24.4 Calendar Date Restrictions
Unless requested by the contractor and approved in the Quality Control Plan (QCP), no field painting is to occur between November 15 and the following April 1. This is due to temperature and humidity sensitivities of the coating materials. There are Department-approved coating materials that the manufacturer recommends for use at lower temperatures, however to allow their use, the contractor needs to include them in their QCP or amend their QCP to include them. If the contractor requests to use a coating material that the manufacturer recommends for use at lower temperatures and includes this in their QCP, and the Department approves the QCP, then the calendar date restrictions shown in section 619.10(a) are waived and the contractor can paint in temperatures down to the manufacturer’s recommended limitations shown on the manufacturer’s product data sheet. While the temperature at the time of application applies to the manufacturer's recommended limitations, care should be taken in monitoring both the day and night temperatures when figuring an average, as it applies to all cure times. Also, the SS require all coatings to be applied inside of the containment. Therefore, the ambient conditions inside the containment are the conditions to be monitored, rather than the outside conditions. This commonly is a factor when applying the prime coat after an abrasive blasting operation. For example, if the humidity level is high outside of the containment, it may still be acceptable inside the containment from all of the dry air that was introduced into the containment during the abrasive blasting operation.

5.24.5 Quality Control Plan, QCP
Prior to beginning cleaning and painting operations, the contractor must have an approved quality control plan, QCP, in accordance with ITM 803. The QCP should be submitted to the PE/S at the preconstruction conference, or as soon as possible thereafter, to allow time for review and correction as necessary. Sections 4 and 8 of ITM 803 define the items that the contractor must include in the QCP. A checklist of items to review in the QCP is included at the end of this section.

Review the QCP and provide a written notice of approval or rejection to the contractor. If the QCP is rejected, cite the items that were cause for rejection. No work can begin until the PE/S has furnished written approval of the QCP to the contractor.

5.24.6 Materials
Typically, coating manufacturers will submit samples of each batch of the various components of the paint systems that they anticipate will be used each year to the Office of Materials Management, OMM, for testing. Contract sampling of paint batches is usually not necessary unless the contract calls for a non-standard topcoat color. A non-standard color is a color that is not listed in section 909.02. Note that the Department’s
approved list for Structural Steel Coating Systems lists an approval number (W-xxxxx) for the complete coating system (primer coat + intermediate coat + top coat), and is not an approval number for an individual batch of one of the components of the system. The Department still needs a sample from each batch for testing. The sample submitted must be from the same batch number as that used on the contract. OMM issues an approval “M-number” for each batch that meets specifications. This M-number is the number that is reported on the material records in SiteManager. Contact the Chemistry Lab at OMM for any questions regarding paint samples or the need to sample a batch. It is the contractor's responsibility to ensure that the materials used meet the SS. The contractor should request that all approval numbers appear on the delivery tickets or, if required for other materials, the required certification accompanies the delivery documentation.

5.24.7 Beginning of Cleaning and Waste Residue Sampling

Unless superseded by other contract documents, the specifications allow the contractor to choose the surface preparation method in accordance with section 619.08. Typically the contractor chooses to use abrasive blasting as the surface preparation method.

The contract documents should contain information either on a plan sheet or in a table or unique special provision in the contract information book on whether or not the existing coating is believed to be hazardous-based (contains lead or other hazardous components). Design memorandum 08-13 informs the designers of the necessary information to include in the contract.

After the contractor establishes containment acceptable to the advertised job conditions (presence or absence of hazardous-based contaminants) the contractor should begin abrasive blasting (cleaning) operations. Obviously, the level of containment is more stringent for anticipated hazardous coatings than for anticipated non-hazardous coatings. The level of containment required is specified in section 619.07(a) and detailed in SSPC-Guide 6. Except in cases where the contractor is recycling the spent abrasive, the waste residue stream produced by the abrasive blasting operation will contain both the existing coating and a small amount of the spent abrasive blasting media. The waste residue stream thus consists of all of the waste residue (existing coating and spent blast media) for a particular structure that is being disposed of, not just the existing coating.

It is not acceptable to “scrape” a sample of the coating ahead of time and send it off for analysis. This is only a sample of the coating and is thus not representative of the entire waste residue stream that is being disposed of.

If a contract contains more than one structure, the waste residue stream for each structure must be kept separate and not commingled or mixed together. The waste residue stream for each structure will be classified as either non-hazardous or hazardous depending on the laboratory results of the waste residue samples for that particular structure.

5.24.7.1 Waste Residue Sampling Procedure

Regardless of whether the existing coating is advertised as hazardous or non-hazardous the waste residue sampling procedure is identical. The waste residue cannot be labeled or classified as hazardous or non-hazardous until after the following waste residue sampling
procedure is followed. Sampling of a waste residue stream is governed by the SS and IDEM regulations.

After a minimum of 4-6 hours of blasting or typically at the end of the first full day of blasting, the first waste residue sample should be obtained. The sample should be the product of random grab sampling that is representative of the waste residue stream and should be of sufficient quantity that it can be split into two parts. In all waste residue sampling, it is important to remember the term “representative”. The waste residue sample obtained should be representative of the waste residue stream generated for that portion of the structure.

An example of a waste residue sampling procedure follows. Jointly with the contractor's foreman or QC technician, the PE/S should obtain material from four or five spots in the waste debris, either personally, through observation, or jointly. It doesn’t matter who performs the sampling operation (contractor or PE/S) however the PE/S must be present and witness the sample extraction. If there are areas that have red colored paint chips, a proportional amount of that material should be included in the sample. This is true of all visually different areas. There should also be portions of the sample from representative spots in the waste debris, even if it all looks identical. The total size of the sample extraction should be two to four cups (16 – 32 oz) in volume. This should be blended together to be uniform in appearance. This sample must stay in the custody of the Department (which is considered the waste generator) or his representative at all times. The two to four cup sample size should be split, with an 8-12 oz portion (or the sample size required by the lab) being sent to the lab for analysis. An equal or greater amount should be maintained by the Department as a back-up. Both the lab sample and the back-up should be labeled identically and maintained with duplicate documentation. There should also be a copy of all documentation in the project file. Quart size freezer food storage bags seem to work well, labeling the bags with a marker with the following information:

- Sample Number – Use the bridge file number or the last four digits of it, as these are unique to a structure. On interstate, US, and state routes, the last four digits of the structure number can be used. For example, a bridge on I-65, bridge file or structure number I-65-202-2345 becomes sample numbers 2345-1, 2345-2, 2345-3, etc. On local agency projects, the county name combined with the unique structure number could be incorporated into the sample number. The sample numbers for bridge 15 in Grant County would be: Grant 15-1, Grant 15-2, Grant 15-3, etc.
- Sample Date – date the sample is taken
- Sample Location - A brief description of the location should be provided. For example: On Road ___ over ____ or under ____ and the containment number or lot numbers or whatever system you are using to track that area of the structure
- Contract Number/ Project Number or any other information that will help the PE/S re-establish the identity of a misplaced sample.

Place the waste residue sample in the bag. Complete the chain of custody form that the contractor's lab uses. Be sure to indicate that the test is to be a “full TCLP” (the
Department has found that some of the old paints contained high levels of cadmium, chromium, and other metals in addition to high levels of lead which will also cause the waste to be classified as hazardous. Place the sample bag inside of another bag. Fold the chain of custody letter into fourths with the printed side out and place it between the two bags so the sample number can be read. Both bags should have most of the air removed before sealing so they don't burst during shipment. The sealed sample goes into the commercial mail service delivery envelope for whichever commercial mail service the contractor uses. The shipping label should be addressed directly to the lab and be billed to the contractor's account. The contractor is required to provide all of the materials (shipping envelopes, labels, chain of custody forms, etc.) needed, although the PE/S may keep some on hand if desired. The PE/S must take the sealed delivery envelope to the appropriate drop box and send it. The second sample is a backup sample and is retained by the PE/S in the field office in case a question arises regarding the integrity of the sample sent to the lab. A good practice is to package it identically to the lab sample, including a copy of the chain of custody form, for verification, in case it is needed. For convenience, the PE/S may insert a note in the commercial mail service delivery envelope requesting to be copied on a fax of the lab analysis results. In order to maintain the integrity of the sample, the PE/S must always maintain possession of both of the waste residue samples from each sampling milestone from the time the samples are taken to the time the PE/S drops the sample in the commercial mail service company’s drop box.

Repeat the waste sampling procedure outlined above three additional times at the following milestones:

- after approximately 25% of the structure has been cleaned,
- after approximately 50% of the structure has been cleaned, and
- after approximately 75% of the structure has been cleaned.

The four samples must be random and representative of the entire waste residue stream for the entire structure. For example if the contract involves a four span overpassing structure, obtain one sample from the waste residue generated from each span. On a truss, for example, obtain two samples from the waste residue generated from above the bridge deck and obtain the other two samples from the waste residue generated from beneath the bridge deck.

The waste residue may only be classified as non-hazardous when the lab results of all four representative samples taken from the waste residue stream at the milestones listed above for a particular structure are returned indicating that none of the threshold values from the TCLP analysis of the contaminants for any of the samples have been exceeded. The waste residue stream may then be disposed of as special waste in an appropriate landfill. Do not contact IDEM or open an EPA ID number. It is not necessary. The material may be transported by a licensed waste hauler and no additional paperwork is required for the contract files.

If any of the contaminants in any of the four sample results exceed the contaminant threshold values, the entire waste residue stream for that structure is considered hazardous and must be disposed of as such. No additional sampling of the waste residue
stream for that structure is required even if four samples have not been taken. Complete the US EPA Notification of Regulated Waste Activity Form and obtain an EPA ID number from IDEM.

5.24.7.2 Paperwork for Hazardous Waste Residue Disposal
If the sample results are returned indicating that at least one of the contaminants exceeds the threshold values, the entire waste residue stream is hazardous-based and it is necessary to complete the US EPA Notification of Regulated Waste Activity Form (Form number 8700-12, OMB# 2050-0028). This form is completed by either the Department or the entity that owns the structure (ex: county or municipality) or its representative administering the contract. Once completed, this form is submitted to IDEM. IDEM then assigns an EPA ID number (or RCRA ID number). In order to keep things moving, IDEM will cooperate with the Department via email/fax submission of the completed form to issue the EPA ID number ahead of time for use; however IDEM still needs to receive the original hardcopy of the form with an original signature in order to make the assigned EPA ID number active (or valid). The EPA ID number is required in order to transport the waste from the project site and should be provided to the Contractor as soon as the PE/S has it. Section 619.07(b) requires the Department to provide the EPA ID number to the Contractor within 30 days of the Department receiving notice that the waste from the project site is hazardous. The contractor should refrain from shipping any waste until at least three work days after the PE/S has mailed the completed Regulated Waste Activity Form to IDEM to allow for mailing time. The EPA ID number must be active prior to transporting or shipping any hazardous waste from the project site. In accordance with EPA requirements, section 619.07(b) provides a maximum time the waste residue may remain on site. The Department is required to obtain the EPA ID number. Therefore, the Department has a responsibility to get the EPA ID number and provide it to the contractor as quickly as possible.

A blank version of the US EPA Notification of Regulated Waste Activity Form is available from the IDEM Office of Land Quality at [http://www.in.gov/idem/5029.htm](http://www.in.gov/idem/5029.htm) under the Notification of Regulated Waste Activity Form and Instructions. The form is also available from the US EPA at [http://www.epa.gov/osw/inforesources/data/form8700/forms.htm](http://www.epa.gov/osw/inforesources/data/form8700/forms.htm)

The Department has met with IDEM and has discussed and agreed to certain formats on how to complete the form. Instructions on how to complete the form are provided at the end of this section. The instructions provided herein in conjunction with the instructions provided with the form must be followed. The form must be filled out, have an original signature (in other than black ink), and the original copy mailed to IDEM at the address indicated in the form directions.

There is a cost associated with opening an EPA ID number. Once a year, IDEM bills the Department for all EPA ID numbers ACTIVATED in the past year. Annual fees are assessed beginning January 1 of the new year for the activities of the previous year. Thus it is imperative for the PE/S to take the necessary steps to update the status of the EPA ID number with IDEM as soon as possible. Payment of these fees is the responsibility of the structure’s owner. Payment is handled at the District for state-owned structures or is sent
to the entity that owns the structure for an LPA structure.

If the existing coating was advertised as hazardous, a contractor may present a waste material profile form to the PE/S and request that it be filled out and signed as soon as possible. This form is from the waste treatment facility. This does not need to be signed as soon as possible. The form should only be completed after the results of the TCLP test(s) are known. If the TCLP results are returned showing the waste is hazardous, then a copy of the test results should be attached to the waste material profile form, the form signed by either the PE/S or the AE, and given to the contractor. The treatment facility may not take the waste without this profile form to accompany it. If the TCLP results are returned showing the waste as non-hazardous, a copy of all test results for the waste contained in that waste container should be attached to the waste material profile form. The PE/S should carefully read the waste material profile form and make sure that any sections or attachments that describe the characteristics of the waste are accurately represented; they should match the results from the TCLP tests. Sometimes these have already been filled in by the contractor. The PE/S should check to make sure the form they are signing is accurate. Once the PE/S is satisfied that the waste material profile form is accurate, either the PE/S or AE signs the form and gives it to the contractor.

When transporting hazardous waste, a copy of the signed manifest must be obtained from the transporter (trucking company) for each and every load removed. As the generator or generator's representative the PE/S must sign each ticket or an authorization form can be sent out with the first pick-up authorizing the contractor's foreman to sign for the generator. The PE/S would still need to be on site for the first pick-up, but after that the PE/S could collect the manifests for his files from the contractor's foreman. The PE/S must keep a running estimate of the tonnage of waste residue shipped (so many waste containers at so many tons per dumpster). The bags that the waste residue was collected in each have a shipping weight that can be used to compute the total weight of waste contained in each dumpster.

When all of the hazardous waste residue has been shipped to the disposal site and the PE/S is comfortable that there are no transportation issues, the Handler ID form that IDEM provided when the EPA ID number was activated should be marked as “INACTIVE” and returned to IDEM so the status of the EPA ID number may be changed to “INACTIVE.” Failure to do this will result in the District or owner continuing to be billed for having an active EPA ID number.

When the hazardous waste residue has been received, treated, and rendered to a “special waste” (normal construction waste) by the treatment facility, the treatment facility issues a certificate indicating the hazardous waste residue has been rendered to a special waste status. These certificates go to the contractor, but the PE/S must request a copy for the contract files. This certificate is a release of liability for the Department and is an important certificate. The certificate should be included in the final construction record for the contract.

5.24.8 Cleaning and Coating Operations
The SS provides requirements in sections 619.11, 619.12, and 619.13 for shop painting,
field painting a new steel bridge, and painting an existing steel bridge. These sections indicate the level of cleaning required as well as the paint system to be used.

The contractor will establish containment for a certain section of the structure to be painted. Once containment is set up for an area, all of the operations (cleaning, priming, painting) associated with painting will typically be done before moving the containment to the next section of the structure. Be aware of this as well as the several hold points identified in section 619.04. Hold points are “stages” in the work in which the contractor must stop or hold up working until the PE/S gives written approval to proceed. Hold points give the Department the opportunity to inspect the work at the various stages and to identify and have problems addressed prior to proceeding. The contractor must provide a minimum of one day’s notice to the PE/S in advance of each of the hold points. The PE/S should make an effort to be available and not delay the progress of the work.

5.24.8.1 Cleaning and Surface Preparation
Areas below bridge joints should be carefully checked. If the contractor did not request and receive approval for an alternate cleaning method to remove contaminants in the QCP, the procedure described in the next paragraph is to be followed. An example of an alternate cleaning method is to waive pressure washing and to use solvent cleaning by hand to remove any grease or salts. This might be proposed because pressure washing can cause logistical problems and may not be practical when the structure is over water and when peeling or delaminated paint is present. If containment is utilized, the addition of water creates a very slippery environment that is difficult to dry and causes problems with gathering and cleaning up abrasive blasting residue. If containment is not utilized, the pressure washing may spatter hazardous paint chips throughout the surrounding environment.

Before doing any other cleaning operation, the contractor is required to pressure wash the area in preparation of subsequent surface preparation operations. After pressure washing the area, areas containing grease, oils, or other contaminants not removed by the pressure washing must be removed by solvent cleaning. Solvent cleaning typically consists of applying a degreasing solvent to a clean rag and wiping the contaminated surface to remove the contaminants. After the pressure washing and solvent cleaning have been done, either an abrasive blasting or power tool cleaning is done to remove the existing coating. The amount of the existing coating that is required to be removed is determined by the level of cleaning required in the contract. The levels of cleaning are provided in section 619.08.

The contractor is required to use a dust collector during all abrasive blast cleaning operations. Using the dust collector provides for a much safer working environment for both the contractor’s personnel as well as the Department’s personnel along with maintaining a good driving visibility for the motoring public by providing a negative pressure environment inside the containment. Section 619.07 requires the contractor to provide personal protective equipment to the Department personnel in addition to the contractor’s personnel.

5.24.8.2 Coating the Structure
Unless the contract documents specify differently, one of the paint systems described in section 619.09 must be used. When an entire structure is being coated, the Structural Steel Paint System as described in section 619.09(a) is used. Note that each subsequent coat must be a contrasting color to the previous coat. Additional information regarding the paint is presented in section 909.01 and section 909.02. The Department maintains an approved list of Structural Steel Coating Systems. The Contractor must not mix items from the approved list. All three components listed on a line must be used, that is the approved system. Using a primer from one system and either an intermediate or finish coat from another system is not allowed; it results in the contractor using an unapproved system. Also, the contractor is not to mix batches of “part A” with “part B” from a differing M number or approval number. Typically the contract documents will contain the color number for the finish coat and the PE/S is encouraged to mention this to the contractor at the preconstruction conference so that the correct finish color may be obtained. This is also a good time to agree on the contrasting colors for the intermediate coat (when the finish coat color is established) and then the prime coat. Also, it is recommended to use a contrasting color to the intermediate coat for the caulk. For example, if light green is the specified finish color, use a caulk of a similar light green color, a white intermediate coat, and a gray or green primer.

Once a section of the structure is coated, perform acceptance testing as described in section 619.03 prior to granting permission to proceed or releasing the hold point. If the coating is too thin, or has other defects, now is the time to correct the defects by using the defect repair procedures outlined in the approved QCP. Review the manufacturer’s technical data sheets either from what the contractor provided or online at the manufacturer’s website to verify the temperature range for the product as well as the required time before recoating, taking humidity and overnight weather information into account.

Striping the outside edges of all structural members prior to painting the fields or the remainder of the structure is good painting practice. When specified in the special provisions, the stripe coat for both the intermediate and finish coat is considered a separate coat and allowed to dry to top coat dry time for that product prior to applying the full field coat. Striping is not required on the prime coat. Striping helps to minimize cracking that often occurs at sharp corners.

5.24.8.3 Coating Concrete Surfaces
Unless specified on the plans, concrete surfaces are no longer sealed. When specified, seal coating shall be performed in all areas adjacent to traffic as described and should be executed while the traffic is restricted. Attention should be paid to not rush this operation and allow time for the material to soak in. Areas away from traffic can be done at the contractor's schedule. A good practice, but not required is to have the contractor brush blast all areas to be sealed when they are cleaning the steel in the adjacent areas. If the contract contains requirements to remove graffiti, this is a good time to do that.

5.24.8.4 Coating Weathering Steel
Weathering steel (or corten or cor-ten) is steel made from a specific group of alloys that was developed to eliminate the need to apply a protective coating. Due to their chemical
compositions, these steels exhibit greater resistance to atmospheric corrosion than other steels. The rust patina that forms on weathering steel becomes the protective coating. For the first several years that the weathering steel is exposed to the atmosphere, water runoff from the weathering steel may result in rust-colored staining of nearby concrete surfaces. This staining looks unsightly and is the primary reason why the plans should show the end 10 feet or other specified length of each steel structural member manufactured of weathering steel that is located at an expansion joint to be coated. Section 619.11 requires that weathering steel be painted using the structural steel painting system in section 619.09(a) with the exception that the finish coat is a different material, color, and sheen in accordance with section 909.02(e). The prime coat and corresponding intermediate coat is from a paint system shown on the approved list. Other than the requirement that the finish coat must be compatible with the chosen intermediate coat, there is no requirement that the finish coat be from an approved list. An approved list for the finish coat for weathering steel does not exist; any material meeting the requirements of section 909.02(e) and that is compatible with the intermediate coat may be used. The material proposed to be used as the finish coat must be sampled and submitted using the Department’s typical sampling and submitting procedures for paint.

5.24.9 Method of Measurement
Partial or complete painting of bridge steel is not measured for payment. The estimated area of steel to be painted is found on the bridge summary table in the contract information book and is furnished on a “for information only” basis.

5.24.10 Basis of Payment
For existing steel bridges to be painted, each structure should have a minimum of two section 619 pay items, clean steel bridge and paint steel bridge that are paid at the lump sum price per structure. Estimate or pro-rate the amount of work that is done each day and enter this on the daily report in SiteManager.

The cost for painting new steel bridges or beams/girders is included in the cost of the structural steel pay item and is not paid for under painting.

5.24.10.1 Pre-Established Remedies for Changed Conditions
Since there is some uncertainty at the time of bid of whether or not the existing coating is actually hazardous, sections 619.18(a) and (b) make provisions for handling a situation where the laboratory analysis has returned results that classify the waste residue stream from the existing coating different from what was advertised in the contract. The pre-established remedies apply only to situations where the contract advertised the existing coating as non-hazardous (or zinc) based and the laboratory analysis has returned results indicating levels of contaminants in excess of the federal threshold limits and thus causing the waste residue stream from the existing coating to be classified as hazardous. Three situations are described in section 619.18(a) with corresponding percentage adjustments described in section 619.18(b) to the section 619 pay item unit costs; discovery of hazardous materials but no mill scale, discovery of mill scale but no hazardous materials, and discovery of hazardous materials and mill scale. Mill scale is a residue or impurities that result from the manufacture of the steel and rise to the surface as the molten steel cools. When lead based primers were used, the mill scale could
remain on the steel. When lead based paints were outlawed and zinc based primers became the coating material, the mill scale could no longer remain on the steel because mill scale and the zinc based primers are incompatible. There may be some structures that have varying levels of mill scale which must be removed prior to application of zinc based primer. Removal of mill scale generally can be done along with the removal of the existing coating using the same blasting media. The contractor’s rate of progress will be slowed by having to remove mill scale.

If the contract advertises the existing coating as hazardous (or lead) based, the provisions described in sections 619.18(a) and (b) do not apply. The contractor should have already included costs for mill scale removal and hazardous waste disposal in the bid.

Conversely, if the contract documents advertise the existing coating as hazardous (or lead) based and the four laboratory analyses all have results indicating that the levels of contaminants are not above the federal threshold limits, the waste residue stream from the existing coating is classified as non-hazardous. In this situation, the Department does not have a basis for requesting a partial credit for the cleaning item because the contract documents informing the contractor that the existing coating is anticipated to be hazardous based, the contractor would have brought and set up the containment required to remove hazardous based material. Per the specification, the fourth waste residue sample is taken when the last quarter of the structure is being cleaned. By the time the lab results are returned, in most cases the cleaning operation will be complete. The only area where a credit may be requested is for the disposal cost of the waste residue. The cost for disposal at a hazardous waste facility should have been included in the bid, but since the waste residue is classified as non-hazardous, the waste residue may be disposed in a local landfill at a lower cost.

A few individuals in each district have attended an SSPC bridge coating class. Questions regarding the pre-established remedies for changed conditions can be directed to the field engineer in the Division of Construction Management or to the appropriate individual in the district.

5.24.11 Final Construction Record Documentation
Make a chart or drawing of the sections of a structure at or before the beginning of the cleaning operation showing the assignment of lot numbers to the entire structure based on the estimated square footage of steel and the lot requirements noted in the SS to promote uniformity in QC documentation and to aid in possible future investigations.

Maintain a copy of all of the related items to the EPA ID number, (sample information, chain of custody, lab test results, application, manifests, certifications from treatment facility, all related correspondence, etc.) along with the completed environmental impact study in duplicate in the contract files and as a packet to be given to the District Environmental Department for their archives. As the contract files are destroyed by the District Final Records after ten years, the environmental archive copy must be included with the district shipment of critical archived records for permanent storage in Central Office against future claims for situations such as EPA Superfund clean-ups. This also includes non-hazardous determinations of a waste residue stream from a contract that was
advertised hazardous. Where there is no documentation of the existing coatings being hazardous or any discovery of the same, this documentation should not be archived. It would only take up space without possible purpose.

Final quantities for the cleaning and painting items are based on the square footage of the bridge deck area. This measured quantity is defined in 619.17 as the product of the out-to-out bridge floor length as measured longitudinally along the centerline of the structure and the out-to-out width measured on a line perpendicular to the centerline of the structure. The product should match the unit quantity shown in the schedule of pay items.

### 5.24.12 Bridge Painting Quality Control Plan Checklist

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signed and Dated Letter of Transmittal with space for INDOT Approval Signature</td>
<td></td>
</tr>
<tr>
<td>Names, Qualifications, Phone Number(s), Duties, and Employer of QC Personnel (QC Manager, QC Site Manager, QC Technician)</td>
<td></td>
</tr>
<tr>
<td>Type of Painting (New Steel, Existing Steel on Entire Structure, Beam Ends, etc.) and Paint System proposed for Use</td>
<td></td>
</tr>
<tr>
<td>Copy of the Traffic Maintenance and Management Plan and Contact Information for the Worksite Traffic Supervisor</td>
<td></td>
</tr>
<tr>
<td>Work Schedule showing planned start and stop dates and any contract date restrictions</td>
<td></td>
</tr>
<tr>
<td>Detailed Description of the Containment (including level of containment) and Waste Residue Disposal and Handling</td>
<td></td>
</tr>
<tr>
<td>Detailed Description of the Cleaning and Blasting procedures and equipment for each structure including dust collector manufacturer specifications (in order to validate the proposed dust collector’s capability to maintain the proper environment in the size of containment proposed)</td>
<td></td>
</tr>
<tr>
<td>Spill/Waste Contingency Plan including a list of the tools that will be maintained on site solely for this purpose, where they will be stored, and the name and contact information of the onsite person certified in hazardous component (lead) abatement (if necessary)</td>
<td></td>
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<tr>
<td>Waste Training Program including a history of training dates for all job personnel.</td>
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<tr>
<td>Waste Container Labeling (what will the label read, when will it be placed, etc.) In addition to the information required in the SS, IDEM has requested that the sample date and sample number of the first sample at each structure be included on that label</td>
<td></td>
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<tr>
<td>The exact location of the waste residue storage area and the method of collection and agreed method of transportation to the storage area, if necessary. Sometimes the site characteristics do not allow a safe location for a roll-off dumpster or disposal container</td>
<td></td>
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<tr>
<td>Name of the testing facility that will be analyzing the waste samples and how the samples are to be transported and the necessary materials to be furnished to the PE/S</td>
<td></td>
</tr>
<tr>
<td>Both Special Waste and Hazardous Waste Disposal Plans should be included. The appropriate plan will be implemented once a determination (non-hazardous or hazardous) of the waste residue stream is made</td>
<td></td>
</tr>
<tr>
<td>Where will other project-generated waste (spent solvents, empty cans, etc.) be disposed. This should include a statement of understanding that these will not be co-mingled with any waste residue stream until it is determined to be Special Waste. At that time normal non-hazardous (special) construction waste and debris may be co-mingled for disposal purposes, if desired</td>
<td></td>
</tr>
<tr>
<td>Copy of the Health and Safety Plan with documented training for each employee. This should</td>
<td></td>
</tr>
</tbody>
</table>
include a list of PPE provided and the necessary monitoring that will be observed per OSHA and IDEM for the employees. Also a statement of the required environmental testing that will be done before, during, and after operations on an advertised hazardous removal or at discovery of an existing hazardous material

Proposed materials, origin of materials, storage of materials, and material safety data sheets (MSDSs) for all materials to be used on the job including paint, caulk, thinners, sealers, etc.

Weather limitations of all materials should be shown on the MSDSs

Request to work outside the dates shown in the specifications, if desired. If the weather and temperature limitations, as recommended by the manufacturer, are requested to supersede the SS, this must be done in writing. If not, the limitations as stated in the SS apply.

Paint information (storage, mixing, thinning, curing time, etc…) and system shall be shown in the MSDSs. The color of each coat shall also be stated and comply with the contract requirements.

Copy of Contractor's SSPC-QP 1 or QP 2 certificate; also individual required certifications for lead abatement, QC/QA, worksite traffic supervisor, etc.

Painting procedure and proposed equipment

Description of the material and amount if the paint is to be thinned should be included in the MSDSs.

Proof of contact with IDEM, local air pollution control board, and any other regulatory agency. This should be a statement from the local governing municipality or county stating that they have no regulations that exceed IDEM's or a statement advising that there are. This can be valid for 2 years and maintained on file for any work that falls in the same jurisdiction.

Proposed methods and frequencies of sampling, testing, calibrating, construction control, monitoring, etc. Any methods that are identified by reference name or number should also include a description of the importance and all job specific information.

Provide the references listed in section 8.1 of ITM 803 at the project site and mention where they are located.

Describe the method provided to allow the PE/S to access the work area.

List of the QC Instrumentation to be used with serial numbers and date of last calibration

Sample of the QC recording forms that comply with the SS. QC testing showing locations and frequencies and how the dry film thickness is to be obtained for each lot for all coats.

Describe surface profile testing, surface profile requirements, and documentation on the QC recording form.

Describe the film thickness testing and the film thickness requirements.

Describe the method used to determine the random location for checking the coating thickness within each lot.

A statement indicating that if there are defective areas, the contractor will propose a repair procedure for review and approval by the PE/S.

5.24.13 Department Instructions for Completing the Regulated Waste Activity Form

Section 1 – Reason for Submittal. Generally the box marked "To provide Initial Notification of Regulated Waste Activity (to obtain an EPA ID Number for hazardous waste, universal waste, or used oil activities)" is selected as the reason for the submittal.
Section 2 – Site EPA ID Number. Leave Blank. This is provided by IDEM.

Section 3 – Site Name. For uniformity, the following naming convention has been agreed to between IDEM and the Department and should be used.

- Interstate Bridges – the words “INDOT BRIDGE” followed by the bridge structure number (without dashes.) Ex.: for structure I-69-22-4423, the site name would be shown as: INDOT BRIDGE I 69 22 4423
- US Highway Bridges – the words “INDOT BRIDGE” followed by the bridge structure number (without dashes.) Ex.: for structure 50-15-0569C, the site name would be shown as: INDOT BRIDGE 50 15 0569 C
- State Bridges – the words “INDOT BRIDGE” followed by the bridge structure number (without dashes.) Ex.: for structure 13-48-5622A, the site name would be shown as: INDOT BRIDGE 13 48 5622 A
- County Bridges – All Indiana counties except for Marion use the same format for naming the bridges located in their county, County Name xx xx; Marion County is Marion County xx xxxx x

There are two scenarios for the site name for a county bridge:

1. If the bridge spans another street - the name of the county followed by the county bridge number. Ex.: for Johnson County #15 over Main Street, the site name would be shown as: Johnson County 00 15.

2. If the bridge spans anything other than another street (a river, stream, ditch, railroad, etc.) - the name of the county followed by the name of the feature crossed followed by the county bridge number. Ex.: for Marion County #4901 that crosses Buck Creek, the site name would be shown as: Marion County Buck Creek Bridge 00 4901 0.

- Toll Road Bridges – the words “TOLL ROAD BRIDGE” followed by the bridge number (with dashes.) Ex.: for structure 53-2, the site name would be shown as: TOLL ROAD BRIDGE 53-2

Section 4 – Site Location Information. Since bridges do not have street addresses, the following convention has been agreed to between IDEM and the Department and should be used for the street address.

- Interstate Bridges – the name of the interstate first and then the name of the entity of the feature that the bridge spans followed by the reference post number. Ex.: for structure I-69-77-3589, the site location should be shown as: I 69 & US Hwy 31 RP 235 plus 58
- US Highway Bridges – the name of the US highway first and then the name of the entity of the feature that the bridge spans followed by the reference post number. Ex.: for structure 52-46-6571, the site location should be shown as: US Hwy 52 & White River RP 145 plus 08
- State Bridges – the name of the state highway first and then the name of the entity
of the feature that the bridge spans followed by the reference post number. Ex.: for structure 72-87-2445, the site location should be shown as: SR 72 & NS Railroad RP 42 plus 94

- **County Bridges** – the street name of the bridge first and then the name of the entity that the bridge crosses. If further clarification and more specific information is needed, the longitude and latitude (degrees, minutes, seconds) can be added, especially if the bridge spans a river, road, etc… in multiple locations in the county. Ex.: for the Post Road bridge over Grassy Creek, the site location should be shown as Post Rd & Grassy Creek or Post Rd & Grassy Creek 86 35 27 37 44 50

- **Toll Road Bridges** – the name of the interstate first and then the log mile. Ex.: I 90 LOG MILE 53

- **For the City, Town, or Village** – the name of the nearest city, town, or village in the county where the bridge is located

- **For the County Name** – the name of the county where the bridge is located. For bridges that are on the county line, enter the name of the county who is the “lead” agency for the project

- **For the Zip Code** – the zip code of the city used for the bridge city, town, or village.

**Section 5 – Site Land Type**. Check the appropriate box. Typically this will be “State”, “County”, or “Municipal”

**Section 6 – North American Industry Classification System (NAICS) Code(s) for the Site.** Use the six digit code 238320, since bridge painting is one of the illustrative examples listed in the NAICS information. The NAICS website, [www.naics.com](http://www.naics.com) may be viewed if other codes are desired.

**Section 7 – Site Mailing Address.** Enter the address of the entity that owns or is responsible for the bridge.

**Section 8 – Site Contact Person.** This is the person who IDEM will contact or send communications to regarding the bridge. This typically is the PE/S. There should also be a contact name and address for the person who will be doing the follow-up paperwork after the contract is completed. This could be the same PE/S or it might be the AE or a County Engineer. Around the end of the calendar year, a status form is generally sent to verify that this EPA ID Number was issued for a one-time generator (the owner). Failure to complete this form and return it in a timely fashion is considered an IDEM violation. After that form is returned, the billing will be sent to the waste generator (the owner). There is also the possibility of a site visit/inspection by an IDEM representative, prior to closing the EPA ID Number and, if so, there will be inspection forms for the contact person to sign. If necessary, a change form can be requested from IDEM to correct or change the contact person for all further communications.

**Section 9 – Operator and Legal Owner of the Site.** This is the entity that is responsible for and has authority over the bridge. It will be one of the following: INDOT, Indiana Toll Road Concession Company (ITRCC), or the name of the County/Municipality. The
owner and operator are usually the same entity. The Date Became Operator and Date Became Owner is a required entry. This is typically the year the bridge was constructed or the date the current owner obtained the bridge.

Section 10 – Type of Regulated Waste Activities. For subpart A, question 1, select the level of generation anticipated for the contract. Most bridge painting jobs that do not recycle the blast media are considered a large quantity generator or LQG. The remaining questions in subpart A, B, and C are typically “No” answers.

Section 11 – Description of Hazardous Waste. Follow the directions on the form regarding the order in which they are to be listed. The waste codes entered in part A will also be entered in part B. Typically lead is the contaminant, although other contaminants may be present that exceed the threshold levels. The PE/S is advised to check the lab report to make sure that all of the contaminants that exceed the threshold values are listed in the order stated in the instructions. Two of the more common waste codes for contaminants present in the bridge painting waste residue stream are chromium (waste code D007) and lead (waste code D008). The waste codes may be obtained from the 40 CFR 261.24.

Section 12 – Comments. Enter any other information pertinent to the site. Comments are not required but are encouraged to clarify any confusing entries or information. Please restate any information that is not clearly written.

Section 13 – Certification. The person who has the authority to sign this document. The PE/S should check with their AE or DCD for the District’s procedures regarding signing. This is the section that needs the original signature (in other than black ink) and, when IDEM is in receipt of this form, makes the assigned EPA ID number active.

5.25 RAILINGS (Rev. 04-11-09)
Most bridge contracts now specify concrete railing. The line and grade of the railing should not follow any unevenness of the superstructure. The railings must be as per Section 706 of the SS.

Concrete railings should not be placed until the falsework for all spans under RC slab structures have been removed. Coping forms may remain in-place while bridge rail is being cast on superstructures supported by structural members. Slip forming method may be permitted to place concrete railing providing the contractor has demonstrated the ability to produce barrier rail that conforms to the specifications. This demonstration should be performed in the presence of the Engineer and include the sawing of the wall to ensure adequate consolidation of the concrete around the reinforcing steel.

Particular attention should be paid to the rubbing or sealing provisions set out for the railing. If the railing is not in compliance with the design, or does not present a uniform appearance of smoothness or color, or is not otherwise a workmanlike job, it may have to be removed and replaced at the contractor’s expense. A minimal amount of small air bubbles on a surface are an inherent part of the concrete and an acceptable part of the finished surface.
**5.26 CONCRETE STRUCTURAL MEMBERS** *(Rev. 04-11-09)*

Concrete structural members are inspected during production at the plant. If the PE/S has not received test reports for bearing pads before the structural members arrive at the job site, the DMTE should be contacted to verify that the bearing pads have been sampled. Care shall be taken when handling and shipping precast members so as to protect them from damage. Section 707 of the SS addresses handling and shipping.

The erection of members should normally commence at the centerline of the structure and proceed out to the curb. Any shifting of the members must be done while they are held free of the supports by the hoisting device. Members must be set to proper line and grade with uniform bearing on bridge seats, mortar joints, or bearing pads as required by the plans.

Partial payment for concrete structural members stockpiled, but not erected, shall be as per Section 111 of the SS.

**5.27 BRIDGE DECK OVERLAYS** *(Rev. 04-11-09)*

Bridge deck overlays are typically placed with latex Modified Portland Cement Concrete. Other types of material, such as MicroSilica Modified structural concrete, may be used as allowed by SP. Bridge deck overlays are controlled by Section 722 of the SS.

**5.28 TEMPORARY BRIDGES** *(Rev. 04-11-09)*

When the contract specifies a temporary bridge, the structure must be built as per Section 713 of the SS. The contractor must submit detailed plans for the proposed temporary bridge, signed by and bearing the seal of a registered professional engineer. CO will approve these plans prior to construction of the temporary structure.

The PE/S must perform a general check of the temporary bridge as it is being placed to determine that it is being placed in compliance with the drawings and as per issued permits. A general check will include checking bents, bearing capacity, size and spacing of materials, and connections and/or joints.

The PE/S will document that the temporary bridge was built as per the bridge standard plans, contract plans, or approved contractor’s temporary bridge plan, whichever the case may be.
SECTION 6 – SUBBASE

6.1 SUBBASE (Rev. 01-21-14)
Most PCCP paving projects provide for a course of material to be placed under the pavement on a thoroughly compacted subgrade. The purpose of this subbase is to produce a uniformly composed foundation course for the pavement that is less susceptible to frost action and to eliminate the soil condition that contributes to subsequent pavement pumping.

There are two types of subbase utilized with concrete pavements. One is “Subbase for PCCP” and consists of two aggregate layers. The top layer consists of coarse aggregate No. 8 and serves as the drainage layer for the subbase. Water that enters the pavement structure will flow through this drainage layer to the underdrain system. The bottom layer consists of coarse aggregate No. 53, which serves as a separation layer for the subbase. Its function is to prevent the migration of fine particles from the subgrade to the drainage layer. The second type of subbase used is “Dense Graded Subbase” and it only consists of a 6 in. layer of coarse aggregate No. 53. Refer to the typical sections to determine which subbase type is utilized.

The source of subbase material must be on the Department’s list of certified aggregate producers. Stockpiling and spreading of the material shall be by approved methods to prevent segregation.

Offset grade stakes may be set on both sides of the subbase section. Then forms are placed, a scratch template will be used to check the subgrade. When forms are not used, checking shall be done by measuring proper ordinates down from a string stretched between the grade stakes. “Blue tops” may be set at subgrade elevation and used for final subgrade checking. A tolerance of 1/2 in. from true subgrade is allowable but it should be an average and not all one direction. If the contractor use GPS to control grades, the PE/S may require sufficient staking be done to be able to check grade.

Prior to placing subbase, the subgrade must be completed and approved in accordance with the specifications.

Subbase must be placed and compacted in accordance with Section 302 of the SS.

After the subbase has been completed to its finished grade, depth determinations should be made as required by the Frequency of Sampling and Testing Manual. If deficiencies are found, appropriate corrective steps must be taken. A permanent record should be kept of the date, location and depth of all checks, which shall be a permanent record to accompany the final construction record.

Unless otherwise specified, payment for subbase should be by theoretical volume of the section authorized. If subbase material is used beyond neat lines as shown on the plans, no payment will be paid for the excess material placed outside these lines.

The method for using the Light Weight Deflectometer for testing compaction of granular materials is found in ITM 508.
SECTION 7 – COMPACTED AGGREGATE BASE, SURFACE, OR SHOULDERS

7.1 SUBGRADE OR SUBBASE (Rev. 04-11-09)
In general, the following will apply to subgrade prior to placing compacted aggregate:

(a) The subgrade is to be treated in accordance with 207.04. Refer to the typical sections to determine the required type of subgrade treatment.

(b) The subgrade should be brought to grade and section at least 500 ft ahead of the placing of the aggregate. Be sure the side ditches are adequate to provide proper drainage for the subgrade.

7.2 MATERIALS (Rev. 04-11-09)
Unless otherwise provided compacted aggregate bases, surfaces, and shoulders shall be in accordance with Section 904.02 of the SS.

The percent of moisture must be recorded on the weigh tickets by the supplier as required by Section 109 of the SS. Check in the current specifications for the percent of moisture over which deductions must be made.

7.3 PLACING AND COMPACTING AGGREGATE (Rev. 04-11-09)
In general, the aggregate must be laid to the depth specified by the typical sections and in accordance with Section 301 or 303 of the SS, as appropriate. Frequent checks must be made to determine whether the quantity being placed is in close proximity with the planned quantity. On compacted aggregate base, surfaces, and shoulders, depth determinations are to be made and permanently recorded by date, location and depth.

Rolling should follow immediately behind the spreading in order to take advantage of the moisture in the aggregate. Some additional wetting may be necessary for proper compaction. If traffic is permitted on the material, it should be kept well dispersed and, if possible, the surface should be kept moist. On approaches, runarounds, etc., 100% dry density is desired but the test may be waived if the section is 500 ft or less in length. During all of the placing and compaction, care should be taken to prevent segregation. Segregated areas should be removed and replaced. “Tailgating” of material is not permitted, except in areas inaccessible to the spreader. The finished course should be checked for proper cross section and smoothness longitudinally with a rolling 16 ft straightedge set to 1/2 in. clearance. Any variations exceeding the 1/2 in. clearance shall be corrected.
SECTION 8 – PORTLAND CEMENT CONCRETE PAVEMENT, PCCP

8.1 INTRODUCTION (Rev. 04-30-09)
INDOT has specifications for both QC/QA PCCP (Section 501) and non-QC/QA PCCP (Section 502). The specifications for QC/QA PCCP require a QCP in accordance with ITM 803. The major differences between the two specifications are the testing and documentation requirements. The planned quantity of concrete pavement will determine whether the pay items are 501 or 502. There must be at least 7,200 syd of a concrete pavement item for section 501 to be applied. If a contract starts as a section 502 pavement, but a significant increase in the quantity is authorized, then the DMTE should be contacted to determine if the pavement should be tested under section 501.

The contractor is responsible for designing the concrete mixes in accordance with the specifications. All mix designs are reviewed for compliance with specifications. Section 501 mixes also require a trial batch procedure.

These instructions apply to both 501 and 502 concrete pavements unless specifically indicated otherwise.

8.2 PERSONNEL AND EQUIPMENT (Rev. 04-30-09)
When concrete mix is to be provided from a captive plant and the contractor has the mixer and the aggregate batchers ready for operation, notify the DMTE to arrange for inspection and testing of the water meter on the mixer and the scales on the batchers. The checking of all other equipment and tools is to be done by the project personnel. Give particular attention to the finishing machine screed crown, the screed and float pan crown of the finisher-float, if used, or the crown, in the rails of the mechanical longitudinal float, and the subgrade scratch template.

Equipment for making plastic concrete tests should be obtained through the DMTE before paving operations are started and must be properly calibrated prior to use as outlined in Section 45 of these instructions. Prior to a trial batch demonstration, a discussion should be held with the CCT on the operation to ensure they understand their responsibilities and documentation requirements. Prior to the start of the paving, a pre-paving meeting should be held with the contractor and all INDOT personnel who will be inspecting the paving operations to outline everyone’s responsibilities and review the paving plan and schedule.

Keep in mind that all materials must be approved before being used in the concrete mix. The specifications do not allow the use of fly ash or granulated ground blast furnace slag (GGBFS) as an additive in concrete pavements after October 15th and prior to April 1st of the following year without approval from the Construction Management Division. This requirement is due to the possibility that the use of fly ash or GGBFS in pavements that do not have sufficient cure time prior to the application of deicing chemicals in the winter months are susceptible to scaling or other durability distresses. However, Construction Memorandum 05-14, issued on September 6, 2005 does allow for the use of fly ash or GGBFS through November 15th if the following conditions are met:
• The contractor must agree that the contract will not be accepted until after May 30th of the following year
• The PE/S must identify the sections of pavement placed with fly ash or GGBFS between October 15th and November 15th
• The AE must inspect the identified pavement sections after May 30th to determine if there is any scaling or other distress

If after the spring inspection, no pavement distress is found in the identified sections, the contract may be accepted. If problems are found, the contractor must correct them, including removal and replacement if necessary, before the contract is accepted.

For QC/QA PCCP, the contractor is required to have an ACI certified concrete field testing technician, grade 1, on-site to supervise the QC testing for the contractor. Trial batches are to be run for each mix design with INDOT and contractor present and performing independent tests. The contractor is required to provide a common testing facility for both the contractor and state personnel for use during the contract. The specification outlines the specific requirements for the lab to be provided by the contractor. A good communication process should be in-place between the INDOT field CCT at the paving site and the INDOT lab technician to accurately document the station of the random load of concrete and communicate problems if they occur.

8.3 SUBGRADE AND SUBBASE (Rev. 09-25-09)
Prior to the start of paving operations, the subgrade and subbase must be completed in accordance with the specifications. Checking of subgrade and subbase must be done well in advance of the paving operations. In general, the contractor should keep a minimum of 500 ft. of subbase prepared ahead of the paving operation to allow time for proper inspection before concrete is placed.

8.4 SETTING FORMS (Rev. 04-30-09)
Almost all concrete paving, including shoulders, is done by the slipform method. However, the contractor has the option to set forms and use various types of form riding paving equipment. Short gaps and tight areas will most likely be done by the formed method. This section applies only when the contractor uses the formed method of paving.

Form stakes used to set forms to line and grade should be set not more than 50 ft apart on the outside of each form line. The offset distance from the form line is usually 2 ft. Stakes are tacked for line on one side only.

In setting forms, the most important factor in maintaining a true line and grade is a full and complete bearing of the form base on the subbase. Tamping under the forms after they are set, or shimming with stones, loose material, or blocks of wood to bring them up to proper elevation should not be permitted. A form that is too low must be removed, suitable material added and tamped, and the form reset and checked. This operation must be repeated until the correct line and grade is obtained.

Forms must be anchored in place with a minimum of 3 pins per 10 ft section of form.
Check for tight and complete closure of all form keys, wedges, and latches. All forms should be inspected for proper support and should be checked with a 10 ft straightedge. Variations of 1/8 in. or more in 10 ft. must be corrected before concrete is placed.

Forms that will not straightedge to the above tolerance, which are bent, twisted, or that will not match adjacent forms satisfactorily must be removed from the work.

8.5 ACCEPTANCE TESTING (Rev. 04-30-09)
As previously noted, the primary difference between QC/QA PCCP and non-QC/QA PCCP is the procedure for testing the concrete. These differences are outlined below:

a. PCCP
A standard concrete series of tests (air, slump, and yield) must be taken immediately after the paving starts and any necessary adjustments of the batch weights made. Adjustments should be made by the contractor as work continues. Tests are reported on Form IT-652. The specifications clearly state the limits on all tests and the frequency testing is outlined in the Manual for Frequency of Sampling and Testing.

A water/cementitious ratio test is also made as soon as practicable and the results reported on Form IT-628B (See Attachment ‘A’ ITM 403T). The water/cementitious ratio shall not exceed the limits set out in the specifications.

b. QC/QA PCCP
Testing is based on random sampling of Lots and Sublots as defined in the specifications. The testing is performed by the CCT at the field lab. Standardized forms are available through the district office. Accurate and timely documentation are necessary to ensure proper application of the specification and quality assurance adjustment factors. Daily review of this data is necessary to ensure proper tracking of lot and sublot quantities. The contractor’s control charts should be reviewed and any problems discussed with the contractor weekly by the PE/S. Opening to traffic test beams are separate beams from those cast for acceptance purpose.

8.6 PLACING CONCRETE (Rev. 01-01-02)
The subbase must be kept uniformly moist in front of placing the concrete mix to prevent the dry subbase from removing moisture from the mix.

The concrete is placed on the subbase and spread by means of a mechanical spreader. Strike-offs that do not have sufficient weight or that are of such design that will not level off the concrete at the correct elevation, shall not be used.

Concrete must be kept in front of the strike-off at all times while it is moving forward in order to prevent depressions. Where such depressions do occur, it is necessary that they be filled.

The contractor must place the concrete at joints so that the dowel bar assemblies are not
For formed paving, the edges of the pavement at the form line must be well vibrated to prevent honeycombing. Care must be taken to see that the machine operator uses these vibrators only while the machine on which they are mounted is moving forward. Inspect the pavement edge after removal of forms and have any honeycombed patched before the edges are banked with earth or sprayed with curing compound. Patching of honeycomb must be done immediately after removing the forms.

8.7 PAVEMENT JOINTS (Rev. 09-25-09)
Joints are placed in concrete pavements primarily to control cracking and to permit placing of adjacent slabs. Poorly constructed joints constitute one of the greatest sources of trouble in concrete pavement construction. For example, poor construction of transverse joints causes bumps at each joint which negatively impacts the life of the concrete as well as the traveling public. Regular and consistent inspection is important to achieve proper placing and finishing of joints.

When placing fresh concrete adjacent to a joint within a pavement, the existing joint must be protected to prevent mortar and fines from entering the joint. If this is not done, the joint will fail prematurely.

Each type of pavement joint is discussed in detail below.

8.7.1 Longitudinal Joints
Longitudinal joints permit a hinge action between slabs and may be either of the types shown on the plans or specified in the contract.

Tie bars are an integral part of a longitudinal joint, and are installed on suitable chair supports driven in the subgrade, or placed after the concrete has been struck off. Check that the contractor uses the correct size and spacing of the tiebars.

Unless a particular type of longitudinal joint is specified, all longitudinal joints must be sawed under provisions of Section 500. All longitudinal joint sawing should typically be performed within 2 to 12 hours after the pavement is placed. The slurry created by sawing operations must be completely flushed from the joint by a high-pressure water jet. All joints must be entirely open for their entire depth immediately prior to sealing.

8.7.2 Contraction Joints
Contraction joints are placed across the pavement at right angles to the centerline to control cracking, and unless otherwise provided must be sawed.

The maximum allowable contraction joint spacing is specified in the plans. When manholes, utility access ports, catch basins, inlets, etc. are located within the pavement, a contraction joint layout plan needs to be made. No pavement block out section should be closer than 4 ft from a contraction joint unless a contraction joint is incorporated as one side of a block out section. Under no circumstances should the maximum contraction
joint spacing be exceeded. Contraction joint placement is especially critical in urban pavement sections in order to avoid random pavement cracking and deterioration subsequent to construction.

The subbase must be accurately prepared at the joint location when either a welded dowel bar assembly that rests on the subgrade or a full depth separator is used. A template may be required for checking the subbase and position of the dowels if necessary. The position of the dowels must be checked, as described in section 8.10 of these instructions, to ensure that the dowels are parallel with both the pavement section.

Dowel bar assemblies must be pinned securely to the subbase. The concrete must be placed in such a manner that individual dowels or entire assemblies will not be displaced from their true position. Dowels that do not remain parallel with the pavement will cause cracking and spalling of the pavement.

Contraction joints are to be sawed the full pavement width in two separate operations. The initial transverse saw cut must be at a depth of D/3 for new pavement sections. This initial saw cut should commence as soon as the concrete has hardened sufficiently to permit sawing without raveling, usually 2 to 12 h after placement. If necessary, the sawing operations must be carried on during day and night, regardless of the weather conditions. After the concrete has sufficiently cured, but before opening the pavement to non-construction traffic, a second saw cut must be made. Immediately upon completion of the sawing operation, the joint must be thoroughly washed to ensure that all the slurry is washed out, and not permitted to remain and harden in the joint.

8.7.3 Sawed Joints
When sawed contraction or longitudinal joints are required, the work must be performed in accordance with all applicable provisions of the contract, plans, and specifications. Contraction joints should be sawed within a period of 2 to 12 h after placing of the concrete to prevent the development of random and premature cracking. Sawing should start as soon as the concrete has hardened sufficiently so that the sawing can be performed without undue raveling or spalling, resulting in a clean, neat groove. Careful detailed inspection is necessary to ensure that the contraction joints are sawed prior to the development of random cracks that result from poor timing. If random cracks develop, contact the AE immediately and secure assistance in determining the cause of the cracks, means of preventing them and any corrective measures that may be required.

During the placing of concrete the contractor must accurately reference the location of the contraction joint assembly in order that the subsequent saw cut is made directly over the center of the dowel bars.

The inspector assigned to the sawing operation should be thoroughly familiar with the applicable specification requirements and in addition give detailed attention to the following:

1. Check width of saw cut.
2. Check depth of saw cut.
3. Ensure that saw cut is straight.
4. Ensure that transverse saw cuts are at right angles to the pavement lanes.
5. Ensure that saw cuts are clean.

8.7.4 Expansion Joints
Expansion joints are used only where specifically called for on the plans. Expansion joints are indicated on the intersection detail sheets in the plans as to kind and width. A careful study should be made of all detailed intersections, and if in your opinion, the joint arrangement as shown will not function properly, the layout should be discussed with the AE and the designer.

Expansion joints labeled as terminal joints at bridges, railroad grade crossings, or abutting existing jointed pavement, consist of a concrete sleeper slab installed below the joint and the joint itself is filled with HMA mixture. Care should be exercised to ensure that the sleeper slab is constructed in the same plane as the pavement that will be placed on it.

8.7.5 Construction Joints
A construction joint is a rigid type joint that joins two sections of pavement together by the use of deformed reinforcing bars.

Construction joints are commonly used at the end of a day’s run or whenever the paving is stopped for 30 minutes or more and the location does not fall at a contraction joint. The tie bars are pushed into the concrete through holes or slots in the header board to the required depth. The free ends on the bars must be supported. When starting from a construction joint the inspector must check the vertical face of the existing pavement for right angles and alignment.

The specifications state that the construction joints must be at a minimum spacing from a contraction joint. In fact no two transverse joints, of any kind, should be spaced closer than the specified spacing. This means that headers must be placed exactly at a point half way between preset contraction joint baskets unless a contraction joint is used as a header also.

Contraction joints may be used as a construction joint, but care must be taken to ensure that the dowels are positioned parallel to the plane of the pavement, both horizontally and vertically. A slotted header board is recommended.

8.8 FORMED PAVING (Rev. 09-25-09)
It is the inspector’s duty to see that the contractor’s operation in placing and finishing concrete is done in a manner that will produce a smooth riding pavement. Any variations that exceed the acceptable limits must be corrected either at the time of finishing, which is by far most preferable, or later.

The following are the most important elements in securing a smooth riding pavement:
1. Uniformly compacted subgrade and/or subbase.

2. Straight forms properly aligned and staked or properly aligned stringlines for slipform equipment.

3. Uniform consistency of concrete as specified.

4. Uniform spreading and consolidation of the concrete in front of the finishing machine to produce a constant elevation during the forward movement.

5. Correctly adjusted finishing machinery that is in good condition and operating properly.

6. Correct and constant use of a true 10 ft straightedge which is cleaned and checked frequently.

7. Checking the pavement as far back of the float as concrete setting will permit.

8. Skilled and judicious use of hand tools.

9. Texturing at the proper time in the proper manner.

The following is a discussion of operations and equipment in the order as normally used on paving projects.

(a) Mechanical Spreader or Strike-off. A properly operating machine spreads the concrete uniformly over the subgrade in a manner that produces a minimum of segregation.

(b) Finishing Machine. The principal functions of the finishing machine are to uniformly screed and consolidate the concrete mix. The rate of placement of mix in front of the finishing machine must be matched to the finishing machine’s capacity. A uniform head of concrete should be carried in front of the finishing machine. The amount of surge under a screed is controlled by the head of concrete in front of it, the consistency of the mix, and the tilt of the screed. When the head is too high, an excess will pass under the screed making a bump in the finished pavement. A deficiency of concrete at any point along the width of the screed will cause a low spot at that point. The rear screed should cut the concrete off to the elevation and section of the finished surface, allowing a slight surplus of mortar for proper operation of the longitudinal float. Tearing of the surface indicates too stiff a mix or too much forward travel as related to transverse motion. A non-uniform surface behind the finishing machine, such as deep or irregular corrugations, indicates improper adjustment or operation of the machine.
Floating of the pavement surface follows the finishing machine and is intended to further smooth and true the pavement.

(c) Mechanical Float. This is the next mechanically controlled piece of finishing equipment, and poor quality work will leave irregularities that cannot be properly corrected by the hand finishers. A mechanical float may be used to correct minor variations, but anything other than this calls for immediate revision of the finishing machine operation. Low spots shall be corrected.

Even if the mechanical float is performing satisfactorily, changing conditions can affect pavement smoothness. These conditions can be items such as; concrete mix or consistency, working up or down grade, change in the drying conditions, change in the rate of cross slope, and the time interval between placing of concrete and operation of the float. Attention to these changing conditions will make the difference between an excellent pavement surface and a relatively poor one.

Floating prior to the initial settlement of the concrete is frequently the reason why pavements are found rough when straightedged the next day, and require corrective action to remove the variations. Initial settlement of the concrete should take place before passing of the mechanical float. The float must be held back from the paver to allow for this initial settlement.

If the mechanical float is properly operated the surface will require only minor hand finishing after its passage. The straightedgers following the float will have very little to do except remove the slight trail marks and carefully check the surface. If the finishers are working hard at anytime, a careful check should be made of the finishing machine adjustment in addition to a careful check of the float.

(d) Hand Finishers. Final checking of the pavement is done as far back as possible, but not so far that good texturing and edging cannot follow. Additional water for finishing purposes shall be limited to such quantity as may be applied by fogging as approved.

(e) Texturing. The pavement will receive a finish in accordance with the specifications as described in Section 500. Areas of the hardened grooved pavement which do not meet the contract requirements have to be corrected by cutting acceptable grooves in the pavement with an approved mechanical grinder or cutting machine.

(f) Edging. This operation shall be performed as per Section 500.

(g) Pavement Smoothness. After the concrete has hardened, the profile of the surface shall be checked as per Section 500.
(h) Pavement Thickness. The PE/S must always be on the alert for any operation that would contribute to thin pavement. The contractor is responsible to ensure proper pavement thickness as shown in the contract documents. Cores shall be taken as per Section 500. Factors essential to ensure proper thickness are as follows:

1. Checking the correct crown in the equipment screeds, and carefully check actual pavement crown several times each day, both before and after the concrete has set.

2. Stability of foundation under the forms; give particular attention if paving operations are caught in a hard rain.

3. Care in checking the removal of crown in the subgrade at transitions from crowned to flat sections and from flat to crowned sections.

(i) Hand Methods. Hand methods as set out under Section 500 may be used on widened pavement and other locations as permitted.

8.9 SLIPFORM PAVING
Most mainline paving is currently done by the slipform method. Uniformity is the key word in slipform paving and the need for uniformity begins with the subgrade. Uniform and close conformance with both grade-line and cross-section of the subgrade will affect uniform slab thickness, final smoothness, and riding quality of the pavement.

To accomplish this purpose the contractor will utilize an auto-grade machine with automatic grade control from a pre-set grade-line to trim the subbase. This grade-line on each side of the pavement should be set, in or parallel to, the plane of the edges of pavement.

This same rule applies if the contractor uses automatic grade control when slip-forming. If automatic grade control is to be used when paving, a common elevation datum must be used for both subbase and pavement to prevent deviation in pavement thickness and concrete quantities.

After the subbase is complete, contraction joint assemblies for jointed pavement may be set on the subbase. Pre-set pins or other procedures must be used to properly align the joint assemblies, as there are no side forms that can be used for reference.

Uniform concrete mix is also important in slip-form paving, as it will have a pronounced effect on the smoothness of the final pavement. Attention must be paid to using only properly drained aggregate to obtain uniform slump. Uniform consistency and consistent low slump are necessary to minimize problems with edge slump and rough pavement. Inspection should be made for uniform moisture in the subgrade ahead of the paving and water added to the subgrade as necessary.
The best results for controlling edge slump and smooth pavement are attained with uniform concrete, uniform rate of delivery to the paver, and uniform lateral distribution and level of mix maintained at the main screed. Interruption in the truck cycle causing the paver to stop is a possible source of rough pavement; therefore, paving speed should be coordinated with the rate at which concrete is delivered to the paver. The interval between the spreader and the paver should be maintained such that a short delay at the spreader will not cause the paver to stop. A slow continuous paver speed should be used rather than starting and stopping. Since the main screed is in effect making the final profile and cross section of the pavement, a uniform level of concrete must be maintained across the entire width of the screed.

To obtain uniform consolidation and adequate density of the concrete, a series of internal vibrators are installed in front of the main screed. Occasional observation should be made of the vibratory devices to detect failure of individual units. Inspection should be made on the configuration of the main screed after each major move of the paver to check for any change from the required alignment. Immediately behind the paver the pavement should be checked for conformance with the required cross section.

Periodic checks of the pavement thickness should be made and one of the more efficient methods used is to insert a measuring rod down through the slab to a metal plate set at a pre-determined point. A depth check should be made at least every 400 to 500 ft when starting a project, and then as necessary to confirm proper depth. The information should be recorded noting the station, offset, and depth.

Edge slump should be checked after the trailing forms have passed. Minimum edge slump is particularly critical when an adjacent lane is to be constructed. To protect edge slump from possible rainfall, auxiliary side forms and enough plastic sheeting or other material sufficient to cover several hundred feet should be readily available.

8.10 TEST PROCEDURE FOR CHECKING POSITION OF DOWEL BARS
(Rev. 09-28-09)
After placement on the subgrade each dowel bar assembly should be visually checked for proper alignment. The bars must be parallel to the side and top of the pavement. A minimum of three bars in every assembly should be checked and reported. If any one of the bars is out of alignment, every bar in the assembly needs to be checked after the assembly has been adjusted. The check must be performed before the placement of concrete around the bars. At the beginning of a paving operation, several assemblies should be checked after placement of the PCC prior to initial strike off to ensure no movement of the assembly during the PCC placement operation.

A commonly used method is the “dowel bar checker” which may be obtained at the DO. This instrument is essentially a frame having legs of equal length that supports a level dial. It is first set on the side form or string line with the legs at equal distance from the joint, and the level adjusted until the bubble is centered. This is necessary to compensate for the grade of the pavement. Next, the legs of the checker are set on top of each dowel
to be checked. If the bubble is in the center of the vial, the dowel is in the correct vertical position. If not, the dowel bar shall be marked and the contractor should be notified.

8.11 PERMANENT MARKING OF STATIONING ON PAVEMENT (Rev. 09-28-09)
Station numbers must be marked on the right hand side of the pavement (facing the higher numbers) with the nearest number about 8 in. from the edge of the pavement. The full station number should be placed every 100 feet. Intermediate points will be placed between full stations. At the beginning of each day’s run, the plus of the station and the date should be marked. In the case of a divided lane, the station numbers are to be placed along the outside edge of the pavement, readable from the same direction as the flow of traffic. Cast iron dies of numbers are available from the DMTE.

8.12 CURING (Rev. 09-28-09)
All pavements must be cured using an approved method outlined in Section 500. Curing operations must be continuous until specification requirements are met. During the curing period, any defects in the curing method must be repaired immediately. Curing should be checked daily during the entire required period. If there is any possibility of the temperature dropping below freezing after any pavement is placed, the pavement must be protected by the use of insulated blankets or other approved means.

8.13 PAVEMENT SMOOTHNESS (Rev. 09-28-09)
The specification requirements for smoothness stipulate that the smoothness may be checked as soon as the concrete has cured sufficiently to permit testing. The Department may require the profile to be checked within 24 h to determine if paving operations are producing a pavement with the minimum desired smoothness. Smoothness is checked either by profilograph operated by the contractor or straightedge operated by the Department. The PE/S or a designated representative should be present to observe the profilograph operations.

8.14 CLEANING PAVEMENT (Rev. 09-28-09)
When the paver is supported by an existing pavement while placing widening, adjacent slabs, or incidental construction, care shall be taken that all mortar and concrete drippings are carefully and completely removed from the existing pavement without marring or damaging the existing surface.

8.15 SEALING CRACKS AND JOINTS (Rev. 09-28-09)
All cracks and joints must be sealed prior to discontinuing work for the winter or before opening the pavement to traffic.

Sealing of cracks and joints requires inspection and must be performed in accordance with applicable requirements of the specifications.

Joints are to be thoroughly cleaned and inspected prior to sealing in accordance with Section 500 of the Standard Specifications. All excess and unsightly sealing material is to be cleaned from the pavement surface.
8.16 PAVEMENT INSPECTION *(Rev. 09-28-09)*
Prior to opening a new pavement to traffic the contractor and the PE/S must inspect the pavement for any damage, including random cracks. All random cracking must be repaired prior to opening the pavement to non-construction traffic.

8.17 TEST BEAMS AND OPENING PAVEMENT TO TRAFFIC *(Rev. 09-28-09)*
For opening to traffic, the contractor may choose to determine concrete strengths using the maturity meter or test beams.

When test beams are used for opening to traffic, one or more sets of test beams must be made at each intersecting road and at any other location where the contractor requests beams to control the cure period. The purpose of the beams at intersecting roads is to furnish a basis for allowing traffic across the new pavement.

Test beams are also required for trial batches when fly ash is used in the mix design and for all QC/QA PCCP mixtures.
SECTION 9 – CONCRETE PAVEMENT PATCHING

9.1 SELECTING PATCH AREAS (Rev. 09-28-09)
Concrete patching locations will be marked on the pavement by INDOT personnel, generally the PE/S. The PE/S should refer to the contract plans for specific locations identified by the designer; however, patching quantities often are planned as a percentage of the entire pavement within the contract without specific locations identified. This will require the PE/S to use sound judgment in marking out the areas to be patched to ensure that the worst sections are repaired without over running the plan quantity in the contract. A general procedure that can be used is as follows:

- Note the location of any patches that are specifically identified on the plans. If the planned patch locations equal the total contract quantity, then no further investigation needs to be done and the planned patches should be marked. Otherwise, continue below.
- Drive each lane of the entire job and note the general condition of the pavement.
- Determine the approximate total area of the pavement within the project limits.
- Determine the percentage of contract patching area over the total area.
- Pick an area that has a degree of deterioration that should be repaired and use it as an example to select other locations within the job.
- Drive the job again, counting the approximate number of locations that are similar to the example.
- Calculate the approximate total area of patching based on standard patch size with any added areas of oversize patches added in.
- If the calculation is less than the contract quantity, continue to pick additional locations with decreasing degrees of deterioration until the contract quantity is met.
- If the calculation is more than the contract quantity, delete some patches that may not be as deteriorated as others until the contract quantity is met.

It is highly likely that the quantity in the contract will not be enough to repair every location that a PE/S may believe needs to be addressed. The PE/S should contact the AE and the Project Manager if they feel that the project cannot be properly completed without additional patching.

9.2 REMOVING PAVEMENT AND PLACING PATCHES (Rev. 09-28-09)
In addition to details shown in standard drawings and plans the following guidance should be observed when removing pavement and placing patches.

(a) Methods and equipment used in cutting, breaking and removal of the pavement must not cause structural damage to the pavement to be left in place. It may be necessary to use hand methods in trimming and straightening the edges of the patch after removal of the pavement to avoid damaging the surrounding pavement. Minor chipping of the existing pavement cannot be avoided in most cases.
(b) If the existing pavement is damaged, the contractor must replace it at no additional cost to the Department, provided that the damage was due to poor workmanship. If the damage was unavoidable or was the result of previous damage that was not noticed at the time the patch was marked, then it should be included in the patch and paid for under the contract.

(c) Determine if the subbase is suitable to remain in place. The contractor must not unnecessarily remove subbase during the pavement removal process and must compact any subbase left in place. If the subbase is contaminated because of pumping, then it should be replaced in kind and at the depth of the original subbase. If the contract does not include an item for new subbase material, the PE/S should contact the AE to confirm that items will be added to place new material.

(d) If the existing subbase is clean, but is saturated or standing in water, the PE/S should contact the AE to determine if drainage pipe or aggregate should be installed to drain the subbase.

(e) The depth of the patch should not exceed the depth of the existing pavement and the patching material should not extend under the existing pavement. Prior practice was to place an additional 6 in. depth of patching material and “key” it 6 in. back under each end of the patch. This practice is no longer to be used.

(f) Longitudinal tie bars that are to remain in place be straightened. Retrofit tie bars must be added as required, dependent on the length of the patch.

(g) Dowel bars must be installed at each end of the patch and intermediate dowel baskets for D-1 joints placed within the patch, dependent on the length of the patch and existing adjacent D-1 joints.
SECTION 10 – TRANSPORTATION OR OPERATION OF HEAVY EQUIPMENT ON PAVEMENT

10.1 TRANSPORTATION OR OPERATION OF HEAVY EQUIPMENT ON PAVEMENT (Rev. 09-28-09)

The transportation of heavy equipment, including cranes, mixers or other equipment exceeding the legal load limit will not be permitted on any pavement without a proper executed permit.

Equipment that does not exceed the legal load limit may be operated on pavement as long as necessary precautions are taken to prevent damage to the pavement and joints. Particular attention must be given to the edges of the pavement when driving this equipment on and off the pavement.

Under no condition should any equipment with steel treads, or equipment over the legal load limit with rubber treads, be permitted to operate on new pavement. The DD may grant permission to operate equipment on old pavement. Tractors with cleats must not be permitted on any pavement surface intended to carry traffic except when crossing the pavement and then only where the pavement is protected.

The Department does not accept the responsibility for any damage that might be done during the contractor’s transportation or operation of any equipment on the pavement. Any damage to the pavement should be reported to the AE with a detailed description.

Whenever any equipment is being transported or operated on the pavement, all applicable safety measures must be followed. Warning signs and barricades must be erected and maintained as applicable.
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SECTION 12 – UNDERSEALING WITH ASPHALT MATERIAL

12.1 GENERAL (Rev. 01-21-14)
Undersealing consists of drilling holes and pumping hot asphalt beneath faulted and “pumping” pavement slabs. The fundamental purpose is to provide a uniform bearing for the pavement by filling any cavities and voids that exist between the slab and subgrade. This operation will also seal the cracks and joints from the underside. Underseal should not be used in areas where the subgrade is providing satisfactory support for the slab or to re-adjust adjacent slabs into vertical alignment.

12.2 LOCATING AREAS FOR UNDERSEAL (Rev. 09-28-09)
Well in advance of the undersealing operation the PE/S will mark the pavement with the locations where holes are to be drilled, at the same time recording the station number and lane, right or left, in a field book for the Final Construction Record documentation. The location and spacing of the drill holes is a task requiring particular consideration and forethought. In the absence of previous experience this should be reviewed in detail with the AE.

Cracks and joints which are “pumping” are more easily discernible during the spring. However, during the summer season their detection becomes increasingly difficult. Immediately following a heavy rain, or as soon thereafter as the pavement becomes dry, is an ideal time to observe any tendencies toward slab movement, indicated by water and fine soil particles being pumped back through the joints or from beneath the slab at the pavement edges. Another indication of slab movement is discoloration or evidence of soil staining at the joints and edge of pavement caused by the pumping action through the joints and edge.

12.3 PREPARATION FOR UNDERSEALING (Rev. 09-28-09)
Prior to the start of the undersealing operation, the contractor is required to fill or repair all holes, low areas, and displaced areas in the shoulders immediately adjacent to the pavement to be undersealed. These repairs should be made with appropriate materials to the elevation of the pavement’s edge. All shoulder areas adjacent to the areas to be undersealed shall be compacted prior to the start of the underseal operation.

Holes no larger than 1 1/2 in. in diameter should be drilled in the center of the traffic lane and from 30 to 36 in. from any transverse crack or joint. This distance will vary according to the condition of the crack or joint. At well interlocked cracks one hole placed relatively close may prove sufficient, while an open joint may require a drill hole on both sides as much as 36 in. in each direction from the joint. Establishing typical patterns is impractical because it is seldom that any two jobs are identical, and the satisfactory spacing of the hole or holes is most often a case of trial and error until a pattern giving the desired results is established.

The same is true for the transverse location of the hole. Begin by placing the hole in the
center of the lane and make note of which side of that lane the material creeps out of first, the edge of the pavement or longitudinal joint. If material is consistently creeping out of one side first, the location of the holes should be moved away from that side to ensure complete filling of the void across the lane width. This will require experimenting with a number of holes at the beginning of the operation. Care should be taken that the drill bit is not allowed to penetrate into the subgrade as this may open a new path for the asphalt material into the underlying subgrade.

**12.4 ASPHALT PUMPING** *(Rev. 01-21-14)*

The asphalt pumping operation should be performed at the minimum pressure that will accomplish the desired results. An excessive pressure will contribute to the waste of asphalt by movement into the shoulder and opposite lane, jacking of the slabs, and or increase the hazard of “blowouts” in the shoulder, at the pavement edge, and along the joint or crack. The PE/S should be certain that all personnel on the work are properly instructed concerning the dangers associated with hot asphalt being applied under pressure, cautioning them to be ever alert to blowouts and broken delivery lines. Unnecessary personnel should remain outside the immediate area of the operation at the time the material is being pumped. Long sleeves, face protection and gloves should be worn by those required to be within the immediate area of the pumping operation.

The undersealing measuring device or gauge should be used to monitor the movement of the slab at each hole. Depending on the type of pavement being undersealed, pumping should cease when one of the following conditions are met:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Type of Pavement</th>
<th>Slab Lift</th>
<th>Pumping Time</th>
<th>Extrusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jointed Concrete</td>
<td>1/4 in.</td>
<td>15 seconds</td>
<td>Extrusion</td>
<td></td>
</tr>
<tr>
<td>Continuous Reinforced</td>
<td>1/8 in.</td>
<td>12 seconds</td>
<td>Extrusion</td>
<td></td>
</tr>
</tbody>
</table>

The gauge must be placed on an adjacent area and perpendicular to the centerline of the pavement being undersealed. The gauge must be monitored during the pumping operation to detect slab movement. Each hole may require a different amount of underseal material and must be monitored as outlined above for the applicable treatment.

This gauge can not be used on the center lane of a three-lane roadway due to the requirements for placing the gauge. The center lane should be undersealed first and usually for the time outlined above unless extrusion occurs.

After pumping is complete, a wood plug must initially be driven into the hole. Then, when the pumped material has hardened, the initial plug is removed and a hardwood plug is driven flush with the surface of the pavement. This installation of the hardwood plug should be in accordance with the current Standard Specifications and Special Provisions in both size and manner of installation.
12.5 SAFETY *(Rev. 09-28-09)*

Safety measures with respect to the undersealing operation cannot be overemphasized. Bear in mind that the asphalt material is being placed under pressure and at an unusually high temperature. Flexible lines and connections are subject to mechanical failure. In addition, “blowouts” at surface cracks, pavement joints and edges, and in the shoulders are common occurrences. In view of all these facts, it is advisable for all unnecessary personnel to stay clear of the operation. Those personnel inspecting the operation should stay clear of possible points of danger and if possible on the windward side of the operation. The PE/S should see that all state personnel assigned to the contract dress appropriately for the work and observe proper precautions.
SECTION 13 – HOT MIX ASPHALT, HMA, PAVEMENT

13.1 INTRODUCTION (Rev. 09-29-09)
INDOT has specifications for both QC/QA HMA (Section 401) and non-QC/QA HMA (Section 402) mixtures. The major differences between the two specifications are the acceptance and documentation requirements.

The contractor is responsible for designing the asphalt mixtures in accordance with the Standard Specifications. All design mix formulas (DMF) are reviewed for compliance with the Standard Specifications.

These instructions apply to both 401 and 402 concrete pavements unless specifically indicated otherwise.

13.2 QUALITY CONTROL (QC) AND QUALITY ASSURANCE (QA)
(Rev. 09-29-09)
The contractor is responsible for QC of all phases of asphalt operations. The tolerances that the contractor must operate and control the quality within are defined in Sections 401 and 402, as appropriate.

For Section 401 pay items, to ensure that the contractor’s QC procedures provide a finished product that is within the defined tolerances, the Department follows QA procedures. These procedures are designed to provide for inspection of the contractor’s processes and random sampling of the material placed. The QA process is completed by the performance of testing of the samples by District Testing personnel.

For Section 402 pay items, the contractor provides a Type D certification in accordance with Section 916 as the basis of acceptance. No sampling of asphalt mixtures is required in conjunction with Section 402 work.

13.3 QUALITY CONTROL PLAN (QCP) (Rev. 09-29-09)
The contract specific steps that the contractor intends to use in its paving operations to ensure the construction of a quality pavement are included in its Quality Control Plan (QCP). The QCP must be prepared in accordance with ITM 803 and submitted by the contractor in accordance with 401.02.

Review the QCP and approve it if the plan addresses all appropriate ITM 803 checklist items in a clear and complete manner. The intent of the review is to verify that all checklist items are addressed, not to incorporate the reviewer’s personal preferences into the QCP. If there are any questions regarding QCP contents, the AE and District Testing personnel are available resources. The contractor cannot begin paving operations until the QCP is approved, so review of the QCP must be a high priority. Reject the QCP if it does not address the checklist items and return it to the contractor as soon as possible with a clear description of the deficient aspects of the plan. A primary review criterion for the QCP is whether or not the plan addresses all contract specific issues related to the paving operation. A generic “cut and paste” QCP is not appropriate for contracts on which specific problems are anticipated.
Once the QCP is approved, enforce it to the same extent as any other contract document. If the contractor is performing its work contrary to the QCP, attempt to resolve the discrepancy as soon as possible. If the issue cannot be resolved with the contractor, notify the AE. It is appropriate for the paving operation to be suspended for a contractor’s failure to follow the contents of its QCP. However, suspension of the paving operation should be handled in accordance with guidelines established within the District.

Once a QCP is approved, the contractor can propose changes to the approved plan by submitting an addendum. The addendum must include a complete description of the proposed change, including any element of the approved plan that is modified or deleted. Review the addendum and approve as quickly as possible. If the addendum is incomplete compared to the ITM 803 checklist, reject the addendum and note the deficiencies in the reply to the contractor. The current approved version of the QCP remains in effect until the addendum is approved. Do not allow the proposed change be implemented until the addendum is approved. Once an addendum is approved, attach it to the original QCP. Approved addenda have the same standing as any element of the originally approved QCP.

If a situation which is not covered by the QCP arises, work with the contractor to determine an appropriate solution within the Specifications to resolve the problem. If a joint solution cannot be determined, contact the AE. The AE has resources at District Testing, Office of Materials Management, and Division of Construction Management available to resolve the issue. After a solution is reached, require the contractor to document the agreement by submitting an addendum to the QCP. If the solution is documented correctly, approve the addendum and attach the approved addendum to the original QCP. If the addendum requires correction or additional clarification, reject it and return it to the contractor with a clear description of the deficiencies with the addendum.

13.4 QUALITY ASSURANCE PROCEDURES (SECTION 401) (Rev. 09-29-09)

QA procedures are performed by the Department to verify that the contractor’s work meets the requirements of the Standard Specifications. QA procedures require plate samples of the mixture to be taken from the mat after placement by the paver. The samples are then transported to District laboratory facilities for a battery of tests to determine the following volumetric properties:

- Binder Content
- Air Voids
- Voids in Mineral Aggregate, VMA

In addition, cores are taken to determine the in-place density of each compacted mixture. District Testing personnel will provide QA test results for mixture properties and density.

Pavement smoothness is another criterion which requires QA review. On some contracts, longitudinal profile is measured by a profilograph. Longitudinal profile on portions of these contracts that do not meet the warrants for a profilograph use a 16 ft straightedge to verify the longitudinal profile.
On contracts that do not include the profilograph pay item, use the 16 ft straightedge to verify longitudinal profile of the constructed pavement.

Regardless of the instrument used to measure the longitudinal profile, use a 10 ft straightedge to verify the slopes transverse to the mainline direction of traffic. This includes longitudinal profiles of all public road approaches, commercial driveways, and residential driveways.

13.5 MATERIALS (Rev. 09-29-09)
All asphalt mixtures must be supplied by a certified HMA plant in accordance with ITM 583.

Section 401 pay items have a standardized format that provides information about the type of material required. Consider the following sample QC/QA HMA mixture pay item:

QC/QA HMA, 3, 70, Surface 9.5 mm

Where:

- **QC/QA HMA** is read as “Quality Control, Quality Assurance Hot Mix Asphalt”

The “3” in the pay item reflects the ESAL category for the mixture. The ESAL category is a reflection of the truck traffic that is anticipated on the roadway. There are 5 ESAL categories and higher numbers reflect higher anticipated truck volumes. Therefore, the higher ESAL category mixtures require more durable aggregates to carry these additional loads.

The “70” in the pay item reflects the PG binder grade that is required for the mixture. Typical PG binder grades that appear in pay item descriptions include 58, 64, 70, and 76. Larger PG binder numbers reflect stiffer binders. These stiffer binders are typically required at locations where higher pavement temperatures are anticipated. Therefore, 70s and 76s are usually used in the upper courses of pavement and are more common in pavements in the southern portion of the state. PG 76 binders are also used in open graded mixtures.

The “Surface” in the pay item indicates the mixture type. Base, intermediate, and surface courses are the mixture types utilized in pavement. Base courses are usually placed on treated subgrades, but occasionally they are used for structural (three or more lifts) overlays and are placed on a milled existing pavement. Intermediate courses are typically placed on underlying base courses or a milled pavement for functional (two lift) overlays. Surface mixtures are usually placed on underlying intermediate courses or on a milled pavement surface in mill and fill applications.

The “9.5 mm” in the pay item reflects the nominal aggregate size utilized in the mixture. The available nominal aggregate sizes are 4.75 mm, 9.5 mm, 12.5 mm, 19.0 mm, and
25.0 mm. Mixtures with larger nominal aggregate size designations have larger particle sizes in their gradations. The maximum particle size in a mixture is larger than the size in the nominal aggregate designation, so refer to 401.05 for gradation range information.

The primary difference in the requirements for Section 402 materials compared to QC/QA HMA mixtures is that PG 58-28 and PG 64-28 are only to be used with mixtures that include more than 15% of recycled asphalt products, RAP, by weight.

A sample Section 402 mixture pay item follows:

**HMA Surface, Type A**

The “Type A” portion of the pay item is related to the ESAL category for the mixture. The ESAL categories range from Type A for the lowest anticipated truck traffic volumes to Type D for the pavements with the highest expected truck volumes. Unlike QC/QA HMA, Section 402 pay items do not include any reference to the PG binder required or a specific nominal aggregate size. The Standard Specifications include a minimum PG binder grade for each ESAL category and allow the contractor to select the nominal aggregate size for each mixture.

Asphalt mixtures may also include recycled asphalt pavement (RAP) asphalt replacement shingles (ARS) or a combination of both. There are maximum RAP and ARS amounts allowed in mixtures based on the course and ESAL category. The amount of RAP or ARS included in each mixture is identified in the contractor’s DMF or Job Mix Formula (JMF).

Section 401 mixtures may be dense graded or open graded. All Section 402 mixtures are dense graded. Dense graded mixtures are the structural component of the pavement. Open graded mixtures are utilized to drain the pavement structure and provide a means for water to reach the underdrain systems which are utilized in conjunction with these mixtures.

**13.6 DESIGN MIX FORMULA (DMF)/JOB MIX FORMULA (JMF)** *(Rev. 09-29-09)*

The DMF is the format by which the contractor communicates its design for each HMA mixture to District Testing. ITM 583, Certified Hot Mix Asphalt Producer Program, is the primary document that includes requirements related to the development of DMFs. District Testing personnel should be able to answer questions regarding DMFs.

The DMF includes the following information related to the mixture design:

- Producer (Contractor)
- Plant Location
- Material Identification/Sources-PG binder, coarse and fine aggregates
- DMF number
- Applicable ESAL Categories
- Mixture Course and Nominal Aggregate Designation
- Gradation Information
- Specific Gravity
• Lab and Plant Mixture Temperatures
• RAP/ARS Content
• Volumetric Properties
• Mixture Adjustment Factor, MAF
• Other Miscellaneous Design Information

Once a DMF is approved by the District Testing Engineer, it is afforded an adjustment period each construction season that the design is utilized. The adjustment period is 5,000 tons for base and intermediate mixtures and 3,000 tons for surface mixes. During the adjustment period, the gradation and volumetric properties may be adjusted by the contractor. At the end of the adjustment period, all adjustments must be noted in the resulting JMF. The JMF must be submitted by the contractor to District Testing within one working day after the test results for the mixture volumetric properties are available for the adjustment period.

If the contractor elects to use an approved JMF from the beginning of a contract, there is no adjustment period for the approved mixture.

At the preconstruction conference, ask the contractor which DMF/JMFs are planned to be utilized on the contract. Additional questions include which alternate plants may be used on the contract and whether the required DMF/JMF approvals have been obtained for mixtures produced at that plant. Establish lines of communication between the contractor and the District Testing representative at the meeting to reduce the likelihood of misunderstandings between the parties regarding material sources and material sampling requirements for Section 401 mixtures. Make arrangements with the District Testing representative regarding transporting QA samples to the appropriate District Testing laboratory.

Become familiar with each DMF/JMF number as well as the PG binder content, MAF, and the pay item related information. Each weigh ticket associated with mixture brought to the contract site must include the information included in 109.01(b)—the DMF/JMF number is included in that list of required information. Omission of any of the required information is sufficient cause for the load to be rejected—discuss this at the Preconstruction Conference. When asphalt mixtures arrive at the site, it is necessary to verify that the DMF/JMF number listed on the ticket is appropriate for the mixture associated with the current paving operation.

13.7 MATERIAL SAMPLING AND TESTING (SECTION 401) (Rev. 09-29-09)
Material sampling is very important because the contracts with QC/QA HMA pay items also include a QA Adjustment pay item which either provides the contractor with additional compensation for situations where the QA test results exceed Standard Specification requirements or provide the Department a credit if the test results fall short of these requirements. Sampling must be performed in accordance with ITM 580.

Verify that the contractor is performing QC sampling and testing in accordance with the approved QCP. Because INDOT is responsible for QA testing, determine the random QA sample locations, witness the material sampling performed by the contractor’s Certified
After the samples are taken to the appropriate District lab, District Testing personnel will run the required tests on the samples to verify conformance to 401 requirements. The mixture properties which are determined by the QA testing process include binder content, VMA, and air voids. In addition, after the paving operation is complete, cores are taken to measure in-place density and the smoothness of the pavement surface may be measured by the profilograph to complete the list of pay factors for the individual QC/QA HMA pay items.

After material samples are taken from the newly placed mat, verify that the plate sample locations are satisfactorily repaired by contractor personnel.

After cores are taken from the pavement to determine density, verify that contractor personnel physically mark the course for which the density is to be determined on the core and ensure that all core holes are filled with asphalt material within one working day after the cores are taken.

The required sampling frequency is based on lots and sublots, which are defined in 401.07. It is necessary to keep track of the quantity of each QC/QA mixture/DMF/JMF combination as it is being placed so the appropriate number of samples is obtained and that the samples are taken at the proper locations. Sample locations are to be random and the procedure required for determining these locations is included in ITM 802.

Partial sublots with a quantity of 100 tons or less are considered to be part of the previous sublot and no additional sampling or testing is required. Partial sublots with quantities greater than 100 tons are considered to be a full sublot and all sampling and testing normally associated with a sublot is required. Notify the DTE when a partial sublot is utilized on a contract.

On contracts that require the placement of additional mixture the following year, terminate the sublot at the end of each construction season and notify the DTE of the termination. In addition, if production of an individual QC/QA HMA mixture is going to be halted due to construction phasing or other similar reason, work with the contractor and the DTE to determine whether an agreement can be made to terminate the sublot at the temporary end of production. This may be advantageous should a failed materials issue arise because all of the mixture subject to the Failed Materials Committee action would be contained within one area or construction phase. If either the contractor or DTE does not agree to the early termination of the sublot, include the mixture placed at the
resumption of production in the original sublot.

13.8 MISCELLANEOUS MIXTURES (SECTION 402) (Rev. 09-29-09)
Section 402 mixtures include those used for the following miscellaneous applications—rumble strips, wedge and level courses, temporary pavement, and curbs. When used for these specific applications, there are some requirements for HMA materials used in normal paving operations that do not apply and in some situations, there are additional restrictions that apply to these specialty applications that are not applicable for normal HMA pavement mixtures.

13.9 PAVER SEGREGATION PREVENTION FEATURES (Rev. 09-29-09)
The contractor is required to submit documentation indicating that each paver utilized on the contract has been manufactured or retrofitted with equipment designed to prevent segregation of coarse aggregate during the paving operation. The documentation requirements are outlined in 401.10. The section also outlines additional requirements related to specific pavers which have been proven to be especially susceptible to segregation problems in the past. In addition to providing the documentation, the contractor is required to demonstrate that all of the modifications have been implemented on the paver.

Typically, these features mitigate segregation that is caused by the paver’s gearbox. This segregation usually occurs in the middle of the mat and in most cases eventually results in a longitudinal crack.

13.10 SUBGRADE TREATMENT OR EXISTING PAVEMENT SURFACE PREPARATION REQUIREMENTS (Rev. 09-29-09)
Prior to constructing a full depth pavement or widening adjacent to an existing pavement, the subgrade on which the base mixture is placed must be treated in accordance with 207. Refer to the Typical Sections or the Standard Drawings for the type of subgrade treatment required.

Prior to placing an overlay, the existing pavement surface must be properly treated. Typically, existing asphalt surfaces are milled prior to placement of the overlay. Existing concrete pavements are typically milled, rubblized, or cracked and seated prior to overlay placement. Rubblized concrete pavement surfaces require the application of prime coat in accordance with 405 prior to overlay placement, while all other existing asphalt or concrete pavement surfaces require tack coat to be applied prior to placement of the overlay in accordance with 406.

13.11 WEATHER LIMITATIONS (Rev. 09-29-09)
There are two weather limitations pertaining to Section 401 paving operations that are specifically discussed in 401.13. The first one pertains only to mixtures with planned lay rates less than 138 lb/syd and it requires that the air temperature and the underlying surface temperature to be 45°F or above. The other limitation listed is that no mixture is to be placed on a frozen subgrade. In situations where late season paving is required, contact the AE for guidance.
For Section 402 mixtures, additional weather constraints apply. Refer to 402.12 for these limitations.

If any portion of the paving operation is performed during a rainfall event, verbally notify the contractor that any additional mixture that is placed is at the contractor’s risk. Follow up the verbal notification in writing and include the correspondence in the project file. After conclusion of the rainfall event, hold an inspection of the affected pavement with the contractor as soon as possible. Mark all areas of pavement that are found to require repair or replacement. If there is any disagreement with the contractor regarding the scope of corrective action, contact the AE.

In situations where a rainfall event occurs while mixture is being placed on a treated subgrade, suspend the paving operation immediately if the subgrade deforms in an unacceptable manner while loaded by trucks, paver, or other equipment included in the paving train. For this purpose, unacceptable deformation is defined as that which would require corrective action if noted during a proofroll operation. Note the suspension in the Engineer’s Diary and notify the AE.

13.12 SPREADING AND FINISHING (Rev. 09-29-09)

As mixture is delivered to the site, spread by the paver, and compacted by rollers, pay attention to the following:

- Traffic control associated with paving operation, particularly at intersections and driveway approaches
- Performance of the subgrade or underlying pavement while being loaded by trucks and paving equipment
- Application of prime coat or tack coat as appropriate
- Defects in the mat behind the paver—segregation, flushing, roller marks, petroleum spills, etc.
- Verify correct placement of the mat—depth and width checks as well as yield calculations
- Alignment of paver
- Temperature and compaction requirements if density is not controlled by cores
- Use of paver extensions
- Allowable dropoffs and matching existing lanes if paving is performed under traffic
- Equipment used for placement of mainline and shoulder mixtures
- Roller operation

Verify that the contractor has adequate signage and flaggers available to enable trucks hauling material to the site to enter and leave the paving train in a safe manner. When paving is being performed adjacent to traffic, it may be necessary to employ additional flaggers or signs as the paving train approaches intersections or other site specific locations. If there are deficiencies in the traffic control being provided by the contractor, suspend the paving operation immediately until corrective action is taken. Document the suspension of work in the Engineer’s Diary and notify the AE.

If the mixture is being placed on a treated subgrade, verify that the subgrade does not
show significant deformation under paving train loading. Although proofrolling is required prior to paving in accordance with 207.03, it is necessary to monitor the performance of the subgrade during the paving operation. If the subgrade deforms in a manner that would require corrective action during a proofroll operation, suspend the paving operation until the appropriate subgrade repairs are made. Document the suspension of work in the Engineer’s Diary and notify the AE. For situations where the mixture is being placed on a milled existing pavement surface, verify that the milled surface is not raveling while the paving operation is ongoing. If raveling is occurring, contact the AE for additional guidance.

In situations where prime coat or tack coat is required in accordance with 405 or 406 respectively, ensure that the application is uniform, complete, and at the appropriate rate. Common deficiencies in application of prime or tack coat include improper or incomplete coverage due to improper or clogged nozzles, incomplete coverage due to an improper spray bar height or width on the distributor, or improper application rates due to inappropriate distributor speed or mechanical problems with distributor equipment.

Periodically inspect the mat behind the paver and note any defects that need correction. There will be additional discussion regarding segregation and flushing below. Other defects include areas where petroleum products or hydraulic fluids are spilled. These liquids damage asphalt pavements. Petroleum products are often used by contractor personnel to clean hand tools associated with the paving operation. Do not allow open containers of any petroleum product to be placed on the paver or other pieces of paving equipment. Hydraulic fluids can be introduced to the mat by leaking hoses on the paver or other paving train equipment. It is usually necessary to remove the contaminated mixture from the mat and replace with new material.

Verify that the mat is being placed to the appropriate depth and width. Width checks are especially important when a base course is placed on a treated subgrade. If these courses are placed too wide, overlying mixtures will also be placed too wide as well. Perform depth and width checks every 500 ft. Check the yield associated with five to ten trucks at least twice a day. This is done as follows:

- Determine the approximate beginning station associated with the first truck.
- Determine the approximate ending station associated with the last truck.
- Calculate the weight of the mixture placed by the trucks by adding the weight from individual weigh tickets.
- Calculate the area covered by the mixture from the trucks by using the difference between the stations to determine the length and the average paving width accounting for the edge slope for the mixture on either or both edges as appropriate.
- Calculate the in-place lay rate of the mat by dividing the weight of the mixture by the area over which it is placed.

Compare the in-place lay rate to the target lay rate for the mixture—the target lay rate equals the planned lay rate from the appropriate typical section or Standard Drawing multiplied by the MAF. If there is more than a five percent difference between the in-place and target lay rates, notify the contractor that appropriate corrective action must be
Periodically confirm that the paver is progressing in a straight manner down the subgrade or existing pavement to be overlaid. Pavers that are overloaded or experiencing mechanical problems can fishtail. If the paving is taking place on a steep grade, it may be necessary for the trucks to remain unhitched from the paver and dump partial hopper loads at a time to allow the paver to operate in a straight manner. In order to ensure consistent placement of the mat, it is necessary for the paver to move as straight as possible.

If density of a Section 401 mixture is not controlled by cores, additional requirements are included in 401.14. Verify the mixture temperature immediately behind the paver and check that the paver maximum speed is not exceeded. It is not necessary to check mixture temperatures or paver speeds for other QC/QA HMA mixtures.

Ensure that the paver operator is not using hydraulic extensions in situations where a constant paving width is being placed. It is permissible to use the hydraulic extensions at tapered paving locations.

If the paving is being performed under traffic, verify that the contractor is matching adjacent lanes in accordance with 401.14, if applicable.

Mainline lanes and shoulders which are 8 ft and wider must be placed with equipment employed with automatic grade and slope controls in accordance with 409.03(c)1. Essentially, this means that a paver must be used in these situations. Verify that the contractor’s equipment meets this requirement. Shoulders that are narrower may be placed with a widener.

Because Section 402 mixtures are accepted by certification instead of testing in-place materials, there are a number of specific requirements for Section 402 mixes that do not apply to Section 401 materials.

The primary differences are as follows:

- There are additional spreading and finishing requirements such as maximum paver speed; temperature requirements based on the DMF/JMF mixing temperature; requirement for tarp protection for HMA mixes being hauled to the contract site; and wedge and level course lay rates can vary from 1.5 to 6 times the maximum particle size listed in the DMF/JMF. Refer to 402.13 for additional information.

- The compaction requirements are based on the number of passes made by rollers of various types—these roller combinations are sometimes commonly referred to as a standard compaction train. For lay rates which are less than or equal to 440 lb/syd, four different roller combinations are illustrated and the number of passes made by each roller type is given. For lay rates which are less than 440 lb/syd, there are two different roller combinations shown with the associated pass requirements tabulated. In addition to the above noted requirements, the Standard Specifications include information related to maximum allowable roller speeds,
method of compaction, compaction equipment requirements for areas which are inaccessible to rollers, and emphasizes that the finish rolling operation shall leave no roller marks. For additional information related to compaction of HMA mixtures, refer to 402.15.

- If it becomes necessary to pave in low temperature situations, additional requirements to ensure proper compaction of HMA materials are contained in the specifications. These requirements especially come into play during the late construction season frenzy to get contracts buttoned up for the winter. Low temperature compaction requirements are contained in 402.16.

13.13 WEDGE AND LEVEL CONSTRUCTION (SECTION 402) (Rev. 09-29-09)

One of the more common miscellaneous Section 402 mixture applications is a wedge and level course. The wedge and level application is defined as HMA courses utilized to transition from an existing base with a deficient profile or section to one where uniform depth QC/QA HMA or HMA courses can be used to construct a pavement with an acceptable profile and section. Common examples of where wedge and level courses are used include correcting settlement over or at the approach to a structure; establishing the proper crown on a tangent section of roadway; correcting a deficient superelevation on a curve; correction of wheel path rutting; and construction of an improved section where the existing pavement is badly distorted. Ordinarily the quantity estimated for these purposes will be indicated in the contract or plans, and will vary according to the condition of the road to be resurfaced.

The correct method of longitudinally wedging a dip or settlement in an existing pavement is shown below:

![Correct Method](image1)

An example of an incorrect method of longitudinally correcting a dip or settlement in an existing pavement is shown below:

![Incorrect Method](image2)

The number of wedge courses necessary to construct the desired superelevation on curve is dependent on the maximum size aggregate used in the mixture and the total depth to be placed.
Wedges may also be used to reestablish a crown on a deficient tangent roadway. Again, the number of wedge courses necessary to rebuild the crown depends on the total depth of the wedge to be constructed and the maximum size aggregate in the mixture.

If an undistributed quantity of HMA wedge and level mixture is included in the contract, inspect the existing pavement to determine the limits for wedge and level construction and mark them on the pavement. After this is complete, compare the quantity to the plan quantity for the HMA wedge and level mixture pay item. If the proposed quantity resulting from the layout overruns or underruns the plan quantity by more than five percent, contact the AE for additional guidance. The AE should contact the PM and request a recommendation regarding the resolution of the potential overrun or underrun.

### 13.14 JOINT CONSTRUCTION (Rev. 09-29-09)

Proper construction of joints is very important. Two primary causes of premature asphalt pavement failure are improper longitudinal joint construction and deficient joint density. Verify that the longitudinal joint for each course is offset approximately 6 in from the longitudinal joint of the underlying course. This makes the joint more resistant to infiltration of water and allows for better compaction of the material placed at the joint.

Transverse joints are required at the end of the day’s work, when moving from one lane to another, upon suspension of work for an extended period of time, at paving exceptions, matching with adjacent pavement sections, and where indicated in the plans. Lapped joints for this purpose are not permitted.

If traffic is to be maintained across a transverse joint, the joint must be tapered sufficiently to allow a smooth ride. It is necessary to place paper or other bond breaker under the tapered pavement to facilitate removal of the taper material prior to resuming the paving operation. When paving resumes at the joint location, the paver should be positioned such that the screed rests approximately over the joint line. After the hot mixture is conveyed into position, it should be allowed sufficient time to reheat the joint area before the forward movement of the paver begins. The paver is then advanced ahead.
of the joint enough to allow the workers to perform the necessary handwork. The use of a straightedge throughout this process is of primary importance. Paving should continue only after the joint has been satisfactorily shaped, rolled and finished.

The QCP must address the contractor’s method for constructing these transverse joints. Pay special attention to the method of placing and compacting transverse joints at bridges, paving exceptions, and contract limits. The lower courses are of particular concern because the roller cannot be operated across the joint between the newly placed mat and the adjacent existing pavement. These areas require transverse rolling or special compaction equipment.

13.15 SEGREGATION/FLUSHING (Rev. 09-29-09)

After completion of the rolling portion of the paving operation, look for defects in the newly placed mat. Segregation and flushing are two common problems. Segregation occurs when the fine and coarse aggregates become separated from each other during the hauling or paving operation. Segregated mats feature locations where there are primarily coarse aggregate particles with no fines—the appearance is similar to an open graded mixture. There will be other locations within a segregated mat where there are few, if any, pieces of coarse aggregate and mainly consists of asphalt coated fines—appearing like a sand surface. Common causes of segregation include improper loading into trucks, faulty paver auger operation, and situations where a paver is forced to stop because the hopper runs out of mixture. In order to avoid this situation, many paving trains include a material transfer device—sometimes referred to as an MTD or a shuttle buggy. Shuttle buggies essentially provide a larger hopper for the paver and permit the paving operation to proceed almost indefinitely down the road as long as a sufficient number of trucks hauling mixture are available.

Flushed pavements have locations where liquid asphalt collects on the surface of the mat. This may result from excess tack coat being brought up through the mat, improper mixing of the mixture, or too much PG binder in the mixture.

The remedy for segregated mats usually requires removal of the affected areas and replacement with suitable material. Minor areas of segregation can be repaired by using a sand seal coat. Flushed pavement areas may require removal and replacement or diamond grinding or other fine milling to remove the excess asphalt. Mark all segregated or flushed areas for correction by the contractor prior to being covered up by another lift of material or opened to traffic. Corrective action should be in accordance with the contractor’s QCP. If the QCP does not address the repair of segregated or flushed pavements and an agreement on a solution cannot be reached with the contractor, contact the AE. The Office of Materials Management, Division of Construction Management and Office of Pavement Engineering are all available resources for determining the scope of the required repair.

Another common defect in a newly placed mat is pulling or tearing. The mat can be torn or pulled by a paver that is traveling too fast, a paver with a screed that is worn or not heated properly, compacted by a roller that is traveling too fast or rolling a mix that is too tender. Mark all torn areas when discovered so they can be repaired prior to placing
another mixture on top or opening the road to traffic. All torn areas must be repaired in accordance with the QCP. If the QCP does not address the repair of tears in the mat, contact the AE if no agreement on an appropriate repair can be reached with the contractor.

13.16 COMPACTION/DENSITY *(Rev. 09-29-09)*
For Section 402 mixtures, compaction is performed in accordance with 402.15. Since cores are not taken to verify in-place density, ensure that the contractor is performing its rolling operation in accordance with the requirements of 402.15.

For Section 401 mixtures, density is one of the properties included in the QA Adjustment calculation. In most situations, it is necessary to take cores to determine the density pay factor. However, there are exceptions to core density control related to overlays placed on shoulders, so refer to 401.16 to determine whether cores are required in these situations. When cores are not required, the density is assumed to be 92% MSG and the pay factor for that sublot is assumed to be 1.00.

In general, there are three compaction phases:
- Breakdown or Initial Rolling
- Intermediate Rolling
- Finish Rolling

Breakdown rolling provides compaction beyond what is provided by the paver’s vibratory screed. The intermediate rolling process compacts and seals the mixture. The finish rolling is necessary to take out roller marks and other imperfections that are present in the mat.

There are many aspects of the rolling operation that affect density in the mat. Roller speed is one such factor and maximum roller speed requirements for situations where density is not controlled by cores are included in 401.15. Be aware that there are different maximum speeds for static and dynamic rollers. Another factor that affects density is the manner in which the contractor rolls the newly placed mat. Some good information related to compaction is included in 402.15. The finish rolling operation should be performed while the mixture is still sufficiently warm to compact. There is no set rule for the timing and spacing of rollers as mixture properties and atmospheric conditions affect the compaction of the mat. While rolling, alternate trips or passes should be differing lengths so that the roller is not always reversing direction at the same location. The objective of the rolling operation from a functional perspective is to achieve the highest mat density possible. The contractor should be performing QC testing in conjunction with its rolling operation to maximize the density while minimizing the rolling effort. It is likely that the contractor will periodically have to adjust the number of roller passes as well as the amplitude and frequency of the vibratory rollers to achieve the desired results.

From an aesthetic standpoint, there should be no roller marks, creases, or other surface defects in a mat when the rolling operation is complete. The approved QCP should include information regarding corrective action for situations where the rolling operation is not achieving satisfactory density results.
Areas that cannot be compacted by a roller must be thoroughly tamped with mechanical tampers or vibrators. Tampers should be operated in such a manner that the entire surface is thoroughly and uniformly compacted. Often the areas requiring tamping methods of compaction are at critical locations from a drainage standpoint and care must be exercised to avoid creation of low spots which allow water to pond adjacent to a gutter line.

During the rolling operation surface distresses may develop. Common distresses include waviness, surface cracks, honeycombed texture, shoving, and roller chatter in the surface. As is the case in the spreading operation, these may be due to one or a combination of the following causes:

- Rolling too soon
- Rolling too fast
- Excessive rolling which crushes coarse aggregate
- Turning the roller too abruptly
- Too much slack in the roller drives
- Reversing the roller too abruptly
- Allowing the roller to stand on fresh surface
- Insufficient rolling
- Roller too light
- Mixture temperature
- Mixture composition
- Incorrect vibratory roller frequency or amplitude

Upon completion of the rolling of any mixture, the mat must be protected from vehicular traffic until it has sufficiently cooled to prevent damage from the traffic. The required cooling time varies due to atmospheric conditions.

Urban construction often requires compaction practices that differ from rural paving operations. It is essential to have a good seal at the joint between the new mat and the adjacent curb or curb and gutter. Thorough compaction adjacent to the curb, at intersections and adjacent to castings is likewise essential to good construction. In addition to the compaction requirements, the finished surface mat must match the grades of adjacent gutters and castings to ensure proper drainage. In many situations, an improper matching of grades between a pavement surface and an adjacent gutter line or inlet casting can cause water to pond over a significant area. Verify that the roller operator does not allow the roller to bridge the mixture placed adjacent to a combined curb and gutter by allowing the roller drum to ride on the gutter pan instead of the mixture.

The Standard Specifications do not contain differing density requirements for urban and rural contracts. Achieving the proper density is as important on an urban street as it is on a rural roadway. In many situations, contractors will request to have density requirements waived if it becomes necessary to turn off vibratory rollers due to potential damage to adjacent property or underlying utility facilities. In many situations, proper density can be achieved if the contractor adjusts the amplitude and frequency associated with its vibratory rollers. However, some contractors are reluctant to take the time required to
determine the appropriate amplitude/frequency combination. Do not waive density requirements without OPE or Chief Engineer approval.

**13.17 SMOOTHNESS** *(Rev. 09-29-09)*

For Section 402 mixtures, verify the longitudinal profile of the newly constructed mat in all mainline lanes and shoulders by using a 16 ft straightedge. Verify smoothness transverse to the direction of traffic on the mainline by using a 10 ft straightedge. The 10 ft straightedge is also used to verify the longitudinal profile of public road approaches, commercial driveways, and residential driveways.

For pavements constructed using Section 401 mixtures, smoothness is another factor that may be included in the QA Adjustment. The profilograph is the primary instrument that is used to measure pavement smoothness and the profilogram is the computerized output which displays the results of a profilograph run. On contracts which include the profilograph pay item, the contractor is responsible for operating the profilograph, but is required to provide the profilogram immediately after completion of each run. ITM 912 includes the requirements related to the operation of profilographs and includes a checklist of items to inspect prior to each profilograph run. Questions related to the profilograph should be directed to the AE or District Testing.

When the profilograph pay item is included in a contract that includes a full depth pavement or a multiple lift overlay, the contractor is required to run the profilograph on the top lift of QC/QA HMA Intermediate and on the QC/QA HMA Surface courses. The intent for the profilograph run on the QC/QA HMA Intermediate course is to identify individual bumps and dips that require correction prior to placing the surface mixture. In addition, the profilograph run on the QC/QA HMA Intermediate course is not used to determine a profile index to be considered for payment.

There are two purposes for the profilograph run on the QC/QA HMA Surface course. The first is to locate all bumps and dips that require corrective action in accordance with 401.18. Mark all such locations found by a profilograph run.

The second purpose is to determine the profile index associated with the QC/QA HMA Surface mixture. The profile index is used to determine the pay factor associated with smoothness in accordance with 401.19(c).

When the profilograph pay item is included in the contract, it is only used to measure smoothness on the lanes which meet all of the criteria contained in 401.18 and are not exempted by criteria included in ITM 912. The 16 ft straightedge is used to check longitudinal profile at all other locations. The 10 ft straightedge is used to verify the smoothness of all slopes transverse to the mainline at the same locations as described above for Section 402 pavements.

If there is no profilograph pay item in the contract, the 16 ft and 10.0 straightedges are used to check the newly placed QC/QA HMA mixtures as described above for Section 402 pavements. If these situations, smoothness is not considered in the QA Adjustment calculation.
Department personnel are responsible for furnishing and operating straightedges. The contractor is responsible for providing all traffic control required to operate the straightedge.

Diamond grinding is a common method for correcting bumps and dips which exceed specification limits. Another method sometimes used involves heating the area requiring corrective action and compacting the warmed material. If this technique is used, verify that an open flame is not allowed to come in contact with the pavement. In situations where severe low spots have resulted from the paving operation, it may be necessary to grind longitudinally in one or both directions from the low area and wedge with asphalt material.

ITM 912 also includes information regarding areas which are exempt from smoothness measurements and how to accommodate partial sections encountered due to project limits or paving exceptions. Questions regarding these topics should be directed to the AE or the Office of Materials Management.

The contractor must include all possible methods of corrective action in the QCP. If a QCP does not address proposed methods to correct smoothness deficiencies and no agreement with the contractor can be reached, contact the AE.

13.18 PAY FACTOR DETERMINATION/QUALITY ASSURANCE ADJUSTMENTS (SECTION 401) (Rev. 09-29-09)

When a contractor produces a QC/QA HMA mixture to construct an asphalt pavement or overlay, payment for this work is made at the contract unit price per ton of mixture delivered to the contract. In addition, these contracts include a QA Adjustment pay item which provides additional payment to the contractor or a credit to the Department based on the results of the QA testing.

The QA Adjustment may have two components. The first component is based on mixture properties and density. Secondly, if the contract includes the profilograph pay item, there will be a QA Adjustment based on the profile index measured after the full depth pavement or overlay is constructed.

For all dense graded mixtures with a pay item/DMF/JMF combination quantity greater than one lot, the pay factors are determined based on percent within limits (PWL) methodology in accordance with 401.19(a). The final PWL Acceptance Worksheets for each pay item/DMF/JMF combination provided by District Testing includes composite pay factors for each lot based on mixture properties and density. Use this information to determine the QA Adjustment associated with mixture properties and density for each lot. Add all of the lot QA Adjustments for mixture properties and density to determine the overall QA Adjustment for mixture properties and density.

For all open graded mixtures and dense graded mixtures with pay item/DMF/JMF combination quantity less than one lot, the volumetric property/density portion of the QA Adjustment pay item is based on individual sublot QA test results in accordance with 401.19(b). The final Volumetric Acceptance Worksheets for each pay item/DMF/JMF.
combination provided by District Testing includes composite pay factors for all mixture properties and density for each sublot. Use this information to determine the QA Adjustment associated with mixture properties and density for each sublot. Add all of the QA Adjustments for all mixture sublots to determine the overall QA Adjustment attributed to mixture properties and density.

Ensure that the final versions of the PWL or Volumetric Worksheets are used for determining the QA Adjustment associated with mixture properties and density. The contractor has a right to appeal QA test results and until appeals are finalized, the QA test results and pay factors are not final. Also, if the final version of either worksheet indicates a QA test failure, verify that correspondence related to disposition of this failed material has been received. If no such correspondence has been received, request a copy from District Testing.

For contracts that include the profilograph pay item, the smoothness QA adjustment is determined by the profile index determined by the profilograph for individual sections of pavement and is independent of the lot and sublot concept. Refer to 401.19(c) and ITM 912 for the definition of a smoothness section and the procedure for determining smoothness section limits.

After reviewing the profilogram, locate and mark all bumps and dips that exceed the 401.18 limits. In addition, smoothness sections which have a profile index that exceeds the limits included in 401.19(c) require corrective action to reduce the profile index to acceptable levels. After all contractor repairs are made, a new profile index will be determined for all affected smoothness sections by rerunning the profilograph. Verify that the repairs do not expose underlying pavement courses. If underlying courses are exposed, they require repair in accordance with 401.18.

Use 401.19(c) and the final profilogram to determine the pay factor for individual smoothness sections and the composite smoothness pay factor to determine the smoothness contribution to the QA Adjustment.

After the total QA Adjustment for the contract has been determined, process a change order to facilitate the payment to the contractor or credit to the Department as appropriate. Attach all information used to determine the QA Adjustment to the change order as backup documentation.

13.19 METHOD OF MEASUREMENT/BASIS OF PAYMENT (Rev. 09-29-09)
Because all HMA pay items are measured and paid for by the ton, collect weigh tickets from every truck that brings HMA material to the contract site. Determine if the entire load is placed in the work. If a partial load is returned to the HMA plant, discuss with the contractor’s foreman to estimate the amount returned and record the amount on the ticket. If agreement cannot be reached on the amount returned, request a “weigh back” ticket for the truck.
13.20 WARRANTY HMA CONTRACTS (RECURRING SPECIAL PROVISION)  
(Rev. 09-29-09)
The intent of warranty contracts is to establish performance criteria for the warranty pay items and require the contractor to ensure that these criteria are met or exceeded throughout the warranty period. Therefore, no QA testing is required for any of the warranty pay items during construction.

The scope of inspection on warranty QC/QA HMA mixtures is as follows:
- Collect weigh tickets
- Check in-place yield of mixture in accordance with 401.9 of this document.

On warranty contracts, the contractor is taking full responsibility for the performance of the constructed pavement during the warranty period. Therefore, Department personnel should not give direction to the contractor which is contrary to its QCP. Requiring the contractor to perform its paving operation in a manner contrary to its documented intent may void the warranty.

There may be non-warranty QC/QA HMA and HMA pay items in warranty contracts. For these pay items, all normal specification requirements apply and normal QA sampling, QA testing, certification requirements, and inspection procedures are required.

13.21 DOCUMENTATION REQUIREMENTS (Rev. 09-29-09)
Keep the following documents in the project file:
- Approved DMF/JMFs
- QC Plan, Including Addenda
- QC Plan Approval or Rejection Correspondence
- PWL Acceptance Worksheets or Volumetric Acceptance Worksheets
- Profilograms
- Type D Certifications

It is acceptable to maintain hard copies of the above documents in a project file and/or scan them into SiteManager.

For Section 401 mixtures, maintain a running total of the quantity of mixture associated with each pay item/DMF/JMF combination outside of SiteManager in order to determine the limits associated with individual lots and sublots. Document the limits of individual lots and sublots by entering the lane designation, beginning station, and ending station into the SiteManager DWR on the applicable dates. When paving operations change lanes within a sublot, note the ending station in the first lane as well as the beginning station in lane two into the SiteManager DWR for the date that the lane change is made.

On a daily basis, calculate the total weight represented by the weigh tickets associated with each mixture pay item and record the weight into the SiteManager DWR for the date that the mixture was placed. Attach the calculator printer output to the weigh tickets for the day and maintain them in a file in the field office and incorporate them into the FCR.

For mixtures with QA pay factors that are calculated in accordance with 401.19(a), utilize
the completed PWL Acceptance Worksheet received from District Testing as documentation of pay factors associated with mixture properties and density by including a hard copy in the FCR. Include hard copies of all calculations for determining the quality assurance adjustment for mixture properties and density. Include hard copies of any correspondence related to failed materials in the FCR as well.

For mixtures with QA pay factors that are calculated in accordance with 401.19(b), include hard copies of all Volumetric Acceptance Worksheets in the FCR as documentation of the pay factors associated with mixture properties and density. Include hard copies of all quality assurance adjustment calculations in the FCR. Include hard copies of any correspondence related to quality assurance adjustments for failed materials in the FCR as well.

For contracts with the profilograph pay item, include a tabulation of the individual smoothness section pay factors, as well as the calculations of smoothness QA adjustments for individual sections and the total smoothness QA adjustment for the contract in the FCR.

The FCR also needs to include a tabulation of the overall contract QA Adjustment if there are both smoothness and mixture property/density components.

13.22 TACK COAT  (Rev. 09-29-09)
Tack coat is used to prepare an existing pavement or a previously constructed course or asphalt pavement for construction of an overlay or subsequent course of asphalt pavement.

13.22.1 Tack Coat Quality Control
Details regarding the tack coat operation are included in the QCP submitted by the contractor prior to commencing paving. Verify that the contractor follows all approved QCP content related to application of tack.

13.22.2 Tack Coat Materials
Tack coat materials include certain types of asphalt emulsions and PG binders. These materials are identified in 406.02.

13.22.3 Tack Coat Equipment
Tack coats are applied to the pavement surfaces by an asphalt distributor meeting the requirements of 409.03(a). Additional information regarding asphalt distributors can be found later in this document.

13.22.4 Surface Preparation for Tack Coat
The purpose for applying tack coat is to enhance bond between the newly placed mat and the existing pavement surface. Soil or other debris on the surface to be tacked prevents this bonding from taking place and defeats the purpose of applying the tack coat. All soil and other debris need to be removed from the existing surface prior to application of tack. A rotary power broom is commonly used for this purpose. If there are any areas that require additional cleaning after the power broom operation, this can be accomplished by hand methods.
13.22.5 Tack Coat Application

The surfaces that are to be tacked need to be dry to maximize bonding between the existing surface and the proposed mat. A common area of contention between contractors and the Department is related to how dry is sufficient to allow tack coat to be placed. In reality, it is acceptable to apply tack coat when there are isolated wet spots on the surface to be tacked. By isolated, the rough percentage of damp areas should be less than five percent. There should be no standing water in any of these areas. If there is any question regarding whether the surface is too wet, notify the contractor in writing that performance of the tack coat and paving operations is at its risk and that any delaminated areas shall be repaired at no cost to the Department.

It is important that the existing pavement be coated with the appropriate amount of tack in a uniform manner. One common deficiency is caused by clogged nozzles on the distributor spray bar. In situations where one or more of the spray bar nozzles is clogged, there will be portions of the existing pavement that are either lightly coated or not coated at all. If a distributor spray bar nozzle becomes clogged, the distributor should be stopped and the clogged nozzle or nozzles repaired or replaced prior to resumption of application of the asphalt emulsion.

Another problem which results in inadequate coverage of asphalt emulsion is improper distributor spray bar height. In order to achieve the proper coverage, the individual nozzle sprays must overlap sufficiently. If the spray bar is installed too low, there will be insufficient overlap. If the spray bar is set too high, the overlap will not be uniform. Figure 13.22-1 illustrates the proper double or triple overlap resulting from the asphalt emulsion being sprayed from the distributor spray bar.

![Figure 13.22-1 Desired Double or Triple Overlap](image)

Figure 13.22-2 illustrates non-uniform coverage resulting from a spray bar installed at an
improper height.

![Diagram of improper spray bar height](image)

Figure 13.22-2 Non-Uniform Coverage Due to Improper Spray Bar Height

Distributor operation must be performed such that tack is only applied to the intended surfaces. Sometimes wind can or other environmental factors can result in wayward tack application. Usually, this problem can be solved by attaching a plate to the spray bar to contain the spray to the intended area.

Existing surfaces that cannot be tacked because they are inaccessible to the distributor must be coated by hand prior to construction of the overlying mat.

When the tack coat is applied, it will be brown in color. After a period of time, the tack coat will turn black. At the time that this occurs, it is said that the tack coat has broken. The new asphalt mat should not be placed onto the tacked surface until the break has occurred. The time required to achieve the tack coat break varies based on weather conditions such as temperature, humidity, and wind.

**13.22.6 Tack Coat Documentation Requirements**

Depending on the contract, tack coat is measured and paid for by either the ton or the square yard.

If tack coat is being paid for by area, determine the area covered by tack on a daily basis and enter the daily quantity in the SiteManager DWR. Maintain a hard copy of the daily calculations and sketches in a file in the field office and ultimately include in the FCR.

If tack coat is paid for by weight, collect the weigh tickets for each day. Run a daily total of weigh tickets to determine the daily quantity and enter in the SiteManager DWR for each day that tack coat is placed. Maintain the weigh tickets and calculator tapes in a file in the field office and include in the FCR.

**13.23 SEAL COAT (Rev. 09-29-09)**

Seal coat work consists of one or more applications of asphalt material, each followed by an application of aggregate. Some people refer to this work as chip sealing.
13.23.1 Seal Coat Quality Control
The quality control requirements for seal coat operations are included in 404.02. Review the QCP as soon as possible after receipt. The seal coat operation cannot begin until QCP approval is obtained. Refer to ITM 803 for the Seal Coat QCP checklist. The intent of the QCP review is to verify that all checklist items are included in the QCP. It is not intended to incorporate personal preferences of the reviewer into the QCP. However, prior to approval of the QCP, discuss all checklist items for which there are questions with the contractor.

13.23.2 Seal Coat Materials
The acceptable asphalt materials are listed in 404.03. The cover aggregate requirements are detailed in 404.04.

13.23.3 Seal Coat Types
The types of seal coats are listed in 404.04.

The types are identified by a number between 1 and 7 inclusive. In addition, a letter “P” may be added to the type, which indicates that a polymer modified asphalt emulsion is required. Types 1 through 4 and 1P through 4P consist of one application of asphalt emulsion and one layer of cover aggregate. Types 5 through 7 and 5P through 7P consist of an application of asphalt emulsion, followed by an application of cover aggregate, followed by a second application of emulsion, followed by a second layer of cover aggregate.

13.23.4 Seal Coat Weather Limitations
The weather limitations for the application of seal coats are listed in 404.05. In general, seal coats need to be applied to dry pavements on warm days. The emulsions used in seal coats must have the water evaporate, or commonly referred to break, in order for the seal coat to be able to withstand traffic. Surface water or cool temperatures delay the break and require traffic to stay off of the pavement longer than typically accepted by the general public. If it becomes necessary to perform seal coat work outside the weather parameters contained in 404.05, contact the AE for guidance.

13.23.5 Seal Coat Equipment
The following equipment is required for a seal coat operation:

- Rotary Power Broom
- Asphalt Distributor
- Aggregate Spreader
- Pneumatic Tire Roller

A rotary power broom is used to clean the existing pavement surface prior to application of the asphalt emulsion and to sweep excess aggregate from the seal coated surface. An asphalt distributor is used to apply the emulsion to the pavement surface. An aggregate spreader, or chip box, is used to distribute the cover aggregate to the surface after the emulsion is applied. A pneumatic tire roller is used to seat the cover aggregate into the emulsion. Steel wheeled rollers cannot be used in conjunction with a seal coat operation.
More information regarding equipment used in seal coat operations is included later in this document.

**13.23.6 Surface Preparation for Seal Coat**

Prior to applying the asphalt emulsion, the existing pavement surface must be clean. If the rotary power broom is not capable of removing all dirt or other material from the existing pavement surface, other measures must be taken to remove the objectionable material.

Prior to application of the emulsion, ensure that all snowplowable pavement markers, structure castings, detector housings, and other items in the existing pavement are covered for protection. After completion of the seal coat operation, make sure that the contractor removes all protective coverings.

**13.23.7 Seal Coat Asphalt Material Application**

The surfaces that are to be seal coated need to be dry to maximize bonding between the existing surface, the asphalt emulsion, and the cover aggregate. A common area of contention between contractors and the Department is related to how dry is sufficiently dry to allow seal coat to be placed. In reality, it is acceptable to apply seal coat when there are isolated wet spots on the surface. By isolated, the rough percentage of damp areas should be less than five percent. There should be no standing water in any of these areas. If there is any doubt regarding whether the existing surface is too wet, notify the contractor in writing that performance of the seal coat operation is at its risk and that any de-lamination that occurs must be repaired at no expense to the Department.

It is important that the existing pavement be coated with the appropriate amount of asphalt emulsion in a uniform manner. One common deficiency is caused by clogged nozzles on the distributor spray bar. In situations where one or more of the spray bar nozzles is clogged, there will be portions of the existing pavement that are either lightly coated or not coated at all. If a distributor spray bar nozzle becomes clogged, the distributor should be stopped and the clogged nozzles repaired or replace prior to resumption of application of the asphalt emulsion.

Another problem which results in inadequate coverage of asphalt emulsion is improper distributor spray bar height. In order to achieve the proper coverage, the individual nozzle sprays must overlap sufficiently. If the spray bar is installed too low, there will be insufficient overlap. If the spray bar is set too high, the overlap will not be uniform. Figure 13.23-1 illustrates the proper double or triple overlap resulting from the asphalt emulsion being sprayed from the distributor spray bar.
Figure 13.23-2 illustrates non-uniform coverage resulting from a spray bar installed at an improper height.

**Figure 13.23-2 Non-Uniform Coverage Due to Improper Spray Bar Height**

### 13.23.8 Application of Seal Coat Cover Aggregate

It is important that the cover aggregate be applied to the asphalt emulsion as soon as possible. When the asphalt emulsion is applied to the pavement, it will be brown in color. After a period of time, the emulsion will “break” or turn black. After the emulsion has broken, it is too late to apply and seat the cover aggregate. Since the breaking time depends on environmental factors such as temperature and wind, it is important that the cover aggregate be placed as soon as possible.

### 13.23.9 Rolling of Seal Coat Cover Aggregate

The intent of the rolling operation is to seat the cover aggregate instead of compacting a
mixture as is the case for traditional asphalt paving. In order to seat the cover aggregate properly, the required roller passes need to be performed prior to the break of the asphalt material.

13.23.10 Seal Coat Operation Traffic Control
Traffic control is a very important aspect of a seal coat operation. Verify that the contractor has enough signs and flaggers to direct traffic around the seal coat operation while it is ongoing and that the traffic control is adequate throughout the entire work area. It is necessary for emulsion tankers and aggregate hauling trucks to enter and leave the work area in a safe manner. In addition, once a seal coated lane is reopened to traffic, it is very important to limit the speed of the motoring public so that aggregate is not displaced by the traffic prior to being allowed to embed itself in the emulsion. This usually will require use of pilot vehicles to escort motorists through the contract area at a sufficiently slow speed.

Discuss traffic control with the contractor at the Preconstruction Conference. In addition, ensure that the contractor is complying with the traffic control procedures included in the QCP during performance of the seal coat operation.

13.23.11 Excess Seal Coat Cover Aggregate Removal
It is important to perform a brooming operation within approximately 24 hours after traffic has been placed on the newly seal coated surface. This will reduce the likelihood of damage to windshields and other vehicle parts. This rotary power broom should be applied lightly as the intent is to remove excess aggregate. The asphalt emulsion has not fully cured at this time, so the broom must be applied lightly enough not to dislodge aggregate that is coated, but not locked into the emulsion.

13.23.12 Seal Coat Documentations
Seal coat is measured and paid for by the square yard. On a daily basis, determine the area covered by the seal coat operation and note the quantity in the SiteManager DWR. Include all daily calculations and sketches in a file in the field office and in the FCR.

13.24 ASPHALT PAVING EQUIPMENT (Rev. 09-29-09)

13.24.1 Asphalt Mixing Plant
HMA mixing plants are typically either batch plants or drum plants.

A batch plant gets its name from the fact that it produces HMA in batches. The maximum batch size that a plant can produce is limited by the capacity of its pugmill. The pugmill is the chamber where the aggregate and the PG binder are mixed together.

Batch plants may be portable or stationary. Portable batch plants can be erected, utilized at a location for a period of time, disassembled, and taken to a different location to repeat the process. Stationary batch plants are erected and operated at a fixed location.

Typically, aggregates are stockpiled until the asphalt mixture production begins. The aggregates are then transported into the cold feed bins. Next, it is necessary to heat and
dry the aggregates prior to screening and facilitate storing of the heated aggregates. It is also necessary for the PG binder to be stored and heated prior to beginning the mixing process. The batch plant next produces the mixture by mixing the proper proportions of the aggregates and the PG binder. Finally, the resulting mixture is loaded into the hauling trucks for transport to the contract site.

At a drum plant, the mixing of the aggregates and binder takes place in the same drum as where the aggregates are heated and dried. Also, the aggregate gradation is controlled at the cold feed bins rather than undergoing a screening process as is the case at a batch plant.

13.24.2 Asphalt Distributor
Asphalt distributors are used to apply asphalt material associated with tack coats, prime coats, dust palatives, and other applications. An asphalt distributor is shown in Figure 13.24-1.

![Figure 13.24-1 Asphalt Distributor](image)

13.24.3 Hauling Equipment
Typically tri-axle trucks haul asphalt mixtures from the mixing plant to the job site. The truck beds need to be tight, clean, and smooth. Approved anti-adhesive agents are to be utilized to prevent mixture from adhering to the truck bed. Also, the truck beds require waterproof covers to protect the mixture adverse weather conditions, prevent contamination of the mixture, and to maintain temperature on cool weather days.

13.24.4 Material Transfer Device
Material transfer devices, sometimes referred to as shuttle buggies or MTDs, are sometimes utilized in a paving operation. An MTD effectively increases the size of a paver’s hopper. This is beneficial because segregation can occur in the newly placed mat when a paver is required to stop because it has run out of mixture. Figure 13.24-2 is a photo of an MTD.
13.24.5 Paver

The paver is the piece of equipment that receives the asphalt mixture from the haul truck or MTD and places it on the treated subgrade, existing pavement, or a previously placed mixture. Pavers must be self-propelled, but may be either equipped with wheels or tracks. Augers and vibratory screeds are used to distribute the mixture to the pavement mat. Most pavers also employ automatic grade and slope controls which enable the asphalt mat to be placed at the proper profile and cross slope. Other paver features include extendable screeds and extendable augers. A typical paver is depicted in Figure 13.24-3.
13.24.6 Wideners
Wideners are used in situations where the required paving width is insufficient to accommodate a paver. The term “widener” is derived from the fact that this piece of equipment typically casts the mixture to the side and is usually used to widen an existing pavement. Wideners are equipped with an adjustable screed which is capable of constructing a mat to the proper grade and slope. Figure 13.24-4 depicts a typical widener.
13.24.7 Tandem Roller
Tandem rollers are named based on the fact that they have two axles/rollers. A tandem roller is used to compact newly constructed mats. The minimum weight for a tandem roller is 10 tons. Figure 13.24-5 illustrates a tandem roller.

13.24.8 Three Wheel Roller
Three wheel rollers have three rollers—one on the forward axle and two on the rear axle. There is a minimum bearing requirement for the rear wheels of 300 lb/in in 409.03(d).
Figure 13.24-6 is a photo of a three wheeled roller.

Figure 13.24-6 Three Wheeled Roller

13.24.9 Pneumatic Tire Roller

Pneumatic tire rollers may be used to compact QC/QA HMA or HMA mixtures, but are rarely used for that purpose. They are required to be used to seat the cover aggregate into the asphalt material in seal coats.

Requirements related to pneumatic tire rollers are included in 409.03(d). Figure 13.24-7 is a photo of a pneumatic tire roller.

Figure 13.24-7 Pneumatic Tire Roller
Figure 13.24-8 illustrates how the tires on a pneumatic tire roller are offset to facilitate complete compaction of an asphalt mixture or complete seating of seal coat cover aggregate with each pass.

13.24.10 Vibratory Roller
The prior rollers discussed only use the weight of the roller to achieve compaction as they operate in static mode. Vibratory rollers are capable of imparting an impact loading on the mixture as they vibrate during operation. It is possible to control the frequency as well as the amplitude of the vibratory effort imparted by the roller. Figure 13.24-9 is a photo of a vibratory roller.
13.24.11 Trench Roller
Trench rollers can be utilized to compact asphalt mixtures in situations where the width of mat to be rolled makes the use of the rollers noted above ineffective. Figure 13.24-10 is a photo of a trench roller.

![Trench Roller](image)

**Figure 13.24-10 Trench Roller**

13.24.12 Aggregate Spreaders
Aggregate spreaders are sometimes referred to as chip boxes. They are used to distribute cover aggregate over a freshly applied asphalt emulsion in seal coat operations. Figure 13.24-11 is a photo of an aggregate spreader.
13.24.13 Rotary Power Broom
Rotary power brooms can be used in multiple applications related to paving operations. They are used to clean an existing pavement or a previously placed underlying mixture prior to placing tack coat. They can also be used to clean an existing pavement prior to application of an asphalt emulsion related to a seal coat. A third use for these power brooms is to remove excess cover aggregate from a newly placed seal coat. A rotary power broom is shown below in Figure 13.24-12.
13.25 PG ASPHALT BINDER MATERIAL COST ADJUSTMENT (Rev. 09-29-09)

13.25.1 Introduction
A contract may include a specification that provides for payment adjustments based on the change in cost of PG asphalt binder material. The cost of virgin PG binder material is tracked as an index on a monthly basis and the special provision allows for a payment adjustment if the index for a given month varies more than 10% compared to the index in effect at the time of letting.

Recurring Special Provision 109-C-219 and the associated pay item, “Payment Adjustment, PG Asphalt Binder”, is currently included in all contracts let with 304, 401, 402, 410, 610 and 718 pay items. This is to avoid the need to write a Change Order to add the specification and pay item if the bidder opts for the provision.

At the time a bid proposal is submitted, the bidder will elect whether to opt in or out of use of Recurring Special Provision 109-C-219. This election will be noted on the proposal page of the bidder’s submittal. A copy of the proposal page submitted by the successful bidder must be obtained from the District to determine if the provision is to be implemented on the contract.

If the Contractor has opted out of using the provision, then the provision and the pay item are not used on the contract. The Contractor cannot change its option after submittal of the bid. There is no need to write a Change Order to delete the provision and pay item if the Contractor has opted out; simply ignore the provision and do not pay any quantity on
If the Contractor has opted to include the provision, then any contract with at least one HMA pay item with an original or revised quantity greater than or equal to 2,000 Tons will require pay adjustments for the PG binder used in all HMA mixture pay items on the contract. It is important to note that the provision does not become effective until at least one HMA item’s revised quantity meets or exceeds the minimum requirements and that only future quantities are eligible for payment adjustments.

Payment adjustments will only be applied to contract pay items for HMA mixtures paid in accordance with 304, 401, 402, 410, 610 and 718.

13.25.2 Calculation of Adjustments
When a Contractor has opted to use the provision and the contract meets the quantity requirements, it will be necessary to perform an analysis on a monthly basis in accordance with the recurring special provision to determine whether additional payment is due to the contractor or a credit is due the Department for fluctuations in the actual material cost of asphalt PG binders.

PG binder price fluctuations are measured by the ratio of a monthly binder index (BI) to an established letting binder index (LI) for the contract. The BI is determined by the Office of Materials Management and is published on a monthly basis on the Department’s website. The letting index (LI) is the BI for the month prior to the contract letting date and will serve as the baseline of comparison for the BI throughout the duration of the contract.

If the BI for a given month is within 10.1% of the LI, no monthly adjustment is required. If the BI is at least 10.1% greater than the LI, then the contractor is due additional payment for all HMA pay items in the contract placed during the month under consideration. If the BI is at least 10.1% less than the LI, then the Department is due a credit for all HMA pay items on the contract.

A spreadsheet is maintained on the Department’s website and is available to calculate the required monthly payment adjustments as necessary.

Shortly after the end of a given month, it is necessary to determine the quantities associated with each HMA mixture pay item/DMF/JMF combination during that month. This information, along with the BI associated with the month of placement, is input into the spreadsheet to determine whether or not a payment adjustment is required. Any monetary adjustment should be incorporated into a progress payment estimate within 30 days of the end of the month being analyzed.

13.25.3 Spreadsheet Data Input Instructions
Locate the spreadsheet on the Department’s website and save a copy to a folder on the computer. Then enter the required data for the month and save a copy of the completed spreadsheet as part of the contract files. This process will be repeated for each month throughout the duration of the contract.
The data fields that require user input are highlighted on the spreadsheet. The other boxes in the spreadsheet are locked and are used to display information or results which are calculated automatically.

1. **Contract No.** – Enter the contract number in the format “Prefix-XXXXX”
2. **Letting Date** – Enter the date of the letting in the format MM/DD/YYYY.
3. **Month & Year of Calculation** – Enter the month and year that the adjustment is being calculated for in the format MM/YYYY.
4. **LI** – Enter the binder index for the month before the letting. This information is available from the Office of Materials Management and on the Department’s website. The LI is the BI for the month prior to the month of the contract letting. Once the LI value is determined, it will remain the same throughout the contract duration.
5. **BI** – Enter the binder index for the month under consideration for the adjustment determination. This information is available from the Office of Materials Management and on the Department’s website.
6. After the LI and BI are entered, two calculations will be performed:
   a. The \( \frac{(BI - LI)}{100} \) will be calculated to the nearest 0.001,
   b. The absolute value of \( \frac{(BI - LI)}{100} \) will be compared to 0.101. If the result is less than 0.101, then no adjustment will be made for the month and the result of $0.00 will be shown in **Payment Adjustment, PG Asphalt Binder**. If the result is equal to or greater than 0.101, then a payment adjustment will be calculated for each pay item on the spreadsheet and the total adjustment for the month will be shown in **Payment Adjustment, PG Asphalt Binder**.
7. **MPA Data** – Enter the information in the highlighted boxes for each qualifying HMA pay item. The data in this section must be broken down by pay item and DMF/JMF. If a contractor uses multiple DMF/JMFs for a single pay item, there needs to be separate entries for each pay item/DMF/JMF combination. For example, if a contractor places HMA Base, HMA Intermediate, and HMA Surface during the month under consideration which is all paid for in an “HMA for Approaches” pay item, there would be at least three entries for that pay item because each mixture requires a different DMF/JMF. Once the user has determined all of the applicable pay item/DMF/JMF combinations, the appropriate data for each combination is entered. This data includes “**HMA Pay Item No.**”, “**Pay Item Description**”, “**Q**” (quantity of mixture placed for the month by DMF/JMF), “**DMF or JMF**”, and “**Pb**” (percentage of virgin PG binder used in the mixture from the DMF or JMF). Once this data is input, the spreadsheet automatically calculates the payment adjustment amount in dollars for each line and also calculates the total adjustment for all mixtures for the month.
8. **Item No.** – Below the “**MPA Data**” table, input the contract pay item number for Payment Adjustment, PG Asphalt Binder from the Schedule of Pay Items.
9. **FCR Page No.** – The spreadsheet is set up to allow the user print a hard copy of each month’s adjustment for the Final Construction Record. The user should input the appropriate page number for the month in sequence throughout the duration of
the contract. As distributed, the spreadsheet has no provision to automatically number the pages, so the data must be input.

An example spreadsheet showing entered data and results is also available on the Department’s website. The user can change the LI, BI and Q to see how changes affect the adjustment calculation.

13.25.4 Spreadsheet Data File Management
It is recommended that the spreadsheet for each month be saved using a unique filename, i.e. – “XXXXX_July_2009.xls”, where “XXXXX” is the 5 digit contract number. The spreadsheet should then be attached to the Correspondence Log in SiteManager in the “Other” document category as an “Other” type document.

The spreadsheet has some limitations. There are only fifteen lines available for data input in the “MPA Data” table. If a contractor places more than fifteen pay item/DMF/JMF combinations during the month under consideration, more than one spreadsheet will be required for that month.

Questions about the PG Binder Index and spreadsheet should be directed to the Construction Field Engineer for the District.
SECTION 14 – UTILITY RELOCATION INSPECTION PROCEDURES

14.1 INTRODUCTION (Rev. 01-21-14)
On most highway improvement projects there will be utility facilities located in the project limits or adjacent to the project limits. Some of the facilities within the limits of the project may be in conflict with the proposed construction, some may be in the process of relocating out of conflict with the project and some facilities may not be in conflict with the project. INDOT is required by FHWA to minimize or avoid impacts to utility facilities whenever feasible. The constructability reviews during project development are critical to successful construction projects. These reviews are the most opportune time for developing the correct utility work plans and subsequent project bid documents. The Area Engineer should view these reviews as a primary responsibility of the assigned PE/S. Contractors will be required to schedule their work with utility schedules as presented in special provisions, work around existing utilities as shown on plans, and prepare areas for utility relocations as written in special provisions. The PE/S will bring critical field experience and input into the development of utility work plans, contract bid documents, and design plans.

INDOT manages these utility facilities by coordinating with the utilities prior to construction and developing utility relocation work plans. These work plans coordinate the location, schedule, and work of the utility with the project. A letter ‘Work Plan Approved’ is issued for all relocation work plans that are acceptable to INDOT. A permit number is issued with this letter. Also, in this letter the utility is provided a notice to proceed with their preconstruction activities. A letter “Notice to Proceed with Construction” will be issued by the Utility Coordinator once all work required by INDOT or the INDOT contractor is completed. The utility work plans are accurately reflected in the special provisions and the locations are in the utility relocation drawings uploaded to the bid documents for the contractor to consider. The goal of the Utility section is to address all utility related concerns and inform the project team. The idea is to deliver complete information in sufficient detail that the team has no surprises regarding utility coordination. The Utility coordinator is to be the point person for all utility related concerns from project inception to conclusion.

14.2 AUTHORIZATION (Rev. 01-21-14)
Authorization for a utility to start pre-construction activities is provided in the letter “Work Plan Approved”. Authorization for a utility to start construction activities is provide in the letter “Notice to Proceed”. These letters are issued by the utility coordinator.

One role of the PE/S is to verify that a utility planning to do work or actually doing work within the highway right of way has a notice to proceed issued by the utility coordinator. Also, the PE/S will ensure the work of the utility is appropriate to the special provisions and coordinated with the work of the INDOT contractor to ensure progress of work in accordance with the identified schedule.
14.3 PRE-CONSTRUCTION CONFERENCE *(Rev. 01-21-14)*

When utilities are involved in a project, it is essential that they be called together, with the prime contractors and subcontractors, to discuss a workable schedule that will be coordinated with the contractor’s schedule and the Utility Special Provisions. These Special Provisions are drafted by the Utility Coordinator in coordination with each impacted utility. The provisions are derived from Utility work plans that were negotiated to be in compliance with the project. Any post work plan changes or new expectations of the utilities must be coordinated through the utility coordinator and may result in additional costs to INDOT or the contractor. The utility conference should be held in conjunction with the usual pre-construction conference. The PE/S should prepare minutes of the utility conference and include them in the pre-construction conference minutes. The proposed scheduled starting dates, anticipated completion dates and any applicable or intermediate date, should be noted. On projects where there are major utility concerns, additional utility meetings, such as weekly meetings may be appropriate. A good time for information exchange is during weekly scheduling meeting and monthly partnering meetings. However, the need for attendance by the utilities should be measured by 1) the complexity of the utility relocation needed, and 2) the availability of the utility coordinator who is required to be actively coordinating all utility schedules with construction progress and schedule.

As part of the utility conference, the PE/S should request a list of contact names from each utility involved in the project from the Utility coordinator. Although the contract may include some contact information, it should be verified and updated at the conference. The Utility coordinator is and should be seen as the primary contact person for all utility related concerns which should free the PE/S to manage the project. The PE/S will have this information for the contractor’s required notification to utilities.

Special emphasis must be given to the review of the existing and proposed new locations of aerial lines. The contractor must consider the utilities in their work plan and their bidding of the project. Possible conflicts with the contractor’s construction equipment, such as cranes, backhoes, pile driving equipment, etc, may not have been known at the time of the utility plans formulation or the Department’s review of the plans. The utility relocation drawings in the contract documents should be considered in the contractors bidding of the project and are not a basis for requiring changes in the utilities’ permitted locations. If the contractor chooses a means or method of constructing that requires a change in the utility’s permitted location, the PE/S should inform the contractor that they will have to negotiate the cost of that move with the utility and seek a permit addendum from the utility coordinator.

The date the area necessary for each utility to relocate was staked, the date any obstruction was cleared for the utility, the date each utility was contacted regarding starting their work, the date the utility actually started work, and any adverse conditions causing delay in the sequence of operations should be recorded in the Engineer’s Diary. The PE/S should note specific items of assistance that are provided to the utility such as locating the centerline of the road, establishing grade stakes in advance of normal staking, etc. A comprehensive review of the work to be performed should be made at the start of the utility relocation work, unless covered at a recent pre-construction conference.
14.4 INSPECTION *(Rev. 01-21-14)*

The degree of inspection of utility construction will vary considerably with the nature and location of the work and the type of contract involved. Judgment must be exercised regarding the manner and regularity of inspections. It will vary from spot checks on minor overhead installations to detailed inspections of underground facilities.

The following items should be noted:

a. Be observant of proposed grade and alignment and check that the utility plans are compatible with the road structures, and construction features, etc.

b. Ensure that proper backfill methods and materials are used where proposed and future road surfaces and berms are involved.

c. Be observant for any substantial change in methods and materials from those approved, such as the use of sheeting, special backfill, etc. The PE/S should immediately contact the Utility Coordinator to discuss with the utility. For reimbursable utilities, there can be no payment for any work in addition to the approved work; therefore such approval must be obtained prior to starting the procedure change.

d. Be sure that the utility foreman is familiar with symbols furnished on the construction stakes, such as cut and fill information and that both the utility and contractor use the same data.

e. Spot checks should be made to ensure that trench depths are compatible with highway surface plans, vertical clearance of overhead utility installations are sufficient to insure minimum clearance above highway structures and horizontal alignment is compatible with construction limits, access lines, etc.

Utilities are authorized, after obtaining the notice to proceed, to do all necessary work involving minor changes in quantities or additions of minor items, which are deemed necessary to accomplish the intent of the approved agreements. However, no reimbursement can be made without prior approval. Contact the Utility Coordinator to issue that approval.

Approval must be secured from the Utility Section for substantial changes in the scope of work. Examples of possible substantial changes are changing a planned aerial road crossing to a buried crossing or changing method of installation from trenching to directional bore, and any change to a permitted location. In non-emergency situations, the proposal for such a change must be submitted in writing by the utility to the Utility Coordinator. As much detailed information, sketches, estimates (if work is being performed by contract, the engineer’s estimate should be made prior to contractor’s proposal), costs and other documentation as practical must be provided by the utility.
The Utility Section will inform the utility of the approval of design changes. If timing is of essence, the necessary communication can be accomplished by phone, fax or e-mail and confirmed in writing as soon as practical.

It is recognized that it is essentially impossible to define or otherwise describe the limits of “substantial change” due to variations in cost of work, its complexity, the variable situations, and terrain encountered. It is also undesirable to request approval for every recognizable change. In case of doubt and definitely where the change will increase the utility agreement amount the utility should request approval for the change from the Utility Section.

14.5 RECORDS (Rev. 01-21-14)
The PE/S’s record for utility relocation work should be kept in sufficient detail to identify the conformance with the relocation plans and schedule. These records can become very important when analyzing a utility delay claim by the contractor or a claim for additional compensation by a utility. In general, more detailed records should be kept for utility work that is reimbursable as opposed to non-reimbursable work. The different methods of payment for the utility relocation work determine the type of records that need to be kept at the project level. These are described below:

a. For reimbursable work performed entirely by the utility with utility forces only, the PE/S’s record should include the number and class of employee, major equipment on site, principal materials used and materials removed from the site. Also pertinent data such as weather conditions, ground conditions, breakdown of equipment, delays due to conflicts with other utility forces or general contractor’s operations, should be noted. Any conversations with the utility, District, or the Utility Section should be noted.

b. For reimbursable work where part or all of the work is being done by a contractor having a continuing contract with the utility, the same records are required as in (a) above. Unless the agreement clearly establishes that the work being done under a continuing contract is on a unit of work basis, rather than a manpower and equipment basis. If it is clearly on a unit of work basis, only the units of work completed per day by the contractor need be recorded. Records on any work performed by the utility’s own forces in conjunction with a continuing contract should follow (a) above.

c. For reimbursable work being performed in part or completely by outside contractors on a unit of work basis, the record should cover the units of work performed on a daily basis. On projects being done in part or completely by an outside contractor on a firm bid basis, the items of recording labor and equipment used by the contractor can be deleted from the record; except in those instances when extra work is performed by the contractor on a per hour or per diem basis. The units of work completed should be recorded daily to form a basis for checking payment to the
utility for their contractor’s work. This should include such things as the number of poles installed, amount of wire strung, the lineal footage of pipe or casing installed, the length of line removed, and the amount of trenching or any other work unit.

d. On lump sum agreements, between the Department and the utility where the construction work is being done either by utility forces, under a continuing contract or a contractor selected by competitive bid, the daily checks on manpower, equipment, and material can be omitted. A detailed review should be made at the final utility inspection to ensure conformance with the agreement. In these instances the utility will be paid the exact amount of the original or modified agreement regardless of the actual cost incurred by the utility, as long as they have satisfactorily performed all work covered by the approved plan. When utilities use inspection personnel to observe the work being done, records should be kept showing the hours and rate for the utility’s inspection personnel, with particular emphasis on those not on the utility payroll. Such outside inspection services will usually be covered by a contract between the utility and an engineering firm, and a copy of the agreement should be requested to determine the questionable features of and compliance with the agreement.

14.6 SALVAGE MATERIAL (Rev. 01-21-14)
Salvage is the reclamation of materials from a project site that have some continued value. Salvage value is the monetary value of these reclaimed materials either through reusing the materials or recycling the materials. There are three types of salvage involving utility materials as follows.

1. For utilities that are reimbursable, the utility must reclaim all materials for which the salvage value exceeds the cost of removal unless otherwise coordinated with INDOT. The salvage value is a credit to INDOT on the cost estimate of the agreement. The utility will include the actual salvage value as a credit to the invoiced cost of the agreement. For utilities that are not reimbursable, the salvage value is a credit to the utility who owns and reclams the materials.

2. For utility materials that are retired in place and left on the project site, they remain the responsibility of the utility until removed by either INDOT or the INDOT contractor. The contractor must reclaim all materials for which the salvage value exceeds the cost of removal. All materials that are required to be removed as part of the contract must be salvaged. The contractor must give a credit to the contract for all materials that are salvage. The salvage value is a credit to INDOT on the cost of the contract. The PE/S will track the status of these salvageable items.

The Utility Coordinator will work with each utility to determine what if any materials will be “retired in place”. This will be reflected in the utility work plans and in the
estimates. We have eliminated the use of “abandoned” for the following reasons: the utility will remain accountable for the costs of addressing asbestos materials and any environmental concerns that arise out of leaving the material on INDOT property. If the utility chooses to retire in place a facility it is understood that INDOT can perform any construction activity necessary to complete the project without regard for the impact to the utilities retired in place facility including removal for disposal, salvage, or reuse.

These decisions will be made during project development in constructability reviews then placed in utility work plans and in the project bid documents as appropriate. However if during project construction additional issues arise the Utility Coordinator will be the point person to work with the PE/S and the utility to bring resolution. The State will determine whether it is desirable or economical to recover or leave in place those materials that need not be removed because of construction requirements. Therefore, the Engineer must review the agreement with the utility representative to determine whether the facility was proposed and is approved to be removed. If the agreement called for removal, a determination shall be made that removal is still necessary due to the construction itself. If it is found that the material need not be removed because of construction, then a decision must be made to determine the economical and liability justification for removing such facilities. The utility agreement will normally reflect the fact that if the material is to be salvaged by the utility, the expected salvage credit will exceed the removal, transporting, refurbishing and stores return costs. Otherwise the agreement will call for retirement in place, unless it was presumed at the time of approval that retirement of the material would create a potential liability to the State or the utility or would be detrimental to the present construction or the future use and safety of the road. If the facility is removed as a result of a decision in the field, and the utility is desirous of salvaging the materials for future use, a determination must be made to establish that the credit given the State for such material will exceed the cost of recovery, transporting, refurbishing, and stores return cost. If the credit proposed by the utility does not exceed these costs, the material will be disposed of. This should be discussed with the District Utility Engineer. If the agreement calls for removal and salvage of items that could be retired in place, but unusual field conditions are encountered at the time of removal operations, the utility representative should be questioned about the salvage credit. It should be considered whether the credit will equal or exceed the cost of removal and salvage under these changed conditions. If the utility cannot confirm the salvage credit, cost of salvage and cost of removal, the PE/S should classify this as a substantial change in scope of work and act accordingly.

When the agreement calls for retirement of parts or all of the facility, but such retirement will, in the opinion of the Engineer, constitute a hazard or liability to the State or the prime contractor or in the opinion of the Engineer adversely affects the work of the prime contractor, it shall be treated as a substantial change and approval to remove the facility will be requested through the Utility Section. After approval, the utility should be instructed to remove the facility and the project record should be noted as to the reason for the change. It is the opinion of the Utility Section, and the FHWA, that in general all pipe 12 in. or less in diameter can be retirement in place. The final decision to abandon is the responsibility of the District and the utility concerned.
14.7 FINAL INSPECTION OF UTILITY *(Rev. 01-21-14)*

The final inspection of utilities varies based on whether the utility relocation work was done by the utility or done by the state highway contractor as part of the highway contract. There is little difference between reimbursable and non-reimbursable utility inspections.

For relocation work done by the utility, the PE/S has no specific duties to ensure accurate placement. However, the PE/S is required to ensure the contractor staff and utility staff are coordinating the execution of the work if such coordination is necessary for the project to proceed on time.

For relocation work done by the state highway contractor, the PE/S has the same requirements for the supervision, inspection and record keeping for the work as any other work in the contract.

At the conclusion of the utility work a final inspection should be made in the presence of the utility representative and the contractor, to determine conformity with the approved original or modified plan. The issue of who needs to attend the inspection will need to be discussed with the Utility Coordinator. A report should be written to the file, with a copy going to the DO, which states the date the final inspection occurred, who was in attendance, and the outcome of the final inspection. The coordinator will issue a letter; “Acknowledgement of completion” to each approved utility and is copied to the file.

In the event that a change to the utility’s plans becomes necessary, the change may be authorized in the field if the PE/S approves of it and keeps written documentation of the changes approved except for the permitted location. The Utility Section will assist as needed with any decision on changes. The primary concerns are that the utilities do not interfere with the construction or safety at the project site and that their placement follows the Department’s Utility Accommodation Policy and to the permitted location. It is preferred that all changes to a utility’s work plan are approved by the Utility Coordinator.

14.8 TRANSMITTING RECORDS *(Rev. 01-21-14)*

The PE/S will partner with the Utility Coordinator to create and maintain adequate records. These records will be copied to the Utility Coordinator for use in reimbursement of the utility work and in final audit.

14.9 ASSISTANCE TO THE UTILITY *(Rev. 01-21-14)*

The utility may require assistance in completing their relocation, such as staking of right-of-way, interpreting plans, etc. While it is up to the utility to do their relocation, it is in everyone’s best interest that the Department and the contractor provide the utility with proper assistance so that the utility relocates their facilities to the proper location. If you observe a utility placing their facilities in a location that will cause a conflict, advise them of the problem immediately.
SECTION 15 – FINISHING SHOULDERS, DITCHES AND SLOPES

15.1 FINISHING SHOULDERS, DITCHES, AND SLOPES (Rev. 09-29-09)
The final shaping and dressing of shoulders, ditches and slopes is not a pay item but is included in the cost of other bid items on the project.

This work consists of the final shaping and dressing of shoulders, ditches and slopes by machine or hand methods, or both, to the required smoothness, elevation and cross section as shown on the plans or as directed by the engineer.

Shoulder construction should be in accordance with the typical sections and standards included as a part of the contract plans. Check the typical sections and standards for shoulder slope on tangent sections and changes in shoulder slope on super-elevated curves.

The scope of shoulder construction on HMA resurfacing contracts is covered in Section 208 of the SS. In many instances the resurfacing contract provides for increasing the super elevation in the old pavement to comply with current design standards. When this situation is applicable the additional fill dirt for shoulders on the high side of the curve may be obtained from waste or excess trench widening excavation elsewhere on the contract or they may be constructed with borrow if so specified in the contract.

The use of borrow for this purpose is discussed in Section 3 of these instructions. Due to the limited width of the available roadbed it is seldom possible under these circumstances to construct the high shoulder in strict accordance with the standards herein set out. Therefore, a modification will be necessary and this should be discussed with the AE unless the contract is specific with respect to the cross section at these locations. All ditches must be constructed so that they will drain and be free of water pockets. At the ends of cuts it is the policy to flare the side ditches out to prevent ditch water from being spilled onto the fill embankment. Abrupt changes in alignment of side ditches should be avoided and any contemplated changes in ditch alignment or grade should be provided for during grading operations in order to avoid the necessity for major revision of slopes and ditches during the finishing operations.

Slopes shall be uniform and transitions from steep slopes to flat areas shall be such that no abrupt changes or bulges result. It is also the policy to roll back the ends of cut slopes slightly in order to obtain a more pleasing appearance. In finishing the slopes of rock cuts the rock face shall be carefully inspected for loose or overhanging rock that might subsequently fall onto the roadway. All such rock shall be removed.

The amount of work necessary to finish the shoulders, ditches and slopes on a job can be materially reduced if the contractor completes grading operations to the grade and cross section as work proceeds. It is neither economical nor good construction to include in the finishing operations, yardage that could and should have been moved during the grading operations. Should the contractor’s methods result in rough or otherwise unsatisfactory shoulders, ditches or slopes, they shall be corrected by equipment or hand methods.
If during finishing operations surplus dirt develops and it is decided to use such material to widen the existing shoulders, care must be taken to insure that loose material being dumped along the side of the embankment will not result in sloughing. Section 203 of the SS should be used for guidance in the use of excess material to widen existing slopes.
SECTION 16 – APPROACHES

16.1 POLICY AND PERMITS (Rev. 01-21-14)

There are seven types of drives and they are shown in the standard drawings and are designated by class. Those drives that are to be constructed as a part of a contract will be shown in the Approach Table of the plans. In that table, the approaches are described by location and class as well as the length and width of the drive, the radii, estimated quantities of earthwork, and surfacing material. In general, commercial drives, private drives, and field entrances will be replaced in kind.

It is the policy of the Department to replace existing commercial and private approaches and field entrances that are in existence prior to award of a contract. Occasionally private approaches are constructed subsequent to completion of the original survey, but prior to award of a contract. Should there be approaches on your project requiring replacement but not provided for on the plans, determine when such approaches were constructed; and if they were constructed prior to award of a contract, contact the PM and AE. If the Right-of-Way Grant specified an additional approach, the additional permanent Right-of-Way needed does not change any of the permits, and quantities for the construction have not been included in the contract, a Change Order must be prepared. If the additional Right-of-Way was not accounted for, then the AE and PM should be contacted. If they determine permanent Right-of-Way is needed, then work on that approach cannot begin until the environmental document and Rule 5 permit are amended, and the Right-of-Way is acquired. If temporary Right-of-Way is all that is needed, work on that approach cannot begin until a right-of-entry is secured with the property owner.

When an authorized relocation of planned drives or addition of new drives on an active construction contract occurs, and these changes have been documented by a Change Order, no INDOT permit is required. The “as built” plans will serve as the official record of these driveways. This procedure will provide accurate records of driveway additions or changes due to a construction contract.

Any approaches other than provided for in the plans and contract, or authorized by Change Orders, shall be constructed at the property owner’s expense, and then only after having first obtained an approved permit. In the event a property owner desires to construct a drive after award of a contract, he or she shall complete the application process via the Electronic Permit System (EPS). The property owner should contact the district Permit Office for instructions on submitting a permit application. Before any construction can begin on these driveways a permit must be reviewed and approved by the PE/S and the contractor in writing.

Requests by property owners to place pipe, at no expense to the State, in the ditch line across their residence or building frontage for landscaping purposes shall also be submitted to the Permit Section via EPS or hard copy. The property owner should contact the district Permit Office for instructions on submitting a permit application. Before any construction can begin on these driveways a permit must be reviewed and approved by the PE/S and the contractor in writing.
Commercial entrances come under the same general policy as private entrances, although it is the normal practice to detail commercial entrances on the plans. Existing approaches will be revised and channelized to conform to Department standards and recommended changes or additional entrances must be submitted in a Change Order, along with a plan sketch that has been approved by the DTE.

The locations of approaches on limited access highways are established by an official resolution adopted by the Department. Any proposed change in the location of private or commercial entrances will constitute the basis for an amended resolution by the Department.

16.2 LOCATION OF APPROACHES (Rev. 09-28-09)

Any change in location of a driveway or entrance from that shown on the plans, or in the Right-of-Way grant, must be at the written request of the property owner, and then only after approval of the CO and/or DO.

At all intersecting roads, public road approaches are to be constructed and surfaced in accordance with the standards for such approaches. You will generally find that road approaches and intersections are detailed on the plans. Each intersection should be considered individually and if any deviation from the plans or standards is considered necessary, it should be brought to the attention of the AE and PM.

Prior to the construction of mailbox approaches, the PE/S should contact the appropriate local postal authorities to determine the route and direction of travel of the rural mail carrier. Secondly, the PE/S should contact the individual property owners regarding the location of the mailbox approaches. Locating the mailbox in conjunction with a private entrance is advantageous. Combining two or more mailboxes on one approach is recommended whenever feasible; in which case the tangent length in front of the mailboxes may be extended accordingly. By judicious grouping of mailboxes in built up residential areas the frequency of leaving and entering the traveled roadway may be decreased and is conducive to increased traffic safety. Many rural carriers are interested in mailbox grouping and their assistance in this matter should be requested.

16.3 EXCAVATION AND EMBANKMENT (Rev. 09-28-09)

The approach length and earthwork quantities shown in the Approach Table of the plans have been established on the basis of the standards. With respect to Class II, Class IV and Class V drives, these standards provide for desirable embankment slopes of 6:1 in fill and cut sections; and maximum profile grades of 10% in cut and fill. With due consideration being given to mowing, maintenance, traffic safety, and the local terrain and topography, these slopes may be modified after reviewing with the AE.

If the plans indicate a private drive to extend beyond the right-of-way line, normally temporary right-of-way will be provided for construction. However, if temporary right-of-way has not been provided when it is necessary to extend private drives beyond the right-of-way line, a right-of-entry must be obtained from the property owner. The PE/S should contact the PM for assistance in obtaining the right-of-entry. Should the property
owner refuse to sign a right-of-entry, the approach construction must be confined to the right-of-way limits.

16.4 SURFACING APPROACHES ON CONTRACTS (Rev. 09-28-09)

The materials and the construction methods used in the construction of Private, Commercial, Mailbox, and Public Road Approaches are similar, and are covered in the Plans, SS and Standard Drawings.

The length of surface shown in the Approach Table is the distance that the surfacing material may extend from the edge of pavement towards the right-of-way line, unless approved by the AE. When the new approach meets an existing drive within the right-of-way, the surface must be placed only to that point of intersection. Drives indicated in the plans to extend beyond the right-of-way lines will be surfaced to the point of intersection with the existing drive. Approach grades that are modified with the property owner’s written permission will be surfaced only to the limit established by the intersection of the 10% grade with the existing driveway; and any additional surfacing required beyond that point is an obligation of the property owner.
SECTION 17 – CURBS AND GUTTERS

17.1 CONCRETE CURB, INTEGRAL CONCRETE CURB, COMBINED CONCRETE CURB AND GUTTER (Rev. 09-30-09)

Curbing and combined curb and gutter must be constructed prior to paving, unless permission is obtained to do otherwise. Grade lines for top of curb and flow line of gutter should be established as far in advance of construction as possible, reviewed with the AE, and should be approximately parallel with the centerline of pavement. Wherever it is possible, the elevation of the top of curb should be lower than the sidewalk or ground line. Curb and gutter must be constructed in accordance with the contract documents, and the PE/S will insure that positive drainage is established.

If it appears that the elevation of the top of curb will be above the sidewalk or ground line, the AE should be contacted in sufficient time to permit an inspection of the area before construction is started.

Attention must be given to the preparation and compaction of the subgrade, to the setting of forms and forming of joints. Forms that are not straight, free from warp, or of sufficient strength to resist springing when concrete is deposited will be rejected. True lines and grades on the curb or combined curb and gutter are essential to prevent standing water. Rubbing, finishing and curing must be in accordance with the SS.

The upper portion of integral curb may be constructed after the lower portion is completed and cured with the adjacent pavement, provided stirrup bars are used as specified and the surface roughened prior to the concrete curing. The gutter line should be checked with the straightedge after the stirrup bars have been placed in the lower portion of the integral curb to verify there are no irregularities.

Where HMA surfaces are constructed adjacent to curb or combined curb and gutter, the concrete must be adequately covered to prevent marring by the HMA material or by tack.

17.2 HMA CURBING (Rev. 09-29-09)

The material used unless otherwise specified will be as set out in Section 400 of the SS.

The machine used to place the curb is generally an extruding type machine that forces the HMA mixture through a mule/mold conforming to the typical section.

Irregular sections may be formed and the material placed and compacted by hand methods.

Just prior to the placing of the HMA curb, the base must be thoroughly cleaned of all foreign material. If it is found that the curb will not adhere to this base, the base must receive a tack coat, as provided in Section 605 of the SS.

The Contractor will not be permitted to proceed when the material is not extruding to the desired section and density. Any substandard curb will be removed and replaced.
SECTION 18 – ORIGINAL & FINAL CROSS SECTIONS

18.1 ORIGINAL CROSS SECTIONS (Rev. 09-29-09)
Original cross sections must be checked to verify that the plans accurately reflect the existing ground at the time the contract starts. Section 3 of these instructions includes remarks about obtaining original check sections, depending on whether or not the contract has an item for construction engineering. The PE/S should check the original cross sections as outlined in the SS and Section 3.5.

18.2 FINAL CROSS SECTIONS (Rev. 09-29-09)
Taking, checking and plotting of final cross sections should, as nearly as possible, keep pace with the finishing of shoulders, ditches and backslopes. Data collection for final cross sections should be obtained by Department personnel or consultants working for the Department. The contractor’s data may not be used for determining final pay quantities for earthwork.

When taking final cross sections record information such as edge of surface, flow line of pipes, where final section crosses original ground line and any other information that will be needed to give a clear picture after plotting the final cross section.

Start from a benchmark that was established on the original survey and then tie into all original benchmarks which can be located. Record in your notes the elevation computed for the benchmark, also the original elevation. Do not carry elevations ahead, but start at each benchmark by using the original established elevation.

If an error is made in the fieldbook while taking notes, do not erase the error. Instead, cross out the incorrect figure by putting a line through it and place the correct figure above. Check all your notes and make sure they are correct. Take complete sections at all stations and plus stations at which sections were taken on the original survey.

If the last reading out from centerline does not correspond with the elevation by ± 0.2 ft of the original ground as shown by original sections, find the reason and correct it. This will require checking in the field after final cross sections have been plotted. All sections, when plotted on the original sections, must form a closed area. When field checking is needed to close a section make a note on original sections that the section was closed in the field.

Much care should be used in sectioning and plotting final cross sections.

If there has been a line change made, record the offsets from the original line in the notes so that it can be taken into consideration in plotting the final sections.

All notes should be complete, legible and self-explanatory. Each day’s set of notes should indicate the date, weather and names of the crewmembers and their assigned duties.

Remember that your field notes constitute the basis for payment and are permanent official public records for the contract.
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SECTION 19 – MONUMENTS AND GOVERNMENT BENCHMARKS

19.1 MONUMENTS AND GOVERNMENT BENCHMARKS (Rev. 01-21-14)
The subject of monuments with respect to Congressional Township and Section Corners, and any other established corners, is covered in detail in Section 3 of these instructions. To repeat, do not fail to follow the procedure outlined in Section 3 of this manual and take every precautionary step to assure that the Department has fulfilled the statutory requirements with respect to the preservation and perpetuation of established corners.

The Department has an established system of permanent benchmarks within the State. In addition, the following governmental agencies maintain benchmark systems with which you may be concerned:

- U.S. National Geodetic Survey (NGS)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Coast and Geological Survey
- U.S. Army Corp of Engineers
- Indiana Flood Control and Water Resources System

Normally these benchmarks will be revealed by the original survey, and will be indicated on the completed plans. However, there are occasions when a benchmark is discovered in the field that has not been included in the plans. Under these conditions, the following procedure should be followed by the PE/S.

As soon as it is discovered that a benchmark must be moved, contact should be made with the agency involved, stating the necessity for moving the mark and giving its designation. The DCD, AE, DDC, and PM should be copied in this correspondence. The designation consists of the letters and numbers that have been stamped with dies on the disk and it is desirable to furnish a rubbing of this information in the correspondence. A rubbing can be made by placing a piece of medium weight paper over the disk and then rubbing over the paper with the lead of a hard pencil to bring out the legend and designation cast in the disk.

Upon receipt of this information, the agency will provide instructions necessary for the establishment of the new mark and the transfer of elevation. The procedure, in most cases, is to establish the new mark in a safe place nearby and transfer the elevation from the old mark to the new one and all readings are made to three decimal places in order to preserve the accuracy of the original elevation. An assumed elevation for the old mark may be used in the transfer, since we are primarily concerned with the difference in elevation between the old and the new marks. The old mark should not be disturbed until the observer or the recorder has verified the measurements involved in the transfer.

After the new mark has been established and the elevation transferred to it, the old disk should be broken out and returned to the agency if requested. A complete report on the action taken, including a description of the location in which the new mark is established and a copy of the field notes involved in the transfer of elevation should also be forwarded.
SECTION 20 – SODDING, SEEDING AND LANDSCAPING

20.1 SODDING (Rev. 10-01-09)
Sod is generally placed on slopes steeper than 3:1; in front of dwellings with maintained lawns, in ditches with grade of 1% or over, and in areas where mulch seeding will not perform satisfactorily. It should be noted that sod placed on steep slopes must be pegged. The surface on which the sod is to be placed must be of sufficient depth below adjacent areas so that newly laid sod will be level with the surrounding surface.

All soil on which sod is to be laid must be treated with fertilizer as designated in the SS and SP. Sod laid during the months of June, July, and August, is subject to the following conditions:

1. Sod must be in good, live and growing condition at time of cutting.
2. Sod must be placed within 36 hours after cutting and during that period be protected from damage.

Winter sodding will be permitted when the temperature is above 35°F, and when both the sod and soil are not frozen. Sod must be properly protected from drying out and must be laid within 48 h after cutting.

The cost of furnishing and placing fertilizer used in sodding is included in the price per square yard of sod and is not to be paid for as a separate item. Water is not paid for as a separate item unless it is after the initial 30 day maintenance period.

20.2 SEEDING (Rev. 10-01-09)
The primary purpose of seeding is for erosion control and the secondary purpose is beautification. Sections of bare earth and the length of their exposure to erosion should be minimized. Large cut and fill slopes should be stage seeded as soon as they are finished. Taking time to include seeding operations as soon as possible, as often as possible, can help to reduce soil erosion. This should also prevent time lost to redress slopes after rain events.

Temporary seeding is applied prior to permanent seeding as a temporary erosion control feature. This operation is usually done one or more times during the contract as graded areas are completed or nearly completed. This involves the moving in and out of the seeding equipment in a disjointed fashion as opposed to the massive, one time, application associated with the permanent seeding operation.

There are two kinds of seeding, plain seeding and mulched seeding. The only difference between the two is that a mulching material is placed on those areas where mulched seeding is required.

Seeding may be paid for as mulched seeding by the square yard, or as separate bid items for seed by the pound, fertilizer by the ton, and mulching material by the ton. Check the
special provisions for each project, as different projects may require different quantities of seed and fertilizer.

All seeding operations require some inspection to ensure correct quantities, proper mixing of seed, correctly prepared seedbed, and any additional information to make detailed reports.

Fertilizer and seed must be applied with a sufficient amount of water when hydro-seeders are used to ensure a dampening effect, thus yielding a visual means of inspection for even distribution.

Some contractors and subcontractors may experience difficulty in obtaining the specified 12-12-12 fertilizer and request substitutes. The substitutes must be made of a balanced mix, such as 10-10-10. The application rate, however, must be adjusted to compensate for any change. Application of fertilizer will be based on the rate of 800 lb/ac for seeding and 400 lb/ac under sod unless otherwise specified in the contract or otherwise directed.

For example, a change from 12-12-12 to 10-10-10 for 1 acre of seeding would mean the application of \(1\text{ac} \times \frac{12}{10} \times 800 \text{ lb/ac} = 960\) lbs of fertilizer, but only 800 lbs would be paid for. In other words, areas where extra fertilizer is applied, the pay quantity using 10-10-10 would be \(\frac{10}{12}\) of the quantities applied. Accurate records must be maintained of all the fertilizer used and recorded in the contract and project records. The computations converting the total actual quantity used to equivalent ton of 12-12-12 must be shown for the final construction record.

If seeding is to be paid for by separate bid items, it is the duty of the PE/S to see that the amount of seed used is recorded each day and properly reported. It will be permissible to count sacks of seed and fertilizer used each day, and then multiply by the weight of one sack to get the daily record of each. It is best to keep accurate records of all fertilizer delivered to any contract, then deduct the amount of fertilizer used in sodding to get correct quantities for separate pay items used in seeding.

Mulching material is paid for by the ton, so each truckload must arrive on site with a weigh ticket. Representative samples must be taken from the mulching material to determine the amount of moisture in the material. These samples are to be weighed at time of delivery, then re-weighed when the mulching material is dry, to determine the moisture content. To determine moisture, the sample is placed in a large burlap sack and then placed in a suitable location to dry. The number of samples required will depend on the total amount of mulching required, weather conditions and sources of supply. It is the direct responsibility of the PE/S to see that all records are made and samples taken.

It is important to determine that the required amount of mulching material is placed and that it is uniformly distributed over the area. When too much mulch is placed, it is not only wasteful but may retard the growth of the vegetation. Too little mulch will not afford sufficient protective cover for the seed.

Adequate provision for punching the mulch into the soil or for holding the mulching
material in place is likewise important. Unless the mulching material is retained in place, winds or traffic adjacent to the pavement edge will displace it.

There are a number of approved tie down methods that give satisfactory results. The PE/S should discuss with the contractor the proposed method of spreading and holding mulch in place prior to starting operations.

Normally all areas inside slope stake locations not otherwise surfaced or sodded should be seeded. These areas include the radii at the top of cut slopes and bottom of fill slopes.

Plain seeding without mulch must not be done between May 1 and August 15. For permanent seeding performed from October 16 through January 31, the contractor is required to post a warranty bond for those contracts which are to be accepted prior to April 30.

The sodding and seeding work is generally sublet on many construction contracts. You should go over the job with the AE to determine where to place sod and seed well in advance of the contractor starting work on these items.

Be sure that all seed has been tested and approved. Discuss seed requirements with the contractor well in advance of the seeding operation to avoid unnecessary last minute delays.

20.3 LANDSCAPING (Rev. 10-01-09)
Landscaping contracts are to be administered the same as other construction contracts including the same supervisory checks such as weigh tickets, payrolls if minimum wages are applicable, etc. The Office of Environmental Services should be advised of the time and place for all pre-construction conferences so arrangements can be made for a representative of the landscaping section to attend. A careful study of the SS and SP should be made by the PE/S prior to starting work. Alternate sources of planting material to that originally submitted must be approved by prior to use.

Tree plantings and shrubs must comply with the clear zone distance (feet from the edge of the driving lane) policy as outlined in the Roadside Safety Section of the AASHTO Roadside Design Guide. Storage of equipment and materials is prohibited within 30 ft of the pavement edge. These distances are to be considered as minimums and where sufficient right-of-way is available and field conditions indicate more clearance is needed for safety, these distances should be increased.

Lance watering of planted material is not to be allowed. Backfill and mulch are not direct pay items. The backfill material within 6 in. of the plant ball must comply with the specifications and mulch must be placed to the depth and diameter specified. Guying and staking should be done strictly in accordance with the plans and specifications to ensure against damage to the plant, such as rubbing.

Landscape work and procedures are subject to frequent change and revisions. Therefore, the PE/S should refer to revised SS and SP pertaining to his particular contract and be
cognizant of all current instructions. The Office of Environmental Services is available for technical advice and interpretations and should be contacted when help is needed. “As built” plans are to be prepared and retained for all landscape contracts indicating any changes made during construction.

Section 107.01 of the Standard Specifications requires the contractor to observe all State, Federal and local regulations and quarantines pertaining thereto. The regulations and quarantines referred to pertain to various harmful pests such as, but not limited to, beetles. The quarantine applies to landscape plants, soils, sod, and used earthmoving equipment. When these items are moved from a generally infested area into an area that is considered not infested, or only partially infested, a proper permit or certificate must be obtained. Maps indicating the regulated areas are distributed to the DO and it is the PE/S’s responsibility to determine when a certificate is required and that it is furnished. The contractor must furnish material accompanied by the proper certificate or permit when applicable. For material furnished to the contractor by a commercial nursery, the nursery will provide the certificate to the contractor. Out of state nurseries will provide the required certificate by cooperative agreement between the States. For material from a private source such as sod from a farmer, the contractor must contact the Entomology and Plant Pathology Division, IDNR for the location of a State or Federal inspector to secure the certificate, if the PE/S or DO is not able to furnish an inspector’s name.

The PE/S should obtain copies of the required certificates or permits for items, including earthmoving equipment, moved into the non-infested counties, or partially infested counties. These copies should be retained in the project file.

20.4 MOWING AND HERBICIDE CONTRACTS (Rev. 10-01-09)
It is important that the contractor understand the exact areas that are to be mowed or treated with herbicides. This should be discussed and agreed upon at the pre-construction conference. If problems arise with interpretation of the SP, the Contracts and Construction Division should be contacted immediately. The contractor will be notified to begin each mowing cycle by registered mail.

20.5 PLANTS AND SEEDLINGS (Rev. 10-01-09)
The contractor must submit a list with the name and location of the source of plants to the PE/S. The PE/S will forward this list to the Office of Environmental Services, for approval. The plants should not be placed until approved.

The contractor should choose a source for seedlings that is on the List of Approved or Pre-qualified Materials, for immediate use. If the source for seedlings is not on this list, the same procedure will be followed as stated above for approval of plants.
SECTION 21 – GUARDRAIL AND DELINEATORS

21.1 GUARDRAIL *(Rev. 10-01-09)*
When guardrail or delineators are used, they must be placed as shown on the plans and the material must comply with the SS. The policy for the type and location of guardrail is subject to change and the PE/S must be cognizant of the provisions included as a part of the contract plans. Guardrail should never be placed where current policy does not dictate its use as the guardrail itself constitutes a hazard.

The height of guardrail is an important element of its design. For the guardrail to function properly, the PE/S should make sure that the guardrail is placed at the proper height. This height is based on theory that if the shoulders were repaved in the future with 3 in. of material, the resulting height of the guardrail will still meet minimum design criteria. When existing guardrail is to remain in place, the PE/S should check to determine if minimum height standards are met.

After new units (attenuators or guardrail end treatments) are installed, the PE/S should notify the sub-district in the area of the project, providing the type of unit and its location.

21.2 DELINEATORS *(Rev. 10-01-09)*
Normally the construction plans will indicate where delineator posts are to be placed. Usually the locations will be at sub-surface drain outlets, shoulder edge delineation and at hazardous locations such as sharp curves, steep grades or lane reduction transitions. In determining whether delineators should be used, the location of the project and prevailing topography must be considered in determining what would constitute a sharp curve or a steep grade. The spacing for delineators should match those as shown in the *Manual on Uniform Traffic Control Devices*. Any spacing details requiring additional clarification should be referred to the District Traffic Engineer.
SECTION 22 – ADA COMPLIANCE FOR SIDEWALK, CURB RAMPS, BLENDED TRANSITIONS AND PEDESTRIAN FACILITIES

22.1 SIDEWALKS AND CURB RAMPS *(Rev. 12-07-17)*

22.1.1 Regulations
When constructing pedestrian facilities (sidewalk, trail, non-vehicular use facility), the requirements of the Americans with Disabilities Act (ADA) must be met regardless of the project’s funding source. Exceptions to these requirements require a determination of technical infeasibility, issued by the Highway Design and Technical Support Division in conjunction with the Department’s Title VI Program and FHWA. The intent is that technical infeasibility is determined prior to construction.

If the plans do not accurately reflect the field conditions encountered, particularly when curb ramps are involved, the PE/S should work through the AE and the designer to examine alternative solutions. “Doing the best you can” is not sufficient for ADA compliance. The Department’s ADA Technical Advisory Committee can provide technical assistance (ADA@indot.in.gov). If an alternative that meets the ADA requirements cannot be found, the PE/S should have the designer document the alternatives considered and request a determination of technical infeasibility. The Indiana Design Manual (IDM) describes this process. Work should not continue until a determination has been made.

**Indiana Design Manual**
IDM Chapter 51 contains information on the Americans with Disabilities Act (ADA), curb ramp, sidewalk and pedestrian pushbutton requirements. IDM Chapter 17 contains information on curb ramp quantities.

Note: Effective with September 2016 lettings, curb ramps are no longer paid for by a type. Designers should be detailing all curb ramps on the plans.

**INDOT Standard Specifications**
Section 604 Sidewalks, Curb Ramps, Steps, and Handrails
Section 805 Traffic Signals
Section 905.05 Detectable Warning Surfaces

**INDOT Standard Drawings**
604-SWCR Sidewalk Curb Ramps
604-SWDK Sidewalk and Sidewalk Transitions
805-PBBA Pedestrian Pushbutton Assembly

**ADAAG vs. PROWAG**
The 2010 ADA Standards for Accessible Design (2010 Standards) is the current standard for providing facilities that are readily accessible and usable by persons with disabilities. However, the guidelines were developed primarily for buildings and facilities outside the right of way. Pedestrian facilities within the public right of way contain elements to which the 2010 Standards cannot be readily applied. For this reason, the U.S. Access Board proposed guidelines specifically for pedestrian facilities in the public right of way - the
Public Rights-of-Way Accessibility Guidelines (PROWAG). These guidelines are recommended as best practice by the Federal Highway Administration and are currently being evaluated as part of the federal rulemaking process. Once adopted as a regulation, with or without modifications, the guidelines will be mandatory. The PROWAG was used to develop the Department’s ADA transition plan and should be used as the basis for identifying the required curb ramp, landing (turning space), and sidewalk dimensions and slopes.

**Changes from ADAAG to the PROWAG**

Very little has changed from the ADAAG to the PROWAG. The items listed below represent notable differences.

1. The minimum clear width of a curb ramp, turning space, or sidewalk, is 4 feet. A 3-ft pinch point is not acceptable. For sidewalks – where the width is less than 5 ft, a 5 ft by 5 ft passing space is required every 200 ft.

2. The grade (running slope) of the sidewalk may match the adjacent roadway profile grade.

3. A curb ramp running slope of 10% for a 6-in. rise is not acceptable.

4. A sidewalk adjacent to a roadway does not require a landing area or handrail, regardless of the roadway grade.

5. Detectable warning elements must extend the full width of the ramp. Where forming is required, a 2-in. maximum border width may be provided. Only the clarification where a border is necessary is new.

**Changes from previous INDOT practice**

Much has changed from previous INDOT practice. The items listed below represent notable differences.

1. Designers have been directed to fully detail curb ramps on the construction plans. Simply calling out a ramp by type, e.g. Type A, is not acceptable. Spot elevations, widths, and slopes should be shown or tabulated.

2. **There is no construction tolerance for cross slope.** The maximum cross slope is 2.00%. The PROWAG contains exceptions to cross slope requirements for ramps and turning spaces when matching the grade of the adjacent roadway. Designers have been directed to use no more than 1.5% as a design value. Specifications now state this explicitly. A 2-ft level is also identified for checking compliance. *Note: A 2-ft level is not required by PROWAG but was included so that the expectation was clear. Forms should be checked prior to pour to ensure maximum slopes are not exceeded and minimum dimensions are met.*
3. **There is no construction tolerance for running slope.** The maximum ramp running slope is 8.33%. Designers have been directed to use no more than 8.0% as a design value. Specifications now state this explicitly. *Note: A 2-ft level is not required by PROWAG but was included so that the expectation was clear. Forms should be checked prior to pour to ensure maximum slopes are not exceeded and minimum dimensions are met.*

4. The Standard Drawings no longer identify curb ramps by a letter type. They are identified by configuration – either perpendicular or parallel.

5. All curb ramps are paid for as a single pay item Curb Ramp, Concrete.

6. Detectable Warning Surfaces (truncated domes) are paid for separately. The area of detectable warning surfaces is not subtracted out of the Curb Ramp, Concrete quantity.

### 22.1.2 General Construction Notes

1. Sidewalks are usually replaced when they are disturbed or removed during construction. Sidewalks beyond the construction limits, which are damaged by the contractor’s equipment, must be replaced by the contractor at no cost to the State. Construct sidewalks only where shown on the plans unless a change is authorized. Sidewalks built adjacent to curbs should be constructed 1/2 in. above the curbs.

2. Sidewalks placed at drives shall be 6 in. thick or same depth as existing drive, whichever is greater.

3. When reconstructing portions of sidewalk, the joint pattern of new sidewalk should be similar to that of sidewalk to remain in place.

4. Height of a single two-by-four is not acceptable as a form.

5. Forms should be checked prior to pour to insure maximum slopes are not exceeded and minimum dimensions are met.

6. Construct sidewalks only where shown on the plans unless a change is authorized.

### 22.2 CURB RAMP BASICS *(Add. 12-07-17)*

Curb ramps and turning spaces are part of the Pedestrian Access Route (PAR) and must meet ADA standards. INDOT separates curb ramps into component and design elements.

#### 22.2.1 Components

The PROWAG section reference is shown in brackets adjacent the component description below.
1. **Ramp or Blended Transition** [R304.1]. The ramp or blended transition is the portion of a curb ramp that facilitates the change in elevation from the sidewalk to street level. Typically the curb ram cuts through or is built up to the curb. Although similar, ramps to or within buildings are subject to separate requirements [R407].

2. **Turning Space** [R304.2.1]. A turning space or landing area must be provided at the top of a perpendicular curb ramp, the bottom of a parallel curb ramp, and where the pedestrian access route changes direction. It is acceptable for two perpendicular curb ramps to share a common landing.

   **Minimum dimensions**: 4 ft by 4 ft. Where the turning space is constrained by a curb, building, or other feature at the back of the sidewalk, the minimum required dimensions are 4 ft by 5 ft, with the 5-ft dimension in the direction of the ramp run.

   **Quantities**: The turning space in included in the SYS cost of the concrete curb ramp. Where turning spaces overlap, the area should only be included once.
3. **Clear Space [R304.5.5]**. The clear space is provided beyond the grade break at the bottom of a ramp to allow a wheelchair user to maneuver and align with the crosswalk. The minimum required dimensions are 4 ft by 4 ft. The clear space should be level and must be within the width of the pedestrian crossing and wholly outside the parallel vehicle travel lane. The parallel vehicle travel lane is the lane where traffic is traveling parallel to the crosswalk.

The clear space requirement requires particular attention at diagonal ramps and other locations where the ramp run is not in line with the direction of pedestrian travel.

![Clear Space Diagram]

**Quantities**: The clear space is not quantified separately.

4. **Flared Sides and Returned Curbs [R304.2.3]**.
22-6

a. Flared Sides. Required where the curb ramp intersects a sidewalk or other walkable surface.

Maximum Slope: 10.0%

b. Returned Curbs. May be used instead of flared sides where the curb ramp intersects a buffer, sodded area, or other non-walkable surface or where protected from cross travel by landscaping, street furniture, fencing, or railing.

Note: Returned curbs assist pedestrians with low vision with wayfinding. However, returned curbs can also be problematic for snowplows. Returned curb can be eliminated altogether and the roadway curb tapered to be flush at the ramp. Tapering a curb to the roadway elevation does not impact compliance with ADA standards.

Quantities: Both flared sides and returned curbs are included in the SYS cost of the concrete ramp.

5. Detectable Warning Surfaces [R305.1]. Detectable warning surfaces consist of truncated domes aligned in a square or radial grid pattern and must extend the full width of the curb ramp. The designer will show the DWS the full width of the ramp. The Contractor chooses the DWS from the Approved Materials List. Brick DWS will need some type of forming. A 2-in concrete border can encroach into the ramp width, but any additional width must be outside the ramp. A total width of 4 in. should be sufficient for durability purposes. An L-bracket or other means of restraint is also acceptable.

Detectable warning surfaces must contrast visually with the adjacent gutter, street, or pedestrian access surface. Each curb ramp must contain a detectable warning surface except as follows.

Where the cut through pedestrian refuge island is less than 6 ft in the direction of pedestrian travel, detectable warning surfaces should not be placed as there is not sufficient distance between surfaces to distinguish the boundary between pedestrian and vehicular routes.
Detectable Warning Surface full width of the ramp.

Solution 1. DWS may be at bottom of ramp when located less than 5 ft from back of curb.

Solution 2. DWS should be in a radial pattern beyond the ramp when the bottom of the ramp is greater than or equal to 5 ft from the back of curb.

For a shared-use path, the DWS should extend the full width of the path, regardless of the inclusion of a ramp.

Use DWS in a median cut through only when median width is 6 ft or greater. Do not use DWS when width is less than 6 ft - not enough space between DWS to distinguish boundary between pedestrian and vehicular routes.
Design Elements. Design elements are characteristics of the various components. The PROWAG section reference is shown in brackets adjacent to the component description below.

6. **Width** [R304.5.1]. The minimum clear width of a curb ramp (excluding flared sides) or blended transition is 4 ft. The minimum width for a cut through in the median is 5 ft.

   When ramp or blended transition is used with a shared-use path, it is preferred that the width match that of the shared-use path.

7. **Running Slope** [R304.2.2 and R304.3.2]. The running slope of a ramp is measured parallel to the direction of pedestrian travel. Providing the least slope possible is preferred, and there is no construction tolerance.
   - Curb Ramp. Running slope of 8.33% maximum. 8% should be used for design.
   - Blended Transition. Running slope of 5.00% maximum.
   - Running slope of 2.00% or less is considered level.

Where DWS is field cut, particular attention must be paid to ensure the dome spacing is within the allowable range shown on the Standard Drawings.
8. **Grade Break [R304.5.2]**. The grade break at the top and bottom of a curb ramp must be perpendicular to the direction of the ramp run. It may be necessary at corner with a larger radius to indent the grade break from the back of the curb meet this requirement. Grade breaks are not permitted on the surface of the ramp run or within the landing area.

9. **Cross Slope [R304.5.3]**. Cross slope measured perpendicular to the direction of pedestrian travel. The maximum allowable cross slope of a curb ramp, turning space, or clear space is 2.0% with the exceptions below permitted at crosswalks. 1.5% should be used for design purposes.

At a crosswalk, it may be acceptable for the cross slope to exceed 2.0% without a determination of technical infeasibility. See Sidewalk and Crosswalk Basics cross slope information.

*At a street crossing, cross slope of ramp and turning space may be >2% to meet roadway grade. If crossing is signalized or has no traffic control, max is 5%. If crossing is stopped condition, max is 2%. If crossing is a midblock crossing, max is the roadway grade.*
10. **Counter Slope** [R304.5.4]. The counter slope is a slope opposite to the general running slope of the ramp or sidewalk, typically the cross slope of the gutter or roadway at the foot of the curb ramp or blended transition. The counter slope must not exceed 5%. This maximum allows the rate of grade change not to exceed 13% when the maximum ramp running slope is used. Excessive rate of grade change compromise the ground clearance of a wheelchair footrest and may cause the wheelchair to tip.

Where the rate grade change exceeds 11% a 2-ft level area should be provided adjacent the counter slope.

11. **Vertical Surface Discontinuities** [R302.7.2]. Where a curb ramp meets the roadway, the surface should be flush. Along the Pedestrian Access Route (PAR), the vertical surface discontinuity cannot exceed 0.5 in.. Discontinuities 1/4 in. and less can remain. Discontinuities greater than 1/4 in. to 1/2 in. must be beveled.

22.3 **SIDEWALK AND CROSSWALK BASICS** *(Rev. 12-07-17)*

Sidewalks and crosswalks are part of the Pedestrian Access Route (PAR) and must meet ADA standards.

1. **Width.** Minimum clear width of 5 ft. Where a 5-ft clear width is not provided, passing spaces of a minimum of 5 ft by 5 ft must be provided every 200 ft.

Where street furniture, utilities, or other obstructions are
present on the sidewalk, a clear width (measured between obstructions or from the obstruction to the back of curb or sidewalk) can be 4 ft. The minimum 4 ft dimension is for pinch points only and should not be used as a continuous width.

2. **Cross Slope** (measured perpendicular to the direction of pedestrian travel).

   **Sidewalk.** Maximum 2.0%. 1.5% should be used for design. The cross slope requirements still apply where the sidewalk crosses a driveway. The sidewalk cross slope takes precedence over the driveway grade. The driveway approach can be built on a varying grades to ensure the sidewalk cross slope does not exceed 2.0%.

   **Crosswalk**
   - Pedestrian street crossings (crosswalks) with stop sign or yield sign = 2.0% maximum.
   - Pedestrian street crossings (crosswalks) without yield or stop control, e.g. signalized = 5% maximum.
   - Midblock crossing only = Maximum of grade of street or highway being crossed.

3. **Grade** (measured parallel to the direction of pedestrian travel).

   **Sidewalk.** Maximum grade cannot exceed the grade of the adjacent roadway.
   **Crosswalk.** Matches the cross slope of the roadway.
22.4 PEDESTRIAN PUSHBUTTON BASICS *(Add. 12-07-17)*

The placement and configuration of the pedestrian pushbutton assembly is critical to proper function. Engineering judgment is required to determine the optimal installation at each crossing. Variations in curb radius, available right of way, presence of a buffer or curb ramp, and existing infrastructure make each crossing unique.

1. **Placement.** The MUTCD 4E.10 provides guidance on the location of pedestrian pushbuttons. The distance from the nearest face of a pushbutton assembly to face of the curb or edge of pavement should be between 1.5 ft and 6 ft and should not be greater than 10 ft. Although these guidelines are not requirements for ADA compliance, placement that falls outside these guidelines should be documented as a Technical Inquiry with the ADA Technical Advisory Committee. The ADA requirements are relative to access to the pedestrian pushbutton in its final location.

   Where two APS pushbutton assemblies are closer than 10 ft., special features must be included in accordance with IMUTCD 4E.10 and sections 805 and 922.04(b) of the Standard Specifications.

2. **Side Reach.** The maximum unobstructed side reach distance is 10 in. Designers should be mindful of guardrail, curb, or other obstructions that may affect the available side reach. Pushbutton extensions up to 12 in. may be used to meet the requirements.

3. **Mounting Height.** The actuator must be mounted between 42 and 48 inches.
4. **Pushbutton Clear Space.** A clear space, similar to a curb ramp turning space must be provided adjacent the pushbutton assembly.

Minimum dimensions are 4 ft by 4 ft. The pushbutton clear space may overlap a curb ramp turning space. *Be on the lookout for obstructions such as curb, slopes, guardrail, or unimproved surfaces that may obstruct access to the pushbutton assembly.*

![Photo: ADOT](image1)

5. **Actuator.** The actuator must be at least 2 in. in diameter with a tactile arrow and contrast with the housing. Fingertip pushbuttons are not acceptable.

![Photo: FHWA](image2)

![Diagram](image3)
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SECTION 23 – PAVED SIDE DITCH AND RIPRAP

23.1 PAVED SIDE DITCH (Rev. 10-05-09)
If the grade of a ditch is such that erosion cannot be controlled by the use of sod, paved side ditches may be installed. Reinforcement is required for all paved side ditches, cut-off walls, and lugs as shown on the plans. A strip of sod should be placed along each side of paved side ditch to prevent erosion along the edge of the paved side ditch.

If paved side ditch is placed on a steep grade there is the possibility of surface drainage flowing parallel alongside the side ditch causing scour under it. When such condition is likely, lugs should be constructed as shown in the plans with the upstream edge of the lug lowered so that water will be diverted into the paved side ditch.

The spacing of these lugs will depend on the conditions encountered and intervals set out in the standard drawings. On steep grades it is necessary to lower the paved side ditch so that the slope from the pavement to the ditch is greater than the grade of the road. In exceptionally rough country, it may also be advisable to use sections of slopewall or rip rap to contain the water in the paved side ditch or to turn the water into the paved side ditch at the outlet end of a cross-pipe. A short section of flat bottom paved side ditch, at the outlet end of a cross-pipe, has also been successfully used as a settling basin to direct the cross-pipe water into the V shaped paved side ditch.

Compaction of the soil under the paved side ditch is something that should not be neglected. Without the proper compaction, the ground under the paved side ditch could settle and cause the ditch to break up. Any break in the ditch will allow water to flow under and around the paved section of the ditch and create severe erosion issues.

23.2 RIPRAP (Rev. 10-05-09)
Riprap is specified to protect a slope or ditch against erosion or scour where vegetation or other methods would be ineffective or impracticable. Prior to adding large quantities of riprap to a slope, future maintenance of the area to be ripraped should be considered.

There are a number of different types of riprap. The SS, SP, and plan details cover all the types and the material required for their construction. Occasionally, material such as broken concrete or stone is available from within the project right-of-way and may be used for dumped, revetment, class 1, or class 2 riprap. Payment for riprap that is not transported from offsite will be by the square yard and will only happen if the placement locations are not specified on the plans.

It is necessary to place riprap on a stable slope and over an appropriate geotextile for it to be effective. Careful investigation should be made prior to staking out the proposed riprap area to determine the exact locations where it must be placed to be most effective.

When placing geotextile on areas greater than the roll width, good practice is to place the narrow dimension of the geotextile vertically. Essentially the geotextile is rolled down the slope. If it is necessary to lap the geotextile between the top and bottom of the slope, the lower section of geotextile must be under the upper section of geotextile to prevent
water from being able to flow under the geotextile and erode the slope. When placing the
geotextile on a stream bank or ditch the laps should be placed such that the upstream
sections are over the downstream sections. This allows water to flow over the laps like a
shingled roof. In order to keep the geotextile in place, the geotextile must be pinned as
per the SS.

When placing riprap within the clear zone of a project, uniform riprap must be used and
made as traversable as possible. If a potential for riprap to be thrown by vandals exists,
grouted riprap should be considered.
SECTION 24 – RIGHT-OF-WAY MARKERS AND FENCE

24.1 RIGHT-OF-WAY MARKERS (Rev. 10-06-09)
Where new right-of-way markers are called for on the plans, they must be set in accordance with section 615 of the SS. In addition to new right-of-way markers, the plans should also show the number and location of existing markers that need to be reset.

When right-of-way markers already in place are required to be reset, care must be exercised in removing and handling the markers. The markers to be reset must be set in accordance with the specifications for new right-of-way markers.

All markers should be set with the rear face of the marker on the right-of-way line, and should extend 18 inches above the ground. However, discretion should be used when placing right-of-way markers at the edge of lawns. It may be desirable to set them flush with the ground in those areas.

Right-of-way markers must not be placed where the limits of the State’s right-of-way is defined and identified by right-of-way fence. In general, right-of-way markers must define all purchased right-of-way, unless fenced, or otherwise noted on the plans.

24.2 RIGHT-OF-WAY FENCE (Rev. 10-06-09)
Under certain conditions, right-of-way fence is specified on projects at various locations. It is the policy of the Department to place right-of-way fences along limited or controlled access highways for the purpose of denying access to the highway except at designated locations.

There are two main types of right-of-way fencing; one consists of woven wire fabric, otherwise known as farm field fence, and the other is chain link type fence. The type to be used will be designated in the schedule of pay items as Fence, Farm Field or Fence, Chain Link. The SS and the standard drawings cover the details of material and installation for both types. In order to construct either type of fence to the proper grade and horizontal alignment, clearing and grubbing must be performed.

Unless otherwise directed, posts, including the concrete base for posts, must be set in a manner that the entire fence is inside of the right-of-way; and the fence fabric must be placed on the side of the posts nearest to the mainline pavement.

There are locations where it will be advisable to erect the fence on a direct line between two points although the right-of-way may actually project beyond the fence line, such as encountered at some corner cuts or sharp breaks in the right-of-way. Where the fence location deviates from the actual right-of-way, keep in mind that the fence must be located entirely on State right-of-way, and that portion of right-of-way outside of the fence must be identified and marked by placing right-of-way markers at intervening breaks in the right-of-way.

Gaps in the fence at stream crossings or depressions must be determined in the field and the decision to gap or span a crossing will depend on the conditions at the site, keeping in
mind the purpose of the fence. If the stream or depression is of such depth or span that would preclude entrance onto the right-of-way, a gap in the fence may be the logical solution.

Occasionally we find an existing fence, comparable to the fence we propose placing, such as the type installed by some industries or institutions paralleling and directly adjacent to the right-of-way line. Normally under such circumstances we would terminate our fence at the point where the existing fence and the right-of-way coincide, starting our fence again where the existing fence terminates or leaves the right-of-way. In such case, we abut the existing fence but will not fasten our fence to it.

The SS and standard drawings provide for pull posts to be installed at 500 ft maximum intervals in straight runs, and each vertical angle point of 10 degrees or more, while corner posts must be set at each horizontal angle point of 10 degrees or more. For any posts that are set in concrete, the concrete must be allowed to set for 96 hours before materials can be placed on the aforementioned posts.

As early as practicable, the PE/S should review the proposed location of the fence with the contractor, determining the location and extent of all gaps, terminal points, locations necessitating extra length posts, and changes in horizontal and vertical direction affecting material or erection. This review should be in sufficient detail that the contractor may order his fencing material with reasonable accuracy. The PE/S will measure and pay for the actual quantity placed.
SECTION 25 – PROJECTS WITH LOCAL PUBLIC AGENCY INVOLVEMENT

25.1 GENERAL (Rev. 10-06-09)
It is the policy of the Department on all projects located within city limits to contact the local government entities and utilities in writing or in person to explain to them the impact of the proposed work. These initial contacts are normally made during the design phase. A set of plans is also furnished to the local government and utilities.

While it is impractical to locate all underground sewers, utilities, etc. in sufficient detail at the time of the initial survey, all utilities should have been contacted and included in the plans by the time the final field check is held. The contractor should still contact the utility organizations immediately after the notice to proceed and invite them to attend the pre-construction meeting in an effort to determine the final location and elevation of both underground and aerial installations within the project limits. This information must be obtained to properly coordinate the field layout of the proposed work and to enable the utility organizations to know definitely the amount of work that will be required of them.

The PE/S and AE should ensure the local officials are contacted after the contract is awarded to invite them to the pre-construction conference.

More often than not in large cities the grade line, as shown in the plans, often requires minor adjustment. These slight adjustments to meet sidewalks, intersections, reduce property damage, and to obtain satisfactory grades for gutters are typically necessary.

25.2 INTERSECTIONS (Rev. 10-05-09)
Careful study should be given to the grades and drainage requirements at street and alley intersections. In general, where 40 ft width pavements are constructed in cities, the normal crown should be carried through the intersections in the normal width of pavement. The centerline grade should be carried through intersections where the pavement width is greater than 40 ft and adjustments made in the crown. If not addressed during design, a sufficient number of large-scale profiles should be made to ensure the best possible drainage and riding qualities. Grades established for intersections should be inspected and approved by the PE/S before intersections are paved.

25.3 REMOVAL OF LOCALLY OWNED ITEMS (Rev. 10-06-09)
Removal items owned by local government such as brick pavement, sidewalk, curb and gutter, castings, and lighting and drainage structures, remain the property of the local government, if so specified in the proposal or on the plans. The local government agency should be consulted before the contractor removes such items and, if they do not desire to salvage them, they will remain the property of the contractor. Salvaged items will not be allowed to remain within the street limits after the completion of a project, with promises that they will be removed later. Often the SP require removal items to be hauled to a storage yard or to some designated location.

25.4 CLOSURE OF LOCAL ROADS (Rev. 10-07-09)
It is advisable to keep the local government, as well as the local media, informed of closure time and duration on the local roads. This will help foster communication about
the project and allow the local officials to feel like they are more involved in what the Department does in their community.

25.5 USE OF LOCAL ROADS (Rev. 10-08-09)

When the decision is made that a local detour is the best option for the official detour, arrangements should be made with the local street or highway department to videotape the existing condition of the detour prior to the start of construction. Once the reason for the detour is completed, the road should be compared to the videotape to help determine whether or not the roads used in the detour deteriorated with the additional traffic.

Additionally, if a contractor desires to use local roads as part of their hauling route, they must make arrangements with the local agency to videotape the haul route and if the roads along the route deteriorate due to the heavy loading, the contractor should make repairs at no cost to the State.
26.4 GROUND MOUNTED PANEL SIGN SUPPORTS (Adop. 08-10-17)

The W-beam structural steel supports for ground mounted panel signs are designed to meet the 2015 AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. As detailed in the SS and Standard Drawings they are also compliant with FHWA’s eligibility requirements for roadside hardware. Proper installation is necessary for supports to withstand the design wind loadings and to breakaway during impact from a vehicle in such a manner that vehicle occupants have a significantly reduced chance of being seriously injured or killed.

Particular attention should be paid to the following:

1. There should be no perceivable gap between the upper and middle beam sections at the fuse/hinge plate – the allowable tolerance for this fit is 0 to 1/16 in. Also, the fuse plate/hinge plate attachment hardware should be fully tightened to the specification requirements. Excessive gaps and loose hardware results in premature fatigue in the fuse plates which can result in structural failures. The fuse plates are intentionally weakened via the perforated holes - this feature facilitates breakaway performance during impact. Refer to Standard Drawing E 802-SNGP-05 for fuse plate details.

2. The perforated fuse plate must be installed on the front (traffic approach) side of the sign and the hinge plate on the back side for the supports. Refer to Standard Drawing E 802-SNGP-05 for plate connection details.

3. The hardware at the base plate must be properly tightened within the range provided in the specification. The specified torque values are sufficient so that the structure should not “walk-off” the base and foundation but not so great as to prevent the breakaway slip mechanism from engaging when the structure is impacted.

4. The beams must extend through the entire height of the sign; for signs with an exit panel at least one of the beams must extend to the top of the sign. Refer to Standard Drawing E 802-SNGP-02 for beam placement.

Properly installed sign clips allow an even distribution of the forces transmitted from the sign to the beams improving the service life of the structure. See section 802.09(b) of the SS and the Standard Drawings.
26.5 LIGHTING LEVELS (Adop. 08-10-17)
Illumination levels, the amount of light that reaches the pavement, and the Correlated Color Temperature (CCT) can be verified after installation through the use of a Chroma meter. The Office of Traffic Administration has this equipment and may be contacted for this test if needed or desired.

26.6 DURABLE PAVEMENT MARKINGS (Adop. 10-01-15)
As the final, permanent pavement markings are one of the last items to be installed, with most projects they are installed in late fall, if durable markings are specified and the markings will be installed during cold weather the PE/S should be willing to consider alternative materials that are better suited for the prevailing conditions. The District Traffic Office should be consulted before a change of marking material is approved. The PE/S should also keep in mind that the pavement surface needs to be dry for successful application of any marking material. The standard specifications require that the surface be visibly dry but the contractor may also want to perform a pavement moisture test (ASTM D 1461) to verify.

Alternatives that may be substituted for durable markings in late season, cold weather conditions include, but are not limited to, methyl methacrylate (MMA), low temperature water-borne paint, cold weather thermoplastic. Price adjustment, either up (e.g. for MMA) or down (e.g. paint), may be needed with a substitute material.

Consideration may also be given to installing temporary markings (paint, type I tape, 40 mil thermoplastic) and postponing the installation of the final markings until weather conditions are acceptable.
SECTION 27 – NOTICE OF TERMINATION

27.1 NOTICE OF TERMINATION (NOT) (Add. 01-21-14)
Rule 5 requires the permit coverage for all projects to be terminated before final acceptance can be issued. In order to secure approval for permit termination, a Notice of Termination (NOT) form -51514 (available on the IDEM Forms page) must be submitted to the Indiana Department of Environmental Management (IDEM) for review.

27.1.1 NOT Eligibility Requirements
Once construction activity has been completed, the project site owner is required to terminate permit coverage. Eligibility to terminate a Rule 5 permit is based on the following criteria:

- Final stabilization of the entire project area, including removal of all temporary erosion and sediment control measures, has been completed. This includes any individual projects within the development area. All objects should be constructed with no additional land disturbance planned.

  IDEM, in most situations, does not require individual construction sites within a multi-lot project to be permitted separately. The individual lots are permitted through the original project site owner's submittal of the Notice of Intent.

- The project has achieved 70% uniform vegetation density for turf areas.

27.1.2 Procedures for Acquiring NOT Certification
There are three (3) different scenario/contract types that need to be considered when obtaining an NOT.

**Single Signature Contracts:**

The majority of INDOT contracts are contracts that do not entail design/build, either by line item or by total contract. The following steps must be taken by the PE/S for single signature contracts:

**Step 1:**
- The PE/S will notify Environment Services, ES, or district erosion and sediment control, ESC, district coordinator of substantial completion.

- A site visit by INDOT district ESC or ES or appointed representative to review site for problem areas in developing turf and provide recommendations to correct the problems may be needed.

**Step 2:**
- The Contractor and PE/S will evaluate the project and agree 70% uniform vegetation density of permanent cover (turf or other) has been achieved or is close.

- The PE/S will document site conditions by:
- Written statement that both parties agree that the site meets the 70% vegetation density coverage of turf areas.
- Panoramic pictures of turf areas while making sure the least vegetated areas on site are captured (pictures in focus).
- 4 spot pictures from the least vegetated turf areas trying to capture the worst areas.

Pictures should be taken:
- a) Perpendicular to the ground
- b) In a standing position
- c) Using a digital camera (pictures in focus)

Step 3:
- The PE/S notifies ES of their desire to request NOT from IDEM by:
  - Emailing the request to the Storm Water Team Lead, and copying appropriate persons involved with the contract (PM, AE, ESC District Coordinator, etc.)
    - Attach documentation listed above (written statement and site pictures)

- The ES Manager or team lead will make a determination of the site’s compliance with IDEM regulations based on PE/S and Contractor documentation, site visit, and other sources.
  - If documentation fails to confirm compliance then ES will schedule a field review with District Construction and Contractor to discuss work that needs to be completed or considered.
  - If documentation confirms compliance, ES will notify the PE/S and copy appropriate persons involved with the contract (PM, AE, ESC District Coordinator, etc.) of its decision to sign the NOT. ES will send the form on to IDEM for release.

Step 4:
If IDEM rejects the NOT request, ES will set up an immediate meeting with the IDEM representative, Contractor and PE/S to address rejection of NOT and to understand what corrections are needed to be made in order to be in compliance and gain acceptance.

Step 5:
When corrections have been completed, start again at step 3.

Step 6:
If IDEM accepts the NOT request:
- ES will provide a copy of IDEM’s acceptance to the PE/S so final acceptance
of the contract can proceed.

- The Contractor shall remove any remaining temporary erosion control measures and repair any areas damaged during the removal.

**Co-signature Contracts:**

These are contracts are either design/build contracts or contracts with an item for Design/Build Erosion and Sediment Control. The following steps must be taken by the PE/S for co-signature contracts:

**Step 1:**

- PE/S will notify ES of substantial completion.

- Site visit by INDOT district ESC or ES or appointed representative to review site for problem areas in developing turf and provide recommendations to correct any problems.

**Step 2:**

- Contractor and PE/S will evaluate the project and agree 70% uniform vegetation density of permanent cover (turf or other) has been achieved.

- Contractor and PE/S shall document site conditions by:

  - Written statement that both parties agree that the site meets the 70% vegetation density coverage of turf areas.
  - Panoramic pictures of turf areas while making sure the least vegetated areas on site are captured (pictures in focus).
  - 4 spot pictures from the least vegetated turf areas trying to capture the worst areas.

  Pictures should be taken:
  a) Perpendicular to the ground
  b) From standing position
  c) Using a digital camera

**Step 3:**

- The Contractor sends notification to the Storm Water Team Lead of their desire to request the NOT from IDEM by:

  - Emailing a request for determination of the site’s compliance and willingness to sign NOT to the ES Manager and Permit Coordinator. The Contractor shall copy appropriate persons involved with the contract (PE/S, PM, ESC District Coordinator, AE, etc.).
    o Attach documentation listed above (written statement and site pictures).

- The ES Manager or the Storm Water Team Lead will make a determination of
site compliance with IDEM regulations based on Contractor and PE/S documentation, site visit and other sources.

- If documentation fails to show compliance, then ES will schedule a field review with the PE/S and Contractor to discuss work that needs to be completed.
  - When additional work (if required) is completed, start over at the beginning of this step.
- If the documentation confirms compliance, ES will notify the Contractor of its decision to sign the NOT.
  - The Contractor will prepare and sign the NOT form.
  - The Contractor delivers the signed form to ES for signature.
  - The Contractor will then deliver the form to IDEM in order to obtain final compliance.
  - The Contractor will have the document time-date stamped and provide a hard copy to ES.

**Step 4:**
If IDEM rejects the NOT request, the contractor will set up an immediate meeting with the IDEM representative, PE/S and ES representative to address the rejection of the NOT and to understand what corrections needed to be made in order to be in compliance and gain acceptance.

**Step 5:**
When corrections are made the process will start again at the beginning of step 3.

**Step 6:**
If IDEM approves the request:

- The Contractor will provide the PE/S and ES a copy of the NOT response by IDEM so final acceptance of the contract can proceed.
- The Contractor shall remove any remaining temporary erosion control measures and repair any areas damaged during the removal.

**Local Public Agency, (LPA) contracts:**
On local agency contracts you will need to follow the appropriate process based on the type of contract you have (per above). The exception will be that the LPA’s “Person in Responsible Charge” or its designee will fulfill the role of ES.

Please note that if all other work is complete on a contract, but final acceptance is pending the NOT certification, the Contractor may take down permanent signs and bring out temporary signs to complete any needed work at a later date. **Once the PE/S is successful in getting the NOT,** the Contractor may take down the remaining signs and
accept the contract.

**If the project is determined not to meet the requirements for termination of the Rule 5 permit, then the following may need to occur:**

- Report preparation will need to continue until a NOT is obtained.

- The erosion and sediment control devices will need to remain in place in areas where the density has not been attained and in areas where sediment may leave the project or enter waterways.

- If it is deemed that the Contractor performed the work as required by the specifications, then additional costs will be considered for payment.

- Additional costs will be reviewed for payment on a case by case basis. These costs may include, but are not limited to, document preparation on projects that go beyond the completion date for the reason of the NOT, additional seeding or work needed for erosion and sediment control items, etc.

- For unhealthy vegetation areas, soil mitigation measures may be considered by INDOT.

- Costs and potential costs should be discussed with the AE, especially if the magnitude of the costs will be high as INDOT may wish to consider additional options.

- If obtaining the NOT causes contract time to overrun, a time extension will not be required. It is our intent that the time it takes to get the NOT after the completion date be covered by a Final Inspection Time Waiver similar to when extra work is added to a contract at the final inspection.

- When the PE/S receives a copy of the NOT from either ES or the AE, enter it into the SiteManager Correspondence Log and attach a copy of the NOT document to the Correspondence Log.

**27.2 FEDERAL-AID CONTRACTS (Rev. 09-30-09)**

The DCD should take appropriate action to ensure that the FHWA representative receives an invitation to the pre-final and final inspection on oversight contracts.
SECTION 28 – FIELD DOCUMENTATION

28.1 GENERAL (Rev. 01-21-14)
The use of electronic data collection systems is encouraged and acceptable. In the future these systems will become more common place. For now, field books are the standard method of recording original field notes. For other field measurements, field books are not required but desirable.

28.2 ORIGINAL FIELD MEASUREMENTS (Rev. 01-21-14)
The Department has determined that the following procedures are to be followed for documenting original field measurements for SiteManager contracts.

1. Original field measurements for payment should be recorded in the field at the time of measurement in a format that is suitable for inclusion as a permanent part of the Final Construction Record (FCR). Standard Department forms, such as the IC-225 Pile Driving Record, should be utilized as appropriate to record field measurements for specific items. Acceptable formats are the use of full size 8-1/2 x 11 ruled or graph paper that can be punched and placed in a binder for inclusion with the FCR.

2. Entries should be keyed into the SiteManager system directly from the original field measurements. The field notes should then be filed for inclusion in the FCR.

3. When pay quantities are estimated during the contract prior to final field measurement, the use of Inspector’s Dailies or other documentation that will not be part of the FCR is acceptable for making computer entries. As items of work are completed and final field measurements are made and documented as described above, the estimated pay quantity for an item should be adjusted in the SiteManager system as needed to the final pay quantity. A note in the remarks section of SiteManager should be made to describe why an adjustment is being made.

4. Original field measurement documents are to be included with the submittal of the FCR. Documents should be organized and numbered in accordance with the Construction Record Guide and any subsequent directives from the District or Central Office Final Records sections.

The procedures outlined above are intended to compliment other instructions within the GIFE and the Final Construction Record Guide, not to replace them.

Questions concerning documentation of original field measurements should be addressed to the District Final Records Officer. District questions should be addressed to the Division of Construction Management.
28.3 SITEMANAGER DATA ENTRY *(Add. 06-04-14)*

The purpose of these instructions is to establish standardized guidelines for the entry of data into the SiteManager system in order to address efficiency and utilize the system according to its intended design. All current policies and procedures should continue to be followed unless distinctly changed by the following instructions.

28.3.1 Personal Data Entry

All data collected by a Construction field employee will be entered into the SiteManager system by that employee. This allows supervisors to authorize information as intended. Under no circumstances will an employee log in or enter data into SiteManager using a login ID other than his or her own, as agreed to in the Information Resources Use Agreement. An employee’s manager will not enter information into the SiteManager system unless one of the following exceptions exists:

1. A specific individual has been assigned to complete all paperwork for a contract as identified by the corresponding Area Engineer or District Construction Director.

2. An employee’s absence from work is preventing payment being made to the contractor.

Additionally, a Consultant may enter test data for their Sub-consultant that performed the test. In this case, both the Consultant and Sub-consultant must be qualified in the test method that was performed.

28.3.2 Data Entry Timeframes

This policy ensures that information is entered in a timely manner and that the production of payment estimates will not be delayed.

- **Daily Work Reports**
  
  All information regarding contractor activity, personnel, equipment, and pay items will be entered into a Daily Work Report in the SiteManager system by the Project Engineer or Supervisor (PE/S), Highway Technician (HT), or Shared Workforce (SWF) who observed the work within two business days of completion, excluding weekend days and State holidays.

- **Material Sample Information**
  
  All information pertaining to materials produced or supplied on site should be entered into a Material Sample Information in the SiteManager system. If the sample contains test results, it should be entered by the Project Engineer or Supervisor (PE/S), Highway Technician (HT), or Shared Workforce (SWF) who performed the test within two business days, excluding weekends and State holidays. HMA and soil samples taken to Area Labs or District Labs MUST be entered into SiteManager before the sample is transported. If the sample is for a certification, CAPP, or Material List Approval Number, it may be entered by any individual on site and should be completed within ten business days of the material being installed, excluding weekends and State holidays. An exception to this timeframe is a test that requires more than a ten business day waiting time.
before testing is completed, according to the Standard Specifications or Frequency Manual. This ensures that information is entered in a timely manner and expedites the completion of the Final Construction Record.
SECTION 29 – SHOP PLANS & FALSEWORK DRAWINGS

29.1 GENERAL (Rev. 01-21-14)
The Department will allow the Contractor to submit electronic copies of design calculations and shop drawings for approval in lieu of printed copies. Every submittal must include the contract number, contractor’s name, and contact person with contact information. All drawings and calculations should be submitted in the contract units, English or metric. Dual units are acceptable.

For LPA projects, review of all shop drawings and other items listed herein are the responsibility of the LPA or their designated representative with the exception that MSE design calculations and deck pour sequences should be forwarded to INDOT for review as indicated herein. Contractors on LPA projects are to submit shop drawings and falsework plans as directed by the LPA. Once shop drawings for structural members have been approved by the LPA or LPA’s representative, a copy should be forwarded to INDOT as indicated herein. Questions about LPA procedures should be directed to the District Local Projects Administrator.

For design-build contracts, responsibilities and procedures for shop drawing review and approval is typically described in the design-build contract documents.

For State projects, the following procedures have been implemented for submittal and review of shop plans, falsework drawings and related items as described below. Regardless of the submittal process described below, it is the intent that contractors communicate directly with the PE/S to keep them informed of the status of submittals. If the District has any concerns about the structural integrity of any shop plans submitted with a P.E. stamp, they should contact their Division of Construction Management and District Support Field Engineer for further assistance.

29.2 STRUCTURAL MEMBERS & ITEMS (Rev. 01-21-14)
For LPA contracts, shop plans for structural members and items are to be submitted to the LPA or their designated representative for review and approval. Since INDOT is responsible for fabrication inspection of structural members, upon completion of the shop drawing review, the LPA or their representative should forward an electronic copy of the approved shop drawings to INDOT Division of Bridges.

For State contracts, shop plans for the following items are to be submitted by the fabricator or supplier directly to Burgess & Niple, Inc. for review and approval. Shop plans must be in accordance with the applicable specifications. These items do not require a P.E. stamp for submittal.

- Structural steel & structural concrete members
- Modular expansion joints
- S-S joints
- Elastomeric bearings
For submittal process information for Burgess & Niple, contact Joe Foster at joe.foster@burgessniple.com or 317-237-2760. Burgess & Niple will send approved shop plans to the INDOT Division of Bridges for distribution to the District Construction office.

29.3 MSE WALLS *(Rev. 01-21-14)*
Shop plans and calculations for Mechanically Stabilized Earth retaining walls are to be submitted by the contractor or fabricator directly to the designer of record for review and approval. MSE shop plans and calculations must be stamped by a P.E. Upon receipt, the designer should forward an electronic copy of the shop drawings and design calculations to the INDOT Office of Geotechnical Services. Include the contract number as part of the subject line. The INDOT Office of Geotechnical Services will review the design calculations and will provide comments back to the designer for inclusion in the response back to the contractor or fabricator. The designer will continue to provide the final approval of the MSE shop drawings and design calculations. The designer will attach a cover letter and send a copy of approved shop plans to the submitter and to the District Construction office for further distribution.

29.4 SOUND BARRIER SYSTEMS *(Rev. 01-21-14)*
Shop plans and calculations for sound barrier systems are to be submitted by the contractor or fabricator directly to the designer of record for review and approval. The plans and calculations must be stamped by a P.E. The designer will attach a cover letter and send a copy of approved plans and calculations to the submitter and to the District Construction office for further distribution.

29.5 PRECAST CONCRETE CULVERTS *(Rev. 01-21-14)*
Shop plans and design calculations for all precast concrete 3-sided culverts and precast concrete box culverts that have a dimension or design earth cover not listed in Table 1 of ASTM C 1577 are to be submitted to the INDOT Division of Highway Design and Technical Support for review and approval. Shop plans must be stamped by a P.E. The INDOT Division of Highway Design and Technical Support will distribute approved shop plans to the fabricator and District Construction office.

29.6 WELDED WIRE REINFORCEMENT *(Add. 01-21-14)*
Shop plans and design calculations for locations where the contractor proposes to substitute welded wire reinforcement in lieu of the reinforcing bars shown on the plans are to be submitted to the INDOT Division of Bridges for review and approval. Shop plans must be stamped by a P.E. The INDOT Division of Bridges will distribute approved shop plans to the contractor and District Construction office.

29.7 TRAFFIC ITEMS *(Rev. 01-21-14)*
All required shop plans for traffic items are to be submitted to the Department’s Division of Highway Design and Technical Support for review and approval. The Division of Highway Design and Technical Support will distribute approved shop plans to the fabricator and District Construction office.
29.8 FALSEWORK AND TEMPORARY BRIDGE DRAWINGS *(Rev. 01-21-14)*
Falsework drawings for the following items are to be submitted to the PE/S. Each drawing must include the contract number, contractor’s name and must be stamped by a P.E.

- Cofferdams
- Deck Falsework - temporary
- Coping falsework
- Falsework for reinforced concrete slab superstructures
- Falsework for hammerhead pier caps
- Designs for temporary bridges for runarounds

Temporary bridge design submittals must also include design calculations.

The PE/S will review drawings for compliance with the specifications and the specific job conditions only. The Division of Construction Management and District Support’s Field Engineers are available for assistance on any of the above items. Questions should be directed thru the Area Engineer and District Construction office.

29.9 PERMANENT METAL DECK FORMS *(Rev. 01-21-14)*

Shop plans for permanent metal deck forms are to be submitted by the contractor to the District Construction office for review for compliance with the specifications and the specific job conditions only. Shop plans submitted by the contractor must be stamped by a P.E. The Division of Construction Management and District Support maintains a deck form calculation spreadsheet called “METAL DECK FORM CALC w attach” that can assist in review of metal deck forms on the Department’s Y drive under:

Y:\Div.contracts&construction\metal deck form calc

29.10 FOUNDATION SEALS AND DECK POUR SEQUENCES *(Rev. 01-21-14)*

Requests for use of foundation seals not shown in the plans are to be submitted to the Division of Construction Management and District Support for review and approval. The submittal must include the contract number, contractor’s name and indicate the location and dimensions of the seal. The Division will distribute approved requests.

Requests to revise planned deck pour sequences are to be submitted to the Division of Construction Management and District Support for review and approval. The submittal must include the contract number, contractor’s name, indicate the original and proposed alternate sequence and pour rate. The Division will distribute approved requests.

29.11 STREAM CROSSINGS AND WORK BRIDGES *(Rev. 01-21-14)*

Proposals for stream crossings and work bridges for construction traffic are to be submitted to the District Construction office for review and approval. If the proposal varies from any of the contract’s environmental permit conditions, the contractor must either amend the permits or obtain new permits from the appropriate agency.
29.12 MISCELLANEOUS *(Rev. 01-21-14)*

Shop plan submittals for miscellaneous items not covered by the above, i.e. – post tensioning plans, non-standard manholes, etc., should be submitted thru the PE/S. The PE/S should work thru the District Construction office and the Division of Construction Management and District Support to determine the approval process for these items.
SECTION 30 – INSPECTION PROCEDURES FOR RAILROAD FORCE ACCOUNT

30.1 INTRODUCTION (Rev. 10-20-09)
Responsibility for the inspection of the Railroad Force Account (RRFA) work, the review of the work being accomplished to ensure adherence to the agreement and the approval of the railroad bills will be at the District level. The Railroad Team for the District or Central Office (RT) will be available for consultation involving interpretation of the plans, administrative procedures, RT and District instruction procedures, and salvage values.

Outlined briefly herein are the functions which should be performed by the PE/S in making a satisfactory inspection and administration of the Railroad Force Account work.

30.2 AUTHORIZATION (Rev. 10-20-09)
Do not authorize a railroad to begin work until a copy of the authorization letter has been received from the RT.

The existence of an executed agreement in itself does not constitute authority to proceed with the work. The value of any Railroad work accomplished, special materials ordered, or any other cost incurred prior to the date of FHWA authorization will be cited and deducted from reimbursement by the FHWA. This applies whether the mistake in making an early start is the fault of the Railroad or a mistake by a State or local government employee in authorizing the Railroad to start in advance of FHWA approval.

30.3 RAILROAD GRADE CROSSINGS (Rev. 10-20-09)
Prior to receiving bids on a contract, those railroads having grade crossings are advised of the planned highway construction by the RT. However, upon award of the contract, the PE/S, in cooperation with the District Construction Director, must contact the appropriate railroad officials and arrange a meeting on the site. The railroad should always be invited to the pre-construction conference. This may eliminate the need for a separate meeting on the site. At this meeting, the railroad officials should be advised of the Contractor’s schedule of operations. Coordination of the railroad company’s work with that of the road contractor should also be reviewed.

A Railroad agreement will cover all work between our headers and, if applicable, installation of active grade crossing warning devices. The PE/S must give sufficient inspection of the railroad construction work so he can state at its completion, that the work substantially complies with the plans.

Normally, when work is performed by a highway contractor within the railroad right-of-way, or within 25 feet of the nearest track, Railroad Protective Insurance is required. An insurance policy must be received from the highway contractor’s insurer before the notice to proceed will be issued.

Some railroads will adjust their tracks exactly to the planned road grade, and others may have a policy of leaving the tracks slightly high in anticipation of subsequent settlement.
When power-tamping equipment is used to compact the ballast it should not be necessary to make any allowance for settlement, and this method should be encouraged. In either event it is important that the PE/S give the track foreman the necessary exact grade stakes and inspect their work sufficiently to insure a smooth riding crossing. A poor crossing is not only unpleasant, but can result in damage to the adjacent pavement from the impact of heavy motor vehicles.

Sufficient profiles and cross sections should be taken at all railroad crossings in order to lay a smooth grade. Skew crossings and tracks on super-elevated curves are often difficult to meet. Crossings where there are two or more tracks at different elevations should be adjusted to the same elevation, if possible. When the track adjustment is an appreciable amount, the Railroad should make the change as early as possible. In this manner their roadbed will have had an opportunity to become stabilized prior to paving. The final adjustment, if necessary, would then be only minor and the tracks would maintain their permanent elevation. If it appears that the Railroad will be required to lower its track to meet the planned grade, the Project Manager must be notified so that adjustments to the design can be made. It is very undesirable to attempt to lower the grade of an existing railroad.

If a crossing is to be installed as a part of the project work, a copy of the current General Specifications for Construction of Highway Railway Grade Crossings will be included in the railroad agreement. These are to be treated the same as contract specifications for the project. The Scope of the Work Exhibit should be reviewed for any other work to be done at the crossing. Certain pre-manufactured crossing surfaces will be indicated, “to be installed in accordance with the manufacturer’s specifications.” There should be a copy of these specifications on file in the District office and the PE/S should obtain a copy for his use and to be included in the project files.

Become familiar with those sections of the specifications titled “Railroad-Highway Provisions”, Section 107.09, and “Contractors Responsibility for Utility Property and Services”, Section 107.20. Quite often the road contract will provide for placing drainage culverts through the railroad embankment, either by open cut or jacking. Although features of this nature are a part of the Railroad Agreement and have been cleared with the Railroad Company during the design stage, the Contractor is not relieved of his responsibilities as set out in the specifications and contract.

The specifications require that protection arrangements must be approved by the Railroad. It is the PE/S’s responsibility to determine that the Contractor complies with this specification requirement. In addition to the normal procedure for approval of cofferdams at Railroad structures, this requirement for notification to and approval from the Railroad will also apply on construction and maintenance contracts for installation of new grade crossing headers, widening of an existing grade crossing, installation of a pipe under the tracks or any other operation likely to affect the tracks or operation of the railroad. It will not apply on resurface contracts in which the surface feathers into the existing grade outside of the headers and no change is made in the grade crossing.

Notification and approval by the Railroad of said protection arrangements will be
required regardless of whether there is a formal railroad agreement between the State and
the Railroad. On a County or City Federal-Aid project there will be a written crossing
agreement between the county or municipality and the Railroad with the State as agent
and the same specifications apply.

If the minutes of the pre-construction conference document that a Railroad representative
was present to discuss construction involving the Railroad, these minutes will suffice for
notification by the Contractor to the Railroad. However, written approval for the method
of work to be used must be obtained by the Contractor from the Railroad and verified by
the PE/S.

At crossings where active warning devices are to be installed, the Railroad Agreement
will contain the current General Specifications for Installation of Active Warning
Devices at Highway-Railway Grade Crossings. These specifications contain sufficient
information to stake out the location of the signal hardware listed in the Scope of Work
Exhibit in the agreement. When the agreement indicates “Signals”, this may also include
cantilever signals when the number of lanes or restricted sight distance warrant their
inclusion. Normally, the crossing layout in the Force Account Exhibit will show, by
symbol, the use of additional light pairs, cantilevers, and any other equipment to be
installed outside of the control cabinet.

30.4 PRE-CONSTRUCTION CONFERENCE (Rev. 10-20-09)
Where Railroads are involved in a project, it is essential that they be called together to
discuss a workable schedule that will be coordinated with the construction contractor’s
schedule. The Railroad conference should be held in conjunction with the usual
pre-construction conference, and the RT is to be informed of the pre-construction
conference date. The PE/S should prepare minutes of the Railroad conference for
inclusion in the pre-construction conference minutes. Special emphasis should be given
to the review of the existing, temporary, and proposed new location of communication
lines as to possible conflicts with the Contractor’s construction equipment, such as
cranes, backhoes, pile driving equipment, etc. The RT would not know about these
conflicts at the time of the railroad plans formulation or the review of such plans.

Each Railroad company supervisor should be cautioned at the conference against starting
work prior to receipt of proper authority or making any substantial change in the scope of
work without prior approval as previously noted. Failure to get such approval will restrict
reimbursement for such advance or substantially revised work.

A copy of the minutes of the pre-construction conference involving the utility phase
should be forwarded to the RT for their file and use in the engineering review of the
Railroad billings. The proposed scheduled starting dates, anticipated completion dates
and any applicable or intermediate date, must be recorded.

The date the Railroad was contacted regarding starting their work, the date the Railroad
actually started work and any adverse conditions causing delay in the sequence of
operations should be recorded in the minutes. The PE/S should note specific items of
assistance that he or she gives the Railroad such as locating the centerline of the road,
establishing grade stakes in advance of normal staking, etc. A comprehensive review of
the work to be performed should be made at the start of the Railroad Force Account work
unless covered at a recent pre-construction conference.

30.5 INSPECTION (Rev. 10-20-09)
The degree of inspection of Railroad Force Account construction will vary considerably
with the nature and location of the work and the type of contract involved. Judgment
must be exercised regarding the manner and regularity of inspections. This will vary from
spot checks on some installations to detailed inspections of crossing construction and
grade separation projects.

The following items should be noted:

1. Ensure that proposed grade and alignment are according to approved Railroad
   plans and are compatible with the road structures, and construction features, etc.

2. Ensure that proper backfill methods and materials are used where proposed and
   future road surfaces and berms are involved.

3. Be observant for any substantial change in methods and materials from those
   approved, such as the use of sheeting, special backfill, etc. The PE/S should
   immediately contact the Railroad representative to determine whether the
   Railroad or its contractor expects to get extra compensation for doing such work.
   Such a change, if compensable, can be approved by the RT. However, such
   approval must be obtained prior to starting the procedure change.

4. Be sure that the Railroad foreman is familiar with symbols furnished on the
   construction stakes, such as cut and fill information, and that both the Railroad
   and State use the same data.

5. Spot checks should be made to ensure that depths are compatible with highway
   plans, vertical clearance of overhead installations are sufficient to insure proper
   clearance distance from highway structures, and horizontal alignment is
   compatible with construction limits, access lines, etc.

Railroads are authorized, after the PE/S has obtained the verbal approval of the District
Office, to do all necessary work involving minor changes in quantities or additions of
minor items not included in any approved estimate. These changes are those deemed
necessary to accomplish the intent of the approved agreements and do not require formal
approval from the RT. However, adequate documentation and justification of such minor
changes, items of material and work performed, must be attached to the PE/S’s record to
aid the Audit Section in its review.

RT approval must be secured for substantial changes in the scope of work that may affect
the cost, such as a change in width of the crossing, change in elevation of wire, (causing
different length poles to be used), special footage, extra guyng, bracing, sheeting,
dewatering, and changes in location or alignment. In non-emergency situations, the
proposal for such a change must be submitted in writing by the Railroad to the RT, and shall give as much detailed information as practical. Sketches, estimates (if work is being performed by the Contractor, the engineer’s estimate should be made prior to the Contractor’s proposal for same), costs and other documentation should be required and transmitted.

The RT will base its approval, or denial, of the Railroad’s request on the PE/S’s opinion of the necessity or desirability for the change. The request should indicate whether the changes result from (1) unusual field conditions not considered by the designer, (2) changes made by the State’s contractor, or (3) mutual agreement that a change is desirable.

After approval by the RT the RT will send copies of the approved design changes to the District, the PE/S, and the Railroad. The PE/S must inform the Railroad in writing of approval of field changes with a copy to the District and the RT. If timing is of essence, the RT may be contacted by telephone for their assistance followed by a memorandum for the record. In these emergency situations where the RT has been asked for assistance by the PE/S, the appropriate RT personnel will contact the FHWA, review the problem with them and request their concurrence in the change, subject to receiving the above described documentation from the field. The RT will confirm the approval for the record after receipt of the appropriate documents from the field with a copy to the Railroad.

It is recognized that it is essentially impossible to define or otherwise describe the limits of “substantial change” due to variations in cost of work, its complexity, the variable situations, and terrain encountered. It is also undesirable to request RT Section approval for every recognizable change. However, in case of doubt and where appreciable amounts of money are involved, the RT should be contacted for approval as directed above.

30.6 RECORDS (Rev. 10-20-09)

The PE/S’s record for the Force Account work should be kept in sufficient detail to show that the several stages of the work were done in conformance with the plans or scheduling. This record will also be used in preparing the final letter recommending acceptance and payment for the Force Account work performed. The difference in the several methods of payment of the Force Account relocation work results in a difference in the records needed to be kept at the construction level. These are described below:

a. On projects performed entirely by the Railroad with Railroad forces only, the PE/S’s record should include the number and class of employees, major equipment on site, principal materials used and materials removed from the site. Also, pertinent data such as weather conditions, ground conditions, breakdown of equipment, delays due to conflicts with other Railroad forces or general contractor’s operations, should be recorded. Any conversations with the Railroad or the RT should be recorded in the project files.

b. On the few projects where part or all of the Railroad work is being done by a contractor having a continuing contract with the Railroad, the same records are required as in (a) above, unless the agreement clearly established that the work
being done under a continuing contract is on a unit of work basis, rather than a manpower and equipment basis. If it is clearly on a unit of work basis, only the units of work completed per day by the Contractor need be recorded. Records on any work performed by the Railroad’s forces in conjunction with a continuing contract should follow (a) above.

c. On projects being done in part or completely by outside contractors, on a unit of work basis, the record should cover the units of work performed on a daily basis. On projects being done in part or completely by an outside Contractor, on a lump sum basis, the items of recording labor and equipment used by the Contractor can be deleted from the record, except in those instances when extra work performed by the contractor on a per hour or per diem basis is involved. The units of work completed should be recorded daily to form a basis for checking payment to the Railroad for their contractor’s work. This should include such things as the number of poles installed, amount of wire strung, the lineal footage of pipe installed, the length of line removed, the amount of trenching, tons of ballast placed, number of ties laid, length and weight (size) of rail installed or changed, number of crossing sections installed, lineal footage of track resurfaced, or any other work unit.

d. On lump sum agreements, between the State and the Railroad, where the construction work is being done either by the Railroad forces or by the contract method the daily checks on the manpower, equipment, and material can be omitted. However, a detailed review needs to be made at the final Railroad inspection to ensure conformance with the agreement. In these instances the Railroad will be paid the exact amount of the original or duly modified agreement regardless of the actual cost incurred by the Railroad, as long as they have satisfactorily performed all work covered by the approved plan.

e. Records should be kept showing the hours for the Railroad’s inspection personnel with particular emphasis on those not on the Railroad payroll.

30.7 SALVAGE MATERIAL (Rev. 10-20-09)
If salvageable materials are encountered, the PE/S should immediately contact the District Office. The necessity for accounting for all materials removed from the site cannot be overemphasized. The Railroad must have the scrap or salvage materials available for inspection. In the interest of cooperation and liaison with the Railroad, the PE/S should remind the Railroad representative of this requirement since the Railroad will be held responsible for the full value of the item, whether of salvageable quality or not, if it is disposed of without first notifying and getting approval to do so from the Engineer.

The following definitions are provided as a general guideline:

SALVAGE. Materials, which have been recovered from project work by the Railroad or Contractor and are accepted for re-use and return to company storage. The State is to receive reimbursement for all salvage material and said amount shall be credited to
In determining salvage values, the following criteria should be followed: (1) For all materials recovered from temporary project use, the Railroad or Contractor shall give credit to the total project cost, less a depreciation allowance of 10 percent for rails, angle bars, tie plates, and metal turnout materials and 15 percent for all other materials. (2) All materials recovered from the permanent installation will be credited to the total project cost at current stock prices.

SCRAP OR SALABLE. Materials which have been recovered by the Railroad or Contractor from project work and are not acceptable for re-use, however, are salable items and too valuable to junk. If said materials have a net sale value, then the State shall inspect the materials and authorize for sale. The State or the Railroad shall advertise for bids and sell the materials to the highest bidder or allow the company to retain the materials if the company has periodic sales. If sold in a company sale, credit given for these materials will be based on company records of these periodic sales. If lengths or quantities of any materials installed are less than those removed and if such removal increases operating costs to the Railroad, then the amount of credit given to the State may be reduced.

JUNK. Junk is a material that has no salvage or scrap value. Such junk material is to be destroyed by the Railroad under the State’s supervision.

When the custom or practice call for abandonment in place of parts or all of the facility, but such abandonment will, in the opinion of the District representatives, constitute a hazard or liability to the State, the Railroad, the General Contractor, or in the opinion of the Engineer adversely affect the work of the General Contractor, it shall be treated as a substantial change and approval to remove the facility must be requested from the RT. Abandonment in place of rails within the roadway must not be permitted, and their removal will be considered incidental to the project. After approval by the RT, the Railroad should be instructed to remove the facility and the project record shall be noted as to the reason for the change. It is the opinion of the RT, concurred in by the Design Section and the FHWA that in general all pipe 12 in. or less in diameter may be abandoned in place and poles, after being pulled and hardware removed, may be abandoned on the Railroad’s right-of-way. The final decision to abandon, however, shall be the responsibility of the District and/or the railroad concerned.

After a review by the PE/S of recovered poles, pipes, rails, ties, and other material, which the Railroad has declared to be non-salvageable, (non-usable) the material shall be disposed of by the Railroad through invitational bids, if the estimate of value or amount of material warrants such action: otherwise it shall be taken to an established disposal yard, abandoned outside construction limits, or otherwise disposed of and the record noted accordingly. It should be noted that any pipe over 12 in. diameter to be abandoned under tracks must first be adequately filled with sand or other suitable material and the ends plugged with concrete.

30.8 FINAL INSPECTION OF RRFA (Rev. 01-21-14)
At the conclusion of the Railroad work, a final inspection shall be made by the RT in the presence of the Railroad representative and its contractor, to determine conformity with
the approved original or modified plan. The final inspection should be recorded on Rail Crossing Final Inspection Report form 40908 which is available to the RT in electronic form.

When the RT Section is advised by the Railroad that a project has been placed in service, a final inspection meeting is scheduled with representatives of the Railroad, INDOT District Office, and the FHWA.

The following procedure is followed:

A. MODERN ACTIVE FLASHING LIGHT SIGNALS

1. The location and lateral clearance is checked to determine if it complies with the plan and FHWA requirements.

2. The signal assembly, mast, instrument case and battery well are checked to determine if all construction is done in a workmanlike manner.

3. The painting of all units is inspected.

4. The road is driven from both approaches with the flashing light signals in operation to determine if the flashing light units are properly focused.

5. If a train crosses the intersection during the inspection period the time elapsed from the start of flashing operation until the arrival of the train is determined.

6. The lengths of circuits are checked to determine that the warning devices will be in operation a minimum of 20 seconds before the arrival of the fastest train.

7. Note is made of any highway obstructions to the visibility of the flashing signals.

B. MODERN ACTIVE FLASHING LIGHT SIGNALS WITH SHORT ARM GATES

In addition to the above procedure, tests are conducted to determine if the installation complies with the following requirements:

1. Gate arm lights shall operate in conjunction with the highway-crossing signal. The light nearest the tip of arm shall burn steady and the remaining two lights shall flash alternately in unison with lights on the signal.

2. The gate shall start its downward movement not less than 3 seconds after the signal starts to operate.

3. The gate arm shall reach the horizontal position before arrival of any train and remain in this position until the rear of the train has cleared crossing.

4. The bell shall sound a warning from the time the signal lights start to operate
(minimum of 20 seconds before arrival of the train) until the gate arm is in the horizontal position.

5. The gate arm shall return to the $90^\circ$ vertical position.

6. The time of operation from full horizontal position to raised position shall be from 9 to 12 seconds.

7. Two sources of power shall be provided for the operation of the grade crossing warning devices.

8. If the signals are interconnected with traffic signals for railroad pre-emption of the highway signals, the District Traffic Maintenance shall be requested to attend the final inspection and ascertain that the pre-emption is functioning as specified in the railroad agreement. The amount of advance warning time provided shall be recorded on the form 4098 as “Pre-emption time”.

C. ADVANCE WARNING SIGNS AND STANDARD PAVEMENT MARKINGS

Crossing is checked in regard to the following:

1. Pavement markings as shown in the MUTCD shall be used on all paved approaches to Railroad crossings. Such markings are the responsibility of the public authorities.

2. Advance warning signs are usually off the Railroad right-of-way and are properly the responsibility of the public authorities.

30.9 TRANSMITTING RECORDS (Rev. 10-20-09)

The PE/S must keep the Force Account record at the project office until he receives the final Railroad billing from the RT. The record will be used in reviewing the partial and final billings, after which it must be attached to the recommendation for approval letter for final billing. The RT will then transmit the billing to the Contract Audit Section for audit and payment and retain the PE/S’s record in their files.
In this Section, you will find a list of forms or documents that have been referenced to from the various Sections of this General Instructions to Field Employees.

Please use the provided links that are attached to the title of the corresponding form to access the most current version. Note that some forms are available in pdf format and some are editable in doc format.

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