

STATE OF MAINE



Department of Transportation

Construction Manual

Revision of June 2003



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ADMINISTRATION

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FORWARD

000-1 GENERAL

This portion of the Manual provides basic information in terms of personnel policies, procedures and benefits. The last word is not found here. Check with your supervisor, with other units within the Department of Transportation, or with other Departments, as applicable, for more definitive answers.

For further explanation of policies and procedures refer to the following:

- The MDOT Intranet Website, which is the default Internet site for MDOT employees on the network, is located at <http://mdotweb/>. This website provides the latest news and updates and provides links to other pertinent information, such as Free 2000 and MDOT job vacancies.
- The Maine Department of Transportation's Website can be accessed at: <http://www.maine.gov/mdot/> or through the MDOT Intranet Website under Web Links, under MDOT Internet Website. This website provides access to the Department's organizational directory, project and contract information, and product approval information.
- The Official Website of the State of Maine can be accessed at: <http://www.maine.gov/> or through the MDOT Intranet Website under Web Links, under State of Maine Website. This website provides access to information on Maine State Government Agencies and to the State of Maine Intranet.
- Administration Policy Memorandums (APM's) are available on the MDOT Intranet at: <http://mdotweb/apm/apmindex.htm> or through the MDOT Intranet Website under Policy Information under APM Index. It is the employee's responsibility to become familiar with all current APM's.
- Maine State Employee Association (MSEA) and State of Maine Collective Bargaining Agreements (pocket size books) are provided to MSEA members. There are different Agreements for the various bargaining units: Administrative Services; Professional and Technical Services; Operations, Maintenance and Support Services; and Supervisory Services.

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ADMINISTRATION

001-1 GENERAL

The Maine Department of Transportation is organized to plan, design, construct and maintain Transportation Facilities. Highways and Bridges represent the largest portion of responsibility, and comprise the various road systems in the State Highway Network. The Department also provides assistance to municipal highway departments in compliance with Legislative action. The Commissioner is appointed by the Governor and is the chief executive of the Department. The Commissioner subject to the Personnel Laws, appoints the Deputy Commissioner of Policy & Administration, Chief Engineer, and the Chief Counsel. All other employees of the Department are classified State Employees and fall under the State Personnel System.

001-2 PURPOSE

The basic organization plan provides for four major Bureaus, as described below; also the Environmental Office, Office of Legal Services & Audit, Office of Policy Analysis & Communication, Office of Human Resources, Office of Passenger Transportation, and Office of Freight Transportation.

In the organizational structure, the Bureau of Planning does all of the background planning and safety studies required for the entire Department, and takes care of administrative details for the entire Department as well.

The Bureau of Project Development administers Contracts & Specifications, Capital Resources & Performance, Property Records & Process Assurance, Materials Testing & Exploration, and the Arterial, Bridge, Multimodal and Regional Programs. The Programs are responsible for designing and administering the construction of the transportation facilities. The Programs also develop and promote new methods of design and construction, as well as make suggestions to the Bureau of Planning for modifications to material specifications.

The Bureau of Maintenance and Operations maintains state and state-aid highways, maintains bridges, manages state vehicles and equipment, and maintains the radio communications system.

The Bureau of Finance and Administration provides computer services, accounting, budget functions, operation of central supply, reproduction/printing unit, purchasing, and photographic services.

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001-3 DUTIES OF PERSONNEL

1) Resident. Assigned by the Program designees (Construction Support Engineer/Manager or Project Manager), the Resident administers the inspection of a construction project or projects and performs a variety of complex engineering functions relative to the construction project. The Resident interprets and enforces the plans and specifications and is responsible for the documentation of pay quantities and day-to-day development of the project. They assign and supervise the work and activities of Inspectors required for the project, and instruct them in their duties as necessary. They prepare and submit Extra Work Orders or Resident Work Orders as considered necessary within the scope and budget of the project. They maintain a liaison between the Contractor and the Main Office. They act as the Commissioner's representative to the traveling public and to abutting property owners, and settle project issues to the fullest extent possible. A partial list of Resident's duties are as follows:

A) Contract Issues:

- i) Know project scope
- ii) Know contents of PDR & Preliminary Engineering file
- iii) Utilize Team Members, Direct Supervisor, or others as applicable, as a resource and to clarify policy
- iv) Know environmental permitting requirements, including in-stream work windows
- v) Know contents of soils reports
- vi) Know requirement of the project specific plans and proposal book, standard and supplemental specifications, standard and supplemental details, and bid amendments
- vii) Maintain consistency in treatment of all Contractors and interpretation of Contract documents
- viii) Adopt Partnering principles in Contract administration

B) Supervise Resources:

- i) Serve as a coach for subordinate personnel
- ii) Efficiently manage subordinate inspection staff on project(s)
- iii) Delegate responsibility to subordinates to the fullest extent possible
- iv) Contact Direct Supervisor with personnel and hardware needs
- v) Provide performance expectations to, and complete performance evaluations of, subordinates

C) Plan & Execute Quality Assurance Program for Single or Multiple Projects:

- i) Know inspection skills necessary to complete project
- ii) Understand Project schedule in order to effectively utilize available human resources
- iii) Know all current QA specifications and QA sampling and pay adjustment procedures
- iv) Know Minimum Testing Requirements
- v) Assure that proper inspection and documentation is effectively accomplished.

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- D) Financial Control of Project Inspection Costs & "Changes":
- i) Utilize computer skills to access schedules & budgets on network
 - ii) Use budget information to balance budgets within realm of control
 - iii) Estimate required Inspectors and construction administration costs
 - iv) Provide input during project development phase to minimize Contract issues and changes
 - v) Inform Project Managers, Designers or others, as appropriate, of significant project Overrun/Underrun dollar amounts and material quantities
- E) Team Member, Including Field Reviews:
- i) Insure constructibility of proposed project
 - ii) Insure Special Provisions/Pay Items are reasonable and appropriate
 - iii) Insure that work windows vs. advertising dates are reasonable and appropriate
 - iv) Ensure that significant Overruns/Underruns are discussed at the Final Team Meeting and documented, along with lessons learned, in the meeting minutes
- F) Record Keeping & File Documentation:
- i) Maintain and complete project documentation in accordance with Departmental and FHWA policies
 - ii) Complete Contractor Performance evaluation forms
 - iii) Insure all records are complete in accordance with Departmental and FHWA policies and work with Contract personnel during on-site documentation and wage rate reviews
 - iv) Ensure that "lessons learned" are discussed at the Final Team Meeting and documented in the meeting minutes
 - v) Generate Accident Reports of traffic accidents occurring on project during construction; report any accidents involving significant property damage or any bodily injury to Legal Services and immediate supervisor.
- G) Public Relations:
- i) Work with Public (Public Meetings, Clubs, Traveling Public, etc.) as required, explaining project and possible impacts
 - ii) Act as liaison with Public Officials impacted by the project
 - iii) Work with abutters explaining impact and possible resolution of problems
 - iv) Provide information to the media if requested (be brief, tell the truth and do not be afraid to admit that you do not know the answer to a particular question)
 - v) Coordinate with the Department's Public Information Director (John Stanley)
 - vi) Participate in Public Meetings and Public Hearings as needed
- H) Program Awareness:
- i) Provide input on advertising schedules for project groupings

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- ii) Know and understand project life expectancy
- iii) Be aware of overall Program schedule

I) Knowledge of Departmental Policies, Procedures & Guidelines:

- i) Know contents of Construction Manual
- ii) Stay abreast of new and revised policies, procedures and guidelines
- iii) Stay abreast of overall project schedules and budgets, personnel assignments, etc.
- iv) Know current policies on labor compliance items and issues
- v) Be aware of requirements of applicable design manuals and guidelines

J) Additional Necessary Skills:

- i) Organizational
- ii) Computer
- iii) Technical writing

- 2) Chief Inspectors. A Chief Inspector is usually an experienced Inspector who is put in charge of a major phase of a project when several Inspectors are required for that project, or who may be put in charge of several phases of a project to aid in overall coordination of the work. The Resident makes assignments with the concurrence of the appropriate Program designee.
- 3) Inspectors. The Inspector may be any class of Technician or Engineer. Their work assignment will depend on individual capabilities, training, experience and the project workload. Inspector's project assignments are determined by the Resident or the appropriate Program designee, and are dependent upon availability of personnel. Inspectors' duties vary from unskilled checking, counting or simple drafting and computations, to performing quality assurance of survey layout, paving, complex drainage systems and bridge components, to overall administration of small to medium sized construction projects, to Chief Inspector on a complex construction project.
- 4) Fabrication Engineer. The Fabrication Engineer (FE) is a registered professional engineer who is responsible for the supervision of prefabricated structural items made of steel, aluminum, concrete, timber or other materials. The FE interprets the plans, specifications, and coordinates activities to provide for the inspection of these items. The FE manages the Department's consultant services for fabrication inspection, supervises, directs and instructs Inspectors, both Departmental and consultant personnel, at fabrication shops to assure that proper documentation and Departmental policies are observed, and acts as a liaison between the fabricator and the Department. The FE reviews and determines proper action relative to fabrication and precasting issues as they arise. The FE coordinates with the appropriate Program designee to resolve issues, as necessary. The FE also expedites and tracks the approval process of shop drawings and takes appropriate action to obtain, review, forward, approve and distribute submittal.

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- 5) Acceptance Testing Supervisor. The Acceptance Testing Supervisor is responsible for coordinating field testing activities for construction projects in a geographical area. Duties include providing assignments, training, and technical supervision of personnel as well as insuring that Bituminous/Concrete plants and testing facilities are properly inspected. This person is a resource for materials related problem solving and currently serves as the Radiation Safety Officer/Assistant Radiation Safety Officer for the Department. The Acceptance Testing Supervisor is also responsible for a Regional Laboratory with responsibility for coordinating/performing quality assurance for QA projects located within their geographic area. The Acceptance Testing Supervisor is responsible for building maintenance, for insuring that all lab testing is performed in accordance with the appropriate procedures, and that all equipment is properly maintained and calibrated. The Acceptance Testing Supervisor works very closely with testing personnel in the Central Laboratory in Bangor and may direct/train other personnel needed at the "Regional" Lab.

- 6) Survey Coordinator. The Survey Coordinator is the clearinghouse for assigning survey crews for collecting preliminary and final design data, for assigning survey crews for providing initial construction survey layout, and for assigning survey crews to perform QA construction survey, as required.

- 7) Project Review Unit. The Project Review Unit is responsible for insuring that Project records are kept to State and Federal standards. They conduct field documentation reviews, act as a specification and documentation resource, and review and complete Project closeout.

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EMPLOYEE RELATIONS

002-1 GENERAL

The Resident, although skilled in construction methods and having proper authority and responsibility, still must follow certain policies and principles in dealing with people in order to maintain a smooth running project. Usually more can be accomplished by tactful persuasion than by the use of the full authority given the Resident. Residents come in contact with the following people during the normal course of their work:

- a. Other State Personnel
- b. Contractors and their Representatives
- c. Federal Highway Administration Personnel
- d. State and Municipal Representatives
- e. Utility Representatives
- f. Abutters and the Public

The personnel working for the Resident will also interact with the above listed stakeholders. Therefore, it is important that the Residents brief their subordinates in order for them to establish and maintain amicable and businesslike relations with all stakeholders.

002-2 EMPLOYEE MORALE

The person in authority at any level of the organization affects the factor that probably outweighs all others in importance in obtaining proper project control - morale. Carelessness and failure to resist Contractor pressures may result in poor morale on the part of the project inspection personnel. Poor morale may also come from lack of sufficient training. This may prevent the employees from acting with confidence in discussions with the Contractor and to clearly understand their duties and the methods that they may use to secure the Contractor's cooperation in complying with the specifications.

Failure to support field inspection forces when they have acted prudently can be very damaging and seriously affect the quality of work obtained. Project Managers should support Residents and Residents should support inspection personnel by giving them full consideration and hearing when controversial specification or design modifications are sought by the Contractor, or if allegations are made against them by the Contractor. However, the field inspectors have an obligation to be certain that they have acted correctly before seeking support from their supervisors. A supervisory employee who knowingly supports the position of a subordinate who has acted improperly or erroneously could place the Department at risk.

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If the Resident or Project Manager regularly and arbitrarily overrides decisions made their subordinates, decisions that were made correctly using sound and contract-based judgment, then the Resident or Project Manager must be prepared for the resulting consequences -- destruction of the field personnel's confidence, interest and effectiveness. It will take but a few of these instances on the part of the Resident or Project Manger for the Project field team to become ineffective and demoralized. The key to employee morale is communication. It is imperative that decisions by supervisors, and the reasons for them, be communicated through the field personnel to the Contractor. Insistence that proper administrative practices be followed must be a continuous effort. If leadership fails, apathy, laxity and inefficiency occur at the lower levels of the organization.

The delegation of authority and the subsequent reclaiming of such authority can also damage morale. It leaves a question in the mind of the inspection personnel of whether they really have authority and are expected to exercise it, or if certain persons or conditions are expected to receive preferential treatment. Therefore, it is vital for the Resident to be absolutely certain that their subordinate inspectors are capable of handling any delegated authority before it is given to them.

002-3 EMPLOYEE INTEGRITY

Integrity may be defined as the strict adherence to a code of moral values. The Residents and Inspectors must administer the construction of transportation facilities by private contracting firms, paid for by Federal, State, County, and City or Town funds. The main objective is to construct the highest quality facility possible within the terms of the contract. It is, therefore, the responsibility of all employees to conscientiously perform their duties to assure the public of the best use of their tax dollars.

To the employees, integrity must mean doing the "right" thing in all their dealings with the Contractor and the Department.

There may be opportunities for field personnel to use their position for their own personal gain, but the temptation to take advantage of these opportunities must be ignored. Most field personnel work with limited or no direct, continuous, supervision, so it is up to each employee to determine the "right" thing to do, and to act accordingly.

Above all, employees must be honest. This means that they will work the prescribed number of hours daily, will devote all their efforts to their jobs during working hours, and will accurately record and submit their field expenses. Furthermore, the employees must carry out any activities related to expenditure of public funds in a straightforward and accurate manner. They must insist that the Contractor comply with the plans and specifications of the project, or that any changes allowed are for the good of the project and are well documented. If the employee is responsible for determining payments to the Contractor for work performed or

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materials furnished, they must be accurate in the measurement and computation of the quantities, and pay the Contractor only those quantities that are due.

Employees must guard against becoming indebted to the Contractor in any way. They must not accept cash loans, free meals or materials for their own use. If gifts are offered, the employee will tactfully decline to accept. Any gift or favor, however small, and even though given and received in good faith, may appear to the public as a compromise of the trust placed in the employee.

There are certain established functions and gatherings of a social or professional nature to which the employee may be invited as a guest of the Contractor. In those cases when it is felt that it is in the Department's interest, attendance may be approved.

All employees know right from wrong, but must realize that the borderline case will be taken as "wrong" in the eyes of the public. The employee who always follows the "right" course of action will maintain integrity.

002-4 RELATIONS WITH INSPECTORS

The Residents are responsible for their project, and therefore, are responsible for making the best use of the people assigned to them. They must assign these people to duties that will best aid them in managing the project, and must delegate the authority necessary to carry out these duties. Because the Residents are responsible for the basic training of the people under their control, they will have much influence on their future advancement. Probably the most effective way to influence their people is for the Resident to set the proper example in their dealing with the Contractor and their attitudes towards their job and their supervisors. In particular, new state employees will tend to pattern themselves after the first senior employee who they come in contact with.

It is important that the Resident or Project Manager provide written Performance Management expectations for each Inspector when they are first assigned to the Resident. The Resident or Project Manager must complete the Performance Management form on the Inspector's anniversary date, or when the Inspector is reassigned prior to their anniversary date. It is also important that the Resident brief all the people under their control. This briefing should include the technical aspects of the job to which they assign the people and the procedures that they are to follow in their contacts with the Contractor's personnel. They should then follow up by observing their actions. If criticism is required it should be given in private, but if praise is warranted it may do the most good if others are present. To assure advancement and a good all-around knowledge of the construction field, Inspectors should be rotated from assignment to assignment within the project as they become reasonably proficient in each phase. This will increase their usefulness and value to the Department and to the Resident. Rotation also relieves the boredom of a single operation. The Resident and Project Manager should be familiar with each employee's background in order to make assignments within the employee's capabilities, and they should also know something of their personality and temperament in order to make the best assignment.

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The Resident should back their Inspectors when disputes arise with the Contractor. However, there are instances when, in all fairness to the Contractor, the Resident must overrule the Inspector's actions. At these times the Resident must use extreme tact, carefully pointing out the reason for their decision and at the same time giving the Inspector credit for taking the responsibility they felt was necessary at the time. This situation may indicate a need for more complete briefing and closer supervision of Inspectors.

The Resident's attitude toward their own supervisor is important to their development, to the Project, and to the people working under their control. Occasions may arise when the Resident disagrees with the suggestions or decisions of their supervisor. At such times, they should present their own opinions of what is the right action for the Project. If these opinions are not accepted, they should carry out the orders of their supervisor without complaint or resentment. However, if the Resident feels strongly that the resulting decision will be detrimental to the Project, they should escalate their concerns along the appropriate chain-of-command. The Resident's primary responsibility is to the taxpayers of the State of Maine and therefore the Project.

002-5 RELATIONS WITH SURVEY PERSONNEL

Survey personnel, when required, are assigned to construction projects through each particular Program's Survey Coordinator, when requested by the Resident. Survey Party Chiefs are expected to have the expertise to carry out duties requested by the Resident, however, the Party Chief should be fully oriented on any unusual facets of the assignment. Comments or criticisms regarding the crew's work should be directed to the Party Chief or the Survey Coordinator.

Survey crews normally work only 40 hours per week. Every effort should be made not to exceed this time unless other arrangements have been made. If unusual or emergency circumstances necessitate their working outside of their regular hours, their supervisor has the authority to require them to work as necessary. The Resident shall inform their Survey Coordinator as far in advance as possible when requesting crews. Survey crews should only be asked to perform tasks that are in accordance with Departmental policy.

002-6 RELATIONS WITH OTHER DEPARTMENTAL PERSONNEL

All personnel from within the Department are available to solve particular problems that may arise on a project. The Residents may contact a particular Division, Section or Unit, as they deem appropriate. The Resident's project Team, Project Manager, Construction Engineer, or other supervisory personnel may also need to be made aware of any project issue.

Visitors to Projects should inform the Resident prior to arriving on-site as a courtesy. This allows the Resident to rearrange their schedule to give the visitors the time they require.

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002-7 RELATIONS WITH THE CONTRACTOR

The Resident's relationships with the Contractor and the Contractor's employees is a determining factor in the success of a project. This relationship will vary with the personalities involved, but should at least be cordial and businesslike. The ideal relationship would foster a sense of partnering; that the Resident and the Contractor's Superintendent are working together to create a high quality, high value project for the people of Maine. Residents and Inspectors should use care in maintaining their professionalism when dealing with the Contractor's personnel. Personal feelings of like or dislike should not become a factor in Project decisions. The Resident should be able to anticipate potential construction problems in order to avoid issues or, in the case where construction problems caused by the Contractor have occurred, do what they can to aid the Contractor insofar as the specifications and the interests of the State allow. When the Contractor raises questions, the Resident must be diligent in providing answers promptly.

The Department is looking for a quality product. The methods used to accomplish the work, within the specification requirements, are up to the Contractor. Residents should not condemn a new and unfamiliar technique until they have given the Contractor a chance to demonstrate the methods and the results, provided that the methods do not conflict with the specifications. They may, however, warn the Contractor that an untried method will be acceptable only if the end results are as described by the specifications. The Resident or Inspector also must not direct the Contractor's methods or workforce. They may, however, make suggestions to the Contractor on methods that have proven effective in past similar circumstances.

The contract specifications define the Department's and the Contractor's responsibilities for survey layout. It is important that the Department provide the specified survey layout in a timely manner in accordance with the Department's policy.

The Resident should not attempt to induce the Contractor to perform additional work outside the requirements of the Contract without arranging for proper compensation. Nothing promotes good workmanship and straightforward dealings more than the knowledge by the Contractor that they will be fairly paid for their work. Both the Resident and the Contractor must be thoroughly familiar with the Plans and Specifications to know what work is included under the bid items.

If the need arises to perform work that is not covered by the Contract items or Specifications, an Extra Work Order or Resident's Work Order should be considered to establish a reason for the work and a method of payment. Needed changes in design should be ascertained as early in the construction phase as possible. These changes often require major work by heavy equipment. It is important to a Contractor that they be able to plan the scheduling of their major pieces of equipment. This can also be important to the Department, as moving heavy equipment back to a job can be a very expensive operation for which a Contractor might justly claim additional compensation. Remobilizing may be a justifiable cost.

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The Residents, by their actions, should make it clear that, within the prescribed policies of the Department, they are in charge of their particular project for the Department. The authority of the Resident should be emphasized. The "Notice to Proceed" given to the Contractor specifies that all future matters pertaining to the Project are to be directed through the Resident. If the appropriate lines of authority are allowed to be breached, the Contractor will jump over the Resident on every issue on which there is disagreement, resulting in confusion, miscommunication and demoralization on the part of the Resident.

002-8 RELATIONS WITH THE FEDERAL HIGHWAY ADMINISTRATION

The Federal Highway Administration (FHWA) is the agency given the responsibility of supervising the expenditure of Federal highway funds. Its role in the Federal Aid Highway Program is to approve or disapprove the plans, specifications, and cost estimates presented by the Department for each individual project, and, after construction is under way, to see that the Department follows the approved plans and specifications. Upon approval of the plans, specifications and cost estimates by the FHWA, the Department may advertise for bids and sign a contract with the successful bidder. The Department and FHWA then enter into a contract called a Project Agreement, which binds the FHWA to pay its share of the construction costs if the work is done according to the approved plans and specifications. Thus, it can be seen that two contracts are involved in any project: One between the Department and the FHWA and another between the Department and the Contractor.

It should be noted that there is no direct relationship between the FHWA and the Contractor. After the start of construction, proposed changes in design are treated like the original project proposed and may require approval by the FHWA.

At any time during construction, FHWA personnel from Washington, the Regional Office in Albany, New York, or Maine Division office in Augusta, including both engineers and auditors, may review the plans and check the construction and record keeping procedures on projects receiving Federal funds. These inspections may take place at the Augusta office, in the field office, or on the project, or at any or all of these locations. The purpose of inspections by FHWA personnel is to see that the Department, through the Resident, is requiring the Contractor to comply with the Plans, Specifications, and other prescribed procedures included in the contract. It is expected that all Department personnel involved will give their fullest cooperation in this determination.

An Inspection may be only a normal inspection or it may be an "Inspection in Depth". An inspection in depth will probably consume several days in as much as the objective involves a comprehensive determination and evaluation of compliance with the plans and specification requirements. It will cover most, if not all, items on the project, such as progress estimate payments, sampling and testing, and an overall check as to compliance with the specified depths, widths, etc. of the various roadway items, both by actual check measurements, and by a review of inspection practices being used in each individual case.

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Federal policy regarding irregularities or misconduct on Federal highway projects states that Department personnel involved in such will be unacceptable for employment on federally funded projects for periods of 3 months to 3 years. Individuals involved will appear before a hearing board designated by the Federal Highway Administrator. The Administrator will make the final decision regarding action to be taken by the FHWA.

002-9 MUNICIPAL REPRESENTATIVES

The Resident must coordinate and cooperate closely with local government officials. The local officials can often answer many questions regarding Right of Way, Local Utilities and other problems that may directly affect abutters. In many cases, Municipal money is involved. Even if it is not, the Resident must keep in mind that these officers represent the public. Accordingly, most of the suggestions given below in the PUBLIC RELATIONS section are applicable to the Resident's relations with municipal representatives.

It is Department policy to require local participation in Federal Aid projects in Federal Aid Urban areas as follows:

1. 20% of the contract amount for Federal Aid Urban funded projects.
2. 50% of the non-Federal share for Federal Aid Primary funded projects.
3. 100% of the non-Federal share for locally initiated Work Orders.

On all other projects the city or town is expected to pay 100% of the non-Federal share of locally initiated additions and changes that are in the local interest. Not all projects have a City Agreement providing for this. Consequently, Work Orders should be accompanied in all cases by a written request from the local municipality that includes agreement to pay their share of the cost. Residents may provide municipalities with estimates of the cost of the work.

Upon completion of the final review of the project, the Contracts Unit will provide to the Bureau of Finance and Administration a report of all changes and additions requiring billing to the municipality, including a copy of the pertinent Work Orders. The Bureau of Finance and Administration will arrange for the actual billing.

002-10 PUBLIC RELATIONS

The programs of the Department, while developed to benefit the general public, will, at the same time, inconvenience and disrupt the lives of a number of people living near the project. When the Resident arrives on the Project, they may find that the local residents hold them personally responsible for their troubles, so it will be one of their first jobs to gain the respect and confidence of the property owners and local residents. This can be done by explaining the project to interested parties, and by listening sympathetically to individual problems. In some cases temporary or maintenance type work can be done to ease abutter's problems, but the Resident

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must be careful not to promise permanent work that is not covered on the plans. In other cases, the Resident must forward the complaints to higher authority for consideration and possible action. Care must be taken not to favor one property owner over the others along the project. Never let a question, a suggestion, or a criticism go unheeded. Follow through on such matters until the person has a satisfactory answer.

Project personnel are in daily contact with and under the critical eye of the public, and employees are expected to conduct themselves in a manner that will command the respect and confidence of these people.

Courtesy is a prime requisite of every employee. This applies to answering questions and accepting criticism or suggestions. Whenever an employee can answer a factual question, they should do so. Avoid being drawn into arguments, expressing opinions, making statements that can be erroneously construed as being departmental policy and, above all, avoid facetious statements. Wise remarks directed at citizens or tourists may seem hilarious at the moment, but such statements cease to be humorous by the time they reach the Commissioner or the Office of the Governor.

Maintenance of the portion of the construction over which the public must travel is another phase of the work that requires constant attention if good public relations are to be maintained. This means that the Resident must look at their project through the eyes of the public and must make sure that the road is kept smooth so cars will not be damaged, and will be kept moving as expeditiously as possible. Care must also be taken to see that enough traffic control devices are used to make intersections and detours understandable, and the Project must occasionally be checked at night to assure the safety and convenience of the traveling public. It is the Contractor's responsibility to keep drives to commercial establishments and private homes open for use. If it becomes absolutely necessary to temporarily block or cut off a drive, the Residents should satisfy themselves that the Contractor has notified the property owner well in advance and arrangements made for pedestrian access and for owner or customer parking.

The Resident will occasionally be contacted by the local press for a story on the progress of the project. The Resident's comments should be factual and they should refrain from giving their personal opinion regarding any controversial matter. The Resident should refer controversial questions to his supervisor for response. The Department organization includes a Public Information Officer, located in the Contracts Unit, for guidance in publicity matters. When an article originates at the project level, the Public Information Officer should be notified for coordination purposes. Detrimental comments should never be made regarding: The Contractor, the Contractor's operations, local officials, or the Resident's subordinates or supervisors. All information must be given so concisely that it cannot possibly be misinterpreted. A favorable newspaper article can greatly improve the Department's image with the public, but a critical article can cause many problems for the Resident, the Contractor and the Department.

Field inspection personnel are not in the business of helping travelers, however, a few minutes now and then devoted to helping a traveler out of a difficult situation can be valuable from the standpoint of public relations.

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DELEGATION OF AUTHORITY

003-1 CHANNELS OF AUTHORITY AND COMMUNICATION

Within the Bureau of Project Development, each Program has the responsibility of designing and administering construction contracts from preliminary design through delivery of the Project to Maintenance. Each Program's Program Manager delegates certain tasks to their assistants, who further delegate tasks down to the project Teams, which are lead by the Project Manager. Residents and Inspectors are members of their respective project Teams, and should work through the Team on project issues to the greatest extent possible. Policy issues should be brought to the attention of the Resident's/Inspector's immediate supervisor. Each Program provides an organizational calling chart to assist field personnel in answering technical and general policy questions. These regular channels of communication should be followed under all ordinary circumstances. An employee's immediate supervisor may be bypassed only when the supervisor cannot be located and an emergency exists. Even then, regular channels must be followed until someone of responsible authority is reached.

Inspectors are expected to bring to the attention of the appropriate Foreman or the Superintendent any work or procedure that does not conform to the requirements of the Plans and Specifications. However, official orders which must be given to the Contractor will be given by the Resident or by an Inspector who has been delegated the authority by the Resident to issue such orders. These orders will usually be given in writing and will be addressed to the Contractor's Superintendent or other authorized representative. Emergency verbal orders will be confirmed in writing at the earliest opportunity.

It is sometimes necessary for the Resident or other Program designee, such as the Construction Support Engineer/Manager or the Project Manager, depending on the Program involved, to discuss the Contractor's organization, equipment, methods or efficiency with the appropriate representatives of the Contractor.

If issues arise that cannot be resolved amicably at the project level, they should be quickly escalated to higher authority in accordance with the requirements of Section 111 of the Standard Specifications and as clarified by any agreed upon escalation process resulting from Partnering, as applicable.

003-2 SUPERVISION OF EMPLOYEES

It is the responsibility of the Resident to supervise all personnel assigned to the project and to instruct and train these employees in the proper discharge of their duties. The Resident must report infractions of regulations by their subordinates to their immediate supervisor to ensure that appropriate actions will be taken, as described in

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this Manual in accordance with Departmental policy. The Resident must assist the appropriate Construction Support Engineer/Manager or Project Manager in doing written Performance expectations and completed Performance Management evaluations for subordinates. Completion of evaluations shall be done on the employee's anniversary date.

It is the Resident's job to spot check all phases of the work periodically and to check on the activities and performance of their personnel to the extent that they are assured that their responsibilities are being satisfactorily discharged. It is also the Resident's responsibility to see that proper project personnel are on duty as necessary and that sufficient Quality Assurance inspection is being performed to allow the Contractor to prosecute the work without delay to their progress.

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EXPENSES

004-1 GENERAL POLICY

Travel, Per Diem and Meal Policies:

Information on travel, lodging and meal expenses can be found in Administrative Policy Memorandum (APM) No. 191. APM No. 191 can be found through the MDOT Intranet Website, under Policy Information, under APM Index, or directly at: <http://mdotweb/apm/apm191.htm>

Alternately, this APM can be found directly under the MDOT Expense Voucher Menu, under MDOT Travel APM, once an Expense Voucher has been initiated.

In-state Meal & Travel per diem rates can be found on the MDOT Intranet Website, under General Information, or directly at: <http://mdotweb/f&a/perdiem.htm> Additionally, this site has a link to Per Diem rates for other states and countries.

Per Diem Rates for Maine and other States and countries can also be found through the MDOT Intranet Website, under Web Links, under State of Maine Website, under Government, under State Agencies, under Bureau of Accounts & Control, under Travel Page, or directly at: <http://www.maine.gov/bac/Travel/travelhm.htm>

Alternately, in-state per diem information can be found directly under the MDOT Expense Voucher Menu, under In-State Per Diems, once an Expense Voucher has been initiated.

004-2 REIMBURSEMENT

Department policy is to reimburse employees for mileage, lodging and meals or to pay Board Allowance when they are performing official duties at a location other than Official Headquarters, subject to the rules and regulations of the Department based on Executive Order.

Only charges actually incurred by the employee, or charges established by the Department, will be reimbursed. The amounts entered on the Travel/Expense Voucher and signed by the employee substantiate that the charges were actually incurred by the employee in the conduct of his or her official duties.

004-3 CASH ADVANCES AND EXPENSES

- 1) Upon request, cash advances will be made for reasonable and allowable expenses normally incurred while conducting the business of the Maine Department of Transportation.

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- 2) To obtain an expense advance, complete an on-line Request for In-State Travel/Waivers/Cash Advance form, which can be found through the MDOT Intranet Website, under Free 2000 Login, under Travel/Expense, under Travel Requests, under Create New Travel Request. Once the form has been filled out, it must be routed to the employee's direct supervisor.

004-4 CORPORATE CREDIT CARDS

The State shall provide Corporate Credit Cards for those employees who travel as part of their jobs. The Corporate Credit Card shall be in the name of the employee with the State and Agency name affixed. The monthly bill will be the responsibility of the employee, however, any late charges or penalties that result from the failure of the State to reimburse employees in a timely manner will be the responsibility of the State.

004-5 OUT-OF-STATE TRAVEL

- 1) Out-of-state travel requires approval by the Commissioner of Transportation. To receive permission to travel out-of-state and to obtain a travel expense advance, complete an on-line Request for Out-of-State Travel/Waivers/Cash Advance form, which can be found through the MDOT Intranet Website, under Free 2000, under Travel/Expense, under Travel Requests, under Create New Travel Request. Once the form has been filled out, it must be routed to the employee's direct supervisor.
- 2) Travel expenses for which a cash advance has been made are to be recorded on an Expense Voucher form. All outstanding cash advances must be settled each week or within seven (7) calendar days after the completion of travel. A second expense advance will not be made until the outstanding advance has been settled.
- 3) When the total expense is less than the amount of the cash advance, the difference is to be paid by cash, check or money order made payable to "DOT Petty Cash" (do not send cash in the mail) when the expense voucher is processed. When the total travel expense exceeds the amount of the cash advance, the difference will be paid to the employee by a regular expense check.
- 4) Employees on continuous and extended field assignments may request an advance on a weekly basis. The initial advance and each advance thereafter must be settled each week in accordance with Section 2 above. NOTE: If continuous cash advances are expected to be necessary during a continuous field assignment consult with your direct supervisor.
- 5) Reimbursement for lodging and meals will be for the current per diem rates for the city and state in which the expense was incurred.

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004-6 EXPENSES DURING VACATION PERIOD

No reimbursement will be allowed for Mileage, Lodging, or Meals on any days taken as vacation leave. Board Allowance during the time an employee is on vacation status will be reduced by 1/5 of the weekly allowance for each day vacation is taken.

004-7 EXPENSES WHEN SICK

If an employee is sick during the week, and expects to return to work prior to the end of the week, the employee may remain at the Project living quarters and be reimbursed for reasonable meal and lodging expenses incurred. Reimbursement for mileage, lodging or meals will not be allowed for a full week while the employee is in a non-work status. In those cases where travel expense during the time the employee is sick is allowable, the expense charges are to be coded to the project to which the employee is assigned.

004-8 SUBMISSION OF VOUCHERS

Expense Vouchers are to be submitted weekly. If it becomes necessary to submit 2 weeks of expenses at once then the expenses must be submitted on one voucher with the week ending date being for the second week. Do not submit separate vouchers if preparing them on the same day.

004-9 LODGING AND MEALS

When employees are in overnight travel status in the performance of their duties they will be reimbursed for lodging and meals for the current per diem rates for the State of Maine. Meal amounts include taxes and gratuities. Noon meals are not allowed unless they are provided as part of an organized meeting for which a registration or tuition fee is charged or the employee is in overnight travel status.

004-10 EXPENSE VOUCHER INSTRUCTIONS

The on-line expense voucher form is located on the MDOT Intranet Website, under Free 2000, under Free 2000 Login, under Travel/Expense, under Expense Vouchers. To initiate a new voucher, click on Create New Expense Voucher. Although this form is largely self-explanatory, please note the following:

- 1) Before Finance & Administration's Payroll Section can approve expense vouchers for payment, the corresponding receipt or receipts, if required, must be in their possession. Therefore, receipts must be submitted to the Payroll Section as described in 6), below.

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- 2) If the employee wants to have expense checks mailed to their home or direct-deposited, they must contact the Payroll Section to initiate this process. Once this has been done, the box entitled "Return Check to MDOT" should be left blank, and no location for check delivery should be indicated.
- 3) Coding must be correct. Please consult with your direct supervisor with any questions about coding.
- 4) Travel Miles are those miles from the employee's home or headquarters to the project and back; Project Miles are those miles traveled when the employee is on the project. Do not use ½ miles, round up to the next mile.
- 5) The Misc Mileage-Related Expenses column under the Mileage Section is to be used for the reimbursement of tolls, parking fees, taxis, buses, trains and shuttles. The Misc columns under the Meals/Misc Section are to be used for non-mileage related expenses. Emergency purchases of equipment, supplies or other miscellaneous expenses, incurred and required for official business purposes, are allowed only when necessary and the nature of the expense is clearly, fully and satisfactorily explained. Miscellaneous emergency items eligible for reimbursement of up to \$20.00 include, but are not limited to, the following: keys, calculator batteries, postage/stamps, cost to fax or copy documents, film & film developing (acquisition of film and developing of film should be done through the Department's Photo Lab as much as possible). It must be noted on the receipt that it is an emergency purchase.
- 6) Supporting receipts are required to be submitted to the Payroll Section of Finance & Administration for:
 - A) All lodging charges
 - B) Evening meal exceeding \$8, including gratuities
 - C) Miscellaneous mileage-related expenses or emergency expenses in excess of \$5.00
 - D) Any extraordinary or unusual expenses

These receipts must be taped to a plain white 8 1/2" x 11" sheet of paper and scanned into the Transportation Electronic Document Organization Control System (TEDOCS). Receipts should be scanned after the electronic voucher has been submitted so that the Document ID will be known. Prior to scanning a receipt, the employee must put their name, Social Security number and the Document ID on the receipt. There are often vouchers sitting in the FREE 2000 system that cannot be paid for lack of scanned invoices or documents that have been labeled incorrectly. Therefore, employees should check Free 2000 periodically to verify that vouchers have their scanned documents attached. If they do not, it is imperative that they be scanned into TEDOCS as soon as possible. Contact the office support personnel for scanning assistance.

Any questions about receipts should be directed to the Payroll Section of Finance & Administration.

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- 7) Scanning of Expense Voucher receipts. The following procedure has been established to provide employees and organizational units who are scanning expense account receipts a uniform and consistent methodology for indexing:

GENERAL:

- A) All required receipts associated with travel, lodging and meals are to be scanned immediately after completion of the FREE 2000 Expense Voucher.
- B) Receipts should be retained for five business days to assure that the server backup is successful.
- C) Do not forward scanned originals or copies to the Accounting Services Division of Finance & Administration. They will retrieve data from TEDOCS for pre-audit and reference. If the employee or their office does not have the ability to scan, forward receipts to the Accounting Services Division. Receipts must be referenced with the FREE2000 Document ID number and the traveler's name and Social Security number.

INDEXING:

- A) All titles in red on the profile screen must be completed for all documents. For travel expense receipts, enter the following data:
 - i) Subject Matter- Enter PV and the number generated by FREE 2000.
(Example: PV17ATR000173341).
 - ii) Author-Enter traveler's name. Use drop down box.
 - iii) Document Type-Always enter #15 (Financial Document).
 - iv) Document Date- Week ending date of travel expense voucher.
 - v) OUC- Organizational unit code of traveler.
 - B) No additional fields need to be completed for travel expense receipt indexing.
DO NOT INDEX SOCIAL SECURITY NUMBERS.
 - C) Access Control-Secured Documents: Disregard this field for travel expense receipts.
- 8) Per Diem rates must be accurate (rates can be found on the MDOT Intranet, as noted above). Use the established rates for the appropriate county. Per Diems may need to be prorated, depending on the hour of departure on the first day and hour of return on the last day of the trip. These departure/return times must be recorded in the Overnight Trips Only column of the Meals/Misc Section of the Expense Voucher.
- 9) When requesting reimbursement for meals when in non-overnight travel status, justification must be provided for each meal reimbursement request. This information must be recorded in the Meals columns of the Meals/Misc Section of the Expense Voucher and includes: The meal for which reimbursement is requested; the reason for the request (in work/travel status 2 hours before or after the core working hours); the work start/end times; the hours worked; and the meal amount. Eligibility for reimbursement for breakfast and evening meals are based on the following:

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- A) The core work hours are from 7:30 a.m. to 4:30 p.m. (1 hour for lunch).
 - B) Reimbursement for meals will be allowed when the employee is in work status (combination of work and travel time) a minimum of two hours before or two hours after the core work hours.
 - C) A maximum of one hour of travel time, one-half hour traveling to work from the employee's Official Headquarters or one-half hour returning to the employee's Official Headquarters from work, is allowed to be included in the two-hour period before or after the core work hours.
 - D) If requesting reimbursement for a breakfast meal, the employee must have left their Official Headquarters before 5:30 a.m. and work a minimum of 10 hours.
 - E) If requesting reimbursement for an evening meal, the employee must have worked a minimum of 10 hours, and arrived at their Official Headquarters after 6:30 p.m.
 - F) Lunch meals are not reimbursable for non-overnight travel.
- 10) The Lodging Section is for hotel, motel or other alternate lodging expenses. When making lodging arrangements employees should always request the Government Rate. Employees will be reimbursed for actual lodging charges up to the maximum amount allowed according to the published rates. The published rates exclude all taxes and are not to be exceeded without prior approval. In order to receive reimbursement for lodging, an original receipt must be submitted to the Payroll Section of Finance & Administration, as described in 6), above. The lodging receipt must have the name and address of the establishment at which the employee stayed, the check-in and checkout dates, and the amount paid for the room. If the receipt does not have all the required information imprinted on it, write it in and have the clerk sign the receipt. If the employee happens to stay in a location where the lodging is supplied at no cost to the employee or the State, please make a notation of this information on the expense account- this will enable the employee to claim Per Diem meals.
- 11) If the employee wants to save the changes to a particular electronic expense voucher, the name in the "Please Route To" box should be the employee's name; if the employee intends to sign the voucher for submission, the name in the "Please Route To" box should be the employee's direct supervisor.

004-11 SPECIAL CONSIDERATIONS FOR FOREIGN EXCHANGE RATES

If employees are traveling out of the country and using a foreign exchange rate, the following tips will speed up the processing of Expense Vouchers:

- 1) For meals, the breakout is as follows:

20% for Breakfast

20% for Lunch

55% for Dinner

5% for Miscellaneous Expenses

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If attending a seminar or conference and meals are provided, subtract the appropriate percentage associated with that meal.

- 2) If paying lodging by credit card, it is advisable to wait until the credit card statement is received so that an accurate exchange rate can be determined. If not wishing to wait until the statement is received, the credit card company can be contacted for the US Fund amount charged to the credit card (the name and phone number of the contact person should be included on the voucher). List out the amounts charged and determine the appropriate exchange rate for each bill. For example, if the travel destination is in Canada:

Phone charges:	\$ 25.00	Canadian
Room charges:	\$442.00	Canadian
Fax charges:	\$ 12.50	Canadian
Total:	\$479.50	Canadian

If the bill for \$479.50 Canadian Funds was charged as \$279.47 US Funds, the exchange rate is 0.582836 ($\$279.47/\479.50). To arrive at the charges to be included on the Expense Voucher, apply the exchange rate to all the charges:

Phone charges:	\$ 25.00	Canadian	0.582836	\$ 14.57	US funds
Room charges:	\$	Canadian	0.582836	\$ 257.61	US funds
Fax charges:	\$ 12.50	Canadian	0.582836	\$ 7.29	US funds
Total:	\$	Canadian		\$ 279.47	US funds

The above example shows phone charges. In all cases, every effort should be made to use phones using a Department issued telephone credit card. This is due to the high cost that is usually incurred by using the hotel/motel telephone service.

- 3) Exchange rate used and the transition from the foreign currency to US funds must be shown on the Expense Voucher. The actual credit card statement is not required, providing the name and phone number of the contact person from the credit card company is included. The actual lodging bills are required to be submitted.

If there are any questions regarding exchange rates for Expense Vouchers, please contact the Payroll Section for guidance.

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GRIEVANCE PROCESS

Step 1 (Oral)

Grievances must be submitted by the employee orally to their Immediate Supervisor within 15 workdays after the employee becomes aware, or should have become aware, of the Act or Omission.

The Immediate Supervisor has 10 workdays to resolve the grievance.

Step 2i (Written)

If not resolved, the Grievance may be submitted to the appropriate Director/Bureau/Division Head, in writing, within 10 workdays.

The Director/Bureau/Division Head must respond, in writing, within 10 workdays.

Step 2ii (Written)

If not resolved, the Grievance shall be submitted to the Commissioner of DOT, in writing, within 10 workdays.

The Commissioner (or designee) must respond, in writing, within 10 workdays, or within 15 workdays if a meeting is held.

Step 3

The Grievance shall be submitted to the Bureau of Employee Relations (BOER) within 10 workdays.

The BOER makes the decision within 15 workdays, or within 10 workdays if a meeting is held.

Step 4

The Grievance is submitted for Arbitration within 15 days. Grievances involving discharge of employees have priority.

Reference: For detailed procedures, refer to the current collective bargaining agreement between the State of Maine and the Maine State Employees Association.

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INFRACTIONS OF RULES, REGULATIONS AND POLICIES

006-1 GENERAL

Occasions will arise when it is necessary to counsel an employee that there has been an infraction of a rule, regulation, or policy. This may mean a rule as set forth by the Office of Human Resources, a regulation or policy established by the Department, or a provision of the Collective Bargaining Agreement.

Resolution of infractions will be in accordance with Civil Service Regulations and current Collective Bargaining Agreements.

Disciplinary Action shall be limited to the following: Oral Reprimand, Written Reprimand, Suspension, Demotion, and Dismissal. The principles of progressive discipline shall be followed.

Any employee suspended without pay, demoted, or dismissed, may initiate appeal of such disciplinary action at the department or agency step of the Grievance and Arbitration Procedure within 15 working days after the employee becomes aware of the disciplinary action.

Any employee suspended, demoted or dismissed has the right to meet with the disciplining official (appointing authority) prior to the action being taken.

REFERENCE: Current Collective Bargaining Agreement Article between the State of Maine and the Maine State Employees Association.

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PERSONNEL POLICIES AND RULES

007-1 ALTERNATE WORK SCHEDULE PROGRAM (FLEXTIME)

- 1) Alternate work schedules, while assigned to the Augusta or a Division Office, may be implemented only to the extent that they do not substantially interfere with a Unit's or Program's mission or function.
- 2) Each Unit or Program in the Augusta Office of the Bureau of Project Development shall provide coverage by one or more supervisory employees available to answer inquiries, etc. from 8:00 a.m. to 11:30 a.m. and from 1:00 p.m. to 4:15 p.m., Monday through Friday. Telephone coverage should generally be provided between 8:00 a.m. and 5:00 p.m.
- 3) Supervisors are encouraged to provide maximum flexibility to their employees consistent with items 1 and 2, above.
- 4) Employees are expected to recognize that their work schedule choices may be limited, based on items 1 and 2, above, and that their supervisor is responsible for the determination of what limitations apply.
- 5) His or her immediate supervisor must approve each employee's work schedule. The frequency with which employees are allowed to change their work schedules depends upon the coordination requirements of the Unit or Program involved. In some Units/Programs, supervisors may permit employees to change schedule each pay period; in others, supervisors may require employees to work the same schedule for a substantial amount of time. The supervisor prior to the start of a pay period in which they apply must approve revised schedules. Minor deviations from approved schedules may be permitted by the supervisor to meet temporary individual needs.
- 6) Each employee must put in a combination of hours worked, holidays taken, and various other leave taken, totaling 80 hours in each two-week pay period. Employees who are hourly paid cannot work more than 40 hours per week when working flextime.
- 7) Each paid holiday is equivalent to eight hours of working time.
- 8) Core hours are 9:00 a.m. through 11:30 a.m. and 1:00 p.m. through 3:00 p.m. Time not worked during core hours must be charged to one of the leave categories. Leave is subject to the supervisor's approval. Unit/Program heads may approve exceptions to core hours when justified by unusual circumstance. In the case of compressed schedules, days off may occur any weekday subject to the supervisor's approval.

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- 9) Employees working flextime shall work no longer than 10 hours per day and work hours shall not begin before 6:00 a.m., or end after 5:30 p.m., unless specifically authorized.
- 10) No work shall be performed on Saturdays, Sundays, or holidays unless specifically authorized.
- 11) Lunch breaks are not counted as time worked and each workday must include at least a half hour lunch break.
- 12) Two fifteen-minute break periods may be taken per day and are counted as time worked. Break times need not to be shown on the work schedules.

007-2 COFFEE BREAKS

Department policy allows two rest periods (coffee breaks) of 15 minutes each, one in the A.M. and one in the P.M. Time required in getting to a source of coffee and return is included in the 15-minute period. Department cars are not to be used to obtain coffee nor will mileage be paid for the use of private cars to obtain coffee. The time limitation will not permit most field personnel to travel to a restaurant or coffee shop. Coffee may be carried from home or other establishments, providing this will not exceed 15 minutes. Personnel who pass a restaurant in the course of performing their assigned duties may stop for a coffee break. However, it should be kept in mind that several Department-owned vehicles parked at a restaurant, or large numbers of Department personnel engaged in a coffee break at a public place, during working hours, leaves an unfavorable impression on the tax-paying public.

007-3 RESPONSIBILITY OF CRIMINAL DRUG STATUTE VIOLATION

Any employee who is convicted of a criminal drug statute violation occurring on the job or in the workplace shall notify his or her employing agency no later than five (5) days after such conviction. Each State agency receiving federal funds shall notify its federal funding agency within ten (10) days after receiving such notification. Upon notification of a conviction it shall be the responsibility of the employing agency to terminate the employee.

It shall be the responsibility of all State agencies and departments to work with the Bureau of Employee Health & Benefits, labor unions and other organizations to:

- 1) Advise and inform employees of the dangers of drug and alcohol use and abuse on the job or in the workplace.
- 2) Advise and inform employees of the Employee Assistance Program and rehabilitation services.

It shall be the responsibility of each employee to abide by the terms of this work rule.

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007-4 EQUAL OPPORTUNITY/AFFIRMATIVE ACTION

The Department is an Equal Opportunity Employer and practices affirmative action to overcome imbalances in its work force based on gender, race or handicap status. There are specific policies and policy statements regarding this standard posted on all bulletin boards. Further information on Civil Rights issues is available from the Office of Human Resources, at 624-3050.

007-5 NEW EMPLOYEE INTRODUCTION

The supervisor to whom a new employee is assigned shall discuss the following general information with them and impress upon them that any questions that they have are valid and should be asked:

- 1) The information provided in "Hiring", below.
- 2) Department and Unit/Program Organization charts.
- 3) Instructions regarding the making out of Salary and Expense vouchers.
- 4) Rules and Regulations regarding the use of vehicles, both State and private.
- 5) General Instructions regarding the Construction Manual.
- 6) Plans and Specifications in general.
- 7) Political Activities (both Federal and State Policy).

The supervisor of a newly assigned employee shall discuss the following detailed information with them:

- 1) General description of job duties, as required.
- 2) The Project description.
- 3) Specifications, in detail, for those items with which the new employee will be involved.
- 4) Construction practices for those items with which the new employee is to be directly involved.
- 5) Testing procedures for materials with which the new employee is to be directly involved.
- 6) That they are not to directly concern themselves with the work, other than the work to which they are specifically assigned.
- 7) That they should immediately report any infractions, unusual conversations or difficulty of any kind.
- 8) That any measurements or quantity data shall be reported daily.

The supervisor shall write a job Assignment Letter to the employee. New employees shall not be assigned to any phase of the work until they have received procedural instructions.

Supervisors shall make an extra effort to insure that new employees have positive knowledge of their jobs and to whom they are to report.

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007-6 MOVING EXPENSES

Department personnel employed in a permanent status may be reimbursed for costs of transportation of household effects when transferred in the line of duty.

Reimbursement is not allowable if the move is a result of disciplinary action or to the initial job assignment for newly hired personnel.

Department owned vehicles may be used to transport household effects of reassigned personnel if such effects do not need crating or special packaging.

When moved by commercial carrier, the rates as allowed by Council Order shall not accrue either a profit or loss to the employee. Receipts shall be attached to the reimbursement voucher.

If an employee is eligible for reimbursement of moving expenses, as determined by the applicable Unit/Program head, the employee may discuss the details with the Bureau of Finance & Administration and receive authorization, prior to making the move.

007-7 NEW PERSONNEL

Hiring The following is provided to each new employee, as required by his or her classification:

- 1) Informational packet prepared by the Office of Human Resources
- 2) Current Standard Specification book
- 3) Manual on Uniform Traffic Control Devices, Part VI
- 4) Construction Manual
- 5) Personal Diary
- 6) Safety Vest
- 7) Hard Hat
- 8) Calculator
- 9) Personal Computer (Laptop for field personnel)
- 10) Telephone credit card (field personnel)
- 11) Cellular phone (for Residents, as required)
- 12) Pagers (field personnel)
- 13) Camera (Residents, as required)

007-8 OFFICIAL HEADQUARTERS

- 1) The employee's official headquarters is designated as a State Office location (MDOT Division Office, Augusta Office or regional lab) when first employed or when transferred or moved. A copy of the designated location is sent to the Bureau of Finance & Administration.

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- 2) For employees whose duties require their presence at an established State Office location at least two days per week, that office location shall be designated as their official headquarters.
- 3) For employees whose duties are at other than an established State Office more than three days per week, the designated headquarters may be the employee's residence or project residences if such designation is an advantage to the State and without prejudice to the employee.

The official headquarters for field personnel who are assigned to a construction project or projects shall be their residence. When the projects to which field personnel are assigned are completed or suspended, then the employees' official headquarters becomes their designated State Office location. There is no grace period. When employees are in the field virtually all the time or on a seasonal basis, their place of residence is their official headquarters. The governing Unit/Program head or their designee approves exceptions.

- 4) Employees' salary and expense vouchers shall be approved by their appropriate direct supervisor.

The locations of the Augusta and Division Offices are listed below with office telephone numbers.

Augusta Address: Transportation Building
 16 State House Station
 Augusta, ME 04333-0016
 (207) 624-3000

Location: Between Capitol and Child Streets, adjacent to the north side of
 Capitol Park.

Div. #1 Presque Isle Address: P. O. Box 1178, Rice Street
 Presque Isle, Maine 04769
 (207) 764-2060

Location: ¼ mile North of town, turn east from Route 1. Last building on left.

Div. #2 Ellsworth Address: P. O. Box 539, High Street
 Ellsworth, ME 04605
 (207) 667-5556

Location: East of town at the junction of Routes 1 and 3.

Div. #3 Bangor Address: P. O. Box 1208, 219 Hogan Road
 Bangor, ME 04402-1208
 (207) 941-4500

Location: Take Hogan Road Exit, off I-95, North of town. East off exit. Office is
 at Jct. of Mount Hope Ave. and Hogan Road.

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Div. #4 Fairfield	Address:	10 Mountain Avenue Fairfield, ME 04937 (207) 453-7377
	Location:	West side of Route 201, 0.2 miles North of I-95, Fairfield-Skowhegan Exit.
Div. #5 Rockland	Address:	P.O. Box 566, 143 Rankin Street Rockland, ME 04841 (207) 596-2230
	Location:	Turn onto Route 1A south of town. Rankin Street is $\frac{3}{4}$ of a mile north of Rt. 1 on West side. Office is 100 yards on right side.
Div. #6 Scarborough	Address:	P.O. Box 358 Scarborough, ME 04070-0358 (207) 885-7000
	Location:	Pleasant Hill Rd., Scarborough. Turn southerly just south of Scarborough-S. Portland line on Route 1. Office is $\frac{1}{2}$ mile on right.
Div. #7 Dixfield	Address:	P.O. Box 817 Dixfield, Maine, 04224-0683 (207) 562-4228
	Location:	On West side of Route 2, 14 miles West of Wilton and 8 miles East of Rumford.

007-9 PERSONAL CONDUCT AND APPEARANCE ON AND OFF THE JOB

The proper conduct and appearance of State personnel, both on and off the project, is of great importance in that it is often the basis on which the public forms its impression of the Department of Transportation. Also, the Contractors and their personnel will generally have more respect for a Resident or Inspector who presents a neat appearance and businesslike manner.

On the project, employees should dress appropriately for the duties they are assigned, and in accordance with Administrative Policy Memorandum #410, Protective Clothing, Equipment and Devices.

Conduct off the job, after work, is also important to public relations. Although off duty, employees are still viewed as representatives of the Department of Transportation, and should conduct themselves accordingly.

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007-10 PERSONNEL OF OTHER UNITS OR PROGRAMS

Personnel of other Units or Programs who are assigned, either in writing or orally, to the project are under the direct supervision of the Resident. Personnel assigned to a Resident will have Salary and Expense Vouchers approved by that Resident. Survey crew chiefs will approve vouchers of crew members under their supervision. The assignment of headquarters for these employees is by their respective Unit/Program head.

007-11 WORK HOURS

Employees are required to be on the job on their scheduled workdays for their scheduled hours. Circumstances on construction projects, such as the contractor's schedule, the specific work items being performed and weather conditions, may require field personnel to work beyond their regularly scheduled day. Employees must notify their supervisor as soon as possible if they cannot come to work, or will be late, on a particular day.

General

Typically, personnel assigned to the Augusta Office or Division Offices work 8 hours per day, five days per week. Hours are from 7:30 A.M. to 4:15 P.M. with a 45 minute lunch period, from 11:45 A.M. TO 12:30 P.M. Some employees will have a slightly different schedule so that the public may obtain services until 5:00 P.M.

Personnel Responsibilities

Construction Support Managers/Engineers and Project Managers are responsible for the approval of pay vouchers of all Residents, depending upon the Unit/Program for which the Resident works. In assigning an hourly paid Resident to a project, the Construction Support Manager/Engineer or Project Manager should verify that the hours of work shown by the Resident are reasonable and necessary for the performance of the work required. It is not intended that an hourly paid employee be placed in the position of verifying their own hours for pay purposes.

One of the primary duties of the Resident is to control the use of project personnel by maintaining efficient and flexible work assignments, by managing work hours, by directing additional overtime work, by verifying that the number of hours shown on salary vouchers does not exceed the number required for the work done, and by approving or not approving leave for project personnel. In short, Residents are the personnel manager of those persons assigned to the project and have been empowered to carry out this duty. Residents can expect their use of project personnel to be reviewed by their supervisor and the Augusta Office. Residents can also expect their supervisor and the Augusta Office to cooperate in the administration of this policy and in solving personnel issues.

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Working Hours

Personnel in the Transportation Aide, Assistant Technician and Technician classifications are hourly paid personnel. Employees in these categories working on construction survey crews will not be allowed to work more than 40 hours per week except as authorized in the following paragraph. Working in the project field office may be required during periods of inclement weather in order to provide a complete 40-hour week.

Hourly employees assigned to perform construction inspection will be required to work more than 40 hours per week, as necessary. Time actually worked in excess of 8 hours in any one day, or after their regularly scheduled hours if greater or 40 hours of actual work in any work week, will be paid for at the overtime rates as noted in the "Salary" Section of this manual. However, every effort will be made to hold the number of hours project personnel are used on construction projects to the minimum number required to effectively inspect the work. Therefore, the Resident must schedule the time, location and use of personnel assigned to the project for inspection purposes to produce maximum efficiency of these inspectors and to keep the number of overtime hours authorized to a minimum.

The primary objective of the field personnel is to determine that the work is done according to the Plans and Contract Specifications, and is properly documented and properly measured. However, the Residents need to keep in mind that this does not necessarily mean, or imply, that all personnel assigned to a project must work all the hours that the Contractor works. The Resident may find that efficiency can be gained by assigning different hours of work to different inspectors, depending on the particular operations being performed by the Contractor. Some operations performed by the Contractor, such as installation of materials incorporated into the final product, including Portland cement concrete, embankments, base materials and HMA pavement, must be inspected on a continuous basis. Other operations, such as clearing, fine grading, rock excavation and the installation of guardrail, require only intermittent inspection, or inspection before an operation is started and after it is completed; in these cases, the Resident is not expected to provide continuous inspection during all hours the Contractor is working.

Whenever the Contractor is performing work that requires continuous inspection, someone with the authority to act as, or for, the Resident must be present on the project. With proper management of project human resources, it is not always necessary for Residents to be present on the project simply because work is being performed by the Contractor. However, Residents do have the responsibility for overall project supervision and must work the hours necessary to meet this responsibility. This time is not necessarily the same as the Contractor's workday.

Whenever the Contractor is not performing work under the contract during the normal work week (Monday through Friday), because of inclement weather or other reasons, the Resident will authorize, or direct, the performance of necessary office work which can be effectively performed while the Contractor's work is temporarily suspended. The project personnel will be utilized in the performance of

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this work and will be expected to work an eight-hour day during the period that the Contractor's work is suspended and office or other work is available to be performed. Project personnel not required for the performance of this work and whose services are not expected to be required for the remainder of the day, may be sent home. Overtime hours will not be authorized for hourly paid personnel to perform routine office work.

On Saturday, when the Contractor's entire work force is on the project, the extent of work by project personnel will be the same as any other workday. When the Contractor utilizes only a portion of their work force, or only subcontractor work is being performed, only those project personnel actually necessary for the inspection of the work being performed will be authorized to work.

When the Contractor performs no work on Saturday, project personnel will not be authorized to work on routine office computations. However, work which may affect the Contractor's progress, such as emergency layout or problem solving, may be allowed upon prior approval from the Construction Support Manager/Engineer or Project Manager. The Resident must contact their supervisor not later than the Friday before the Saturday involved, explaining why it is necessary to work the following day, and request authorization for this work. If necessary, more than one Saturday may be included in a single request.

When inclement weather prevents any construction activity on a Saturday when the Contractor had planned to work and Department personnel assigned to work on that day arrive on the job, hourly paid personnel may, at their option, work in the field office for four hours and be compensated for such time. Salaried personnel may also work four hours and be compensated for such time.

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Section 008 Safety & Accidents -- 5 Pages

SAFETY AND ACCIDENTS

008-1 GENERAL

The field construction inspection personnel are constantly exposed to many hazards to their personal safety in their daily work. Prior to the start of construction and during construction, the employee must be alert to these dangers to avoid injury. Some of these hazards include exposure to sharp cutting equipment, inconsiderate motorists, rough terrain, poisonous weeds, and heavy construction equipment. Injuries are not only painful and expensive to the employees, but also are disruptive and a cause of concern to relatives, fellow employees, and to the Department, so all precautions possible must be taken to avoid mishaps.

The Department of Transportation must report to the Department of Labor any deaths or serious injuries sustained by employees while on the job. Reports must be made within 48 hours of such an incident. The Department has assigned the responsibility of making such reports to the Office of Human Resources (tel. 624-3050).

To enable Human Resources to fulfill this requirement, it is imperative that whenever a Department of Transportation employee sustains a serious injury while on the job, a brief report of the circumstances be made at once by telephone to the Augusta Office. In the event such injuries occur outside the normal working hours they must be reported immediately on the following working day.

The law defines serious injuries as "death, amputation, loss or fracture of a body part or injury, which necessitates immediate hospitalization."

008-2 PROTECTIVE CLOTHING, EQUIPMENT AND DEVICES

Refer to Administrative Policy Memorandum #410, Protective Clothing, Equipment and Devices.

008-3 COMMON HAZARDS AND SAFETY TIPS

Listed for consideration are some of the hazards encountered in the field, and actions to be taken to minimize danger:

- 1) If a Contractor has a more stringent personal safety policy than that of the Department, Department employees shall adhere to the Contractor's safety policy.
- 2) When walking within project limits, be aware of your physical position with respect to vehicular traffic, including that of the Traveling Public and that of the Contractor at all times, even if behind temporary concrete barriers.

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When inspecting work elevated above ground, water or other surfaces, Department of Labor or OSHA standards must be adhered to. In general, fall protection must be used when more than six feet above the ground or other surface. Fall protection includes a safety harness and two lanyards (tie-off 100% of the time is mandatory). The Department supplies harnesses and lanyards; the Contractor in general, provides appropriate cables, hooks or other devices to which lanyards are attached in order to access the work.

- 3) Exposure to ticks. Be aware that tall grass, woods or brush provide tick habitat and that there are several types of ticks. Deer ticks can transmit Lyme disease. The highest concentration of deer ticks occurs, generally, in Southern and Coastal Maine. You should check clothing carefully for ticks if exposed to potential tick habitat. If you discover a tick that has become embedded in skin, contact your doctor immediately before attempting to remove the tick. A Lyme disease vaccine is available - contact the Department's Office of Human Resources, Employee Health and Wellness Program, at 624- 3000, for more information.
- 4) Strict compliance with the motor vehicle laws is required at all times.
- 5) Warning lights. Field personnel on all personal or State vehicles used for the following purposes and situations shall use Amber flashing warning lights. These lights are available through Motor Transport Services, located in each Division and in Augusta:
 - A) To protect and to safeguard Department of Transportation personnel and equipment.
 - B) To warn the motoring public of a potential or existing danger in the form of obstructions to the smooth flow of traffic.
 - C) Personnel working upon the travelway portion of the highway, or immediately adjacent thereto.
 - D) Equipment parked upon the highway, or close to the edge of pavement while conducting operations adjacent thereto. (Operations of this nature shall be carried out in emergency situations only.)
 - E) Disabled equipment that creates a potential traffic hazard.
 - F) While stopped upon or adjacent to the highway and rendering aid to stranded motorists or at an accident scene.
 - G) Transporting injured personnel, not requiring ambulance service, for emergency medical attention.
 - H) As a traffic warning device when a potentially dangerous condition develops. (Spot location of slippery roadway surface, heavy snow, or fog, blow down, broken wire, etc.)
 - I) Slow moving vehicles.
- 6) The use of intoxicating liquor while on duty will be sufficient reason for dismissal.
- 7) When working on projects on or adjacent to I-95 or other controlled access interstate or state routes, a Crossover Permit is required in order to legally use crossovers between divided highways. These permits can be obtained through your direct supervisor from the Department's Maintenance Division. Each permit is issued with instructions on how to enter and exit crossovers. Strict adherence to these instructions is mandatory.

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The following safety tips have been prepared to prevent personal injuries that may be caused by unsafe acts and practices:

- A) If a line of traffic piles up behind your slow moving vehicle, pull off the pavement as soon as possible and let it pass.
- B) Be aware of all high-tension power lines.
- C) Stay clear of poison ivy, poison oak, and poison sumac. If possible, obtain an injection to aid in immunity, and consult a doctor without delay if you do break out with a rash after contacting one of these plants.
- D) DO NOT trust a measuring tape to support you if working on steep slopes.
- E) DO NOT stop on pavement in your vehicle if it is possible to get off the edge of pavement within a reasonable distance.
- F) DO NOT ride on running boards, fenders or bumpers of vehicles.
- G) DO NOT attempt to get on or off moving vehicles.
- H) DO NOT attempt to repair or clean moving machinery.
- I) DO NOT walk under crane booms or suspended loads of any kind.
- J) DO NOT turn your back to backing trucks.
- K) DO NOT use two-way radio near blasting operations.
- L) DO NOT back up vehicles of any kind without making sure that the way is clear.
- M) DO NOT allow tires to wear smooth.
- N) DO NOT park vehicles within 300 feet of each other when on opposite sides of the road.

008-4 FIRST AID TREATMENT

This manual does not contain a course on first aid treatment, but all employees should take it upon themselves to be familiar with the common first aid methods for artificial respiration, control of bleeding, and the treatment of shock caused by injuries. The Department offers basic first aid courses periodically (consult the MDOT Intranet Website, under Website Index, Human Resources Training Brochure for information). Local hospitals also offer first aid training.

The telephone numbers of the nearest doctors, hospital, fire department and rescue service should be posted in the Resident's field office. If the field office does not have a phone, know the location of the nearest phone.

Accidents resulting in personal injury to a State employee must be reported as stated above.

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008-4 MOTOR VEHICLE ACCIDENTS

1) GENERAL

When any state vehicle is involved in an accident, the operator will proceed as follows:

- A) Reports: Each vehicle is supplied with a Vehicle Accident Report envelope that contains an Operator's Vehicle Accident Report form and several Witness Statement Forms. Additional Vehicle Accident Report envelopes may be obtained from the Motor Transport Service or MDOT's Office of Legal Services & Audit.
- B) Complete the report and mail through regular mail to MDOT's Office of Legal Services & Audit the day the accident occurs. Prepaid mailing envelopes are provided.
- C) Risk Management must be called the day or night the accident occurs. The 24-hour toll free number is: 1-800-525-1252.

2) PROCEDURES

- A) Remain at the scene and take immediate action to prevent further damage. Warn oncoming traffic.
- B) Call police. Call ambulance if there are injuries. Call your supervisor immediately.
- C) If there is a fatal injury, DO NOT move anything.
- D) Get all the facts about the accident and information from other operators and/or owners to include all information requested in this report and any and all witness names and addresses.
- E) Show your driver's license and registration to all other operators and cooperate with police.
- F) Remember: Only answer questions by police about the accident. State the facts and only what you saw happen to the police. Questions from anyone other than police should be referred to MDOT's Office of Legal Services and Audit at (207) 624- 3020.
- G) Sign no papers, except for your Supervisor or the police.
- H) Send written report through mail to MDOT's Office of Legal Services and Audit in Augusta.
- I) If your accident damages another vehicle or property and you cannot locate the owner, leave your name and MDOT's Office of Legal Services and Audit telephone number, (207) 624-3020, in a safe place where the owner will see it. Notify MDOT's Office of Legal Services and Audit immediately after leaving the note.
- J) If there is a personal injury or the other vehicle is so damaged that it is not safely operable, call MDOT's Office of Legal Services and Audit 624-3020 and notify: John Poor or Cathie Hinds.
- K) Notify the nearest Motor Transport Division Office. The Equipment Supervisor will arrange for repairs.

In the event of an accident in which the vehicle operator is a fatality, the operator's immediate supervisor will prepare and submit the Operator's Vehicle Accident Report.

NOTE: In any accident involving personal injury and/or major property damage, the supervisor of the employee must report the accident to the appropriate Program Manager immediately by telephone.

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008-5 SPECIAL REPORTS REGARDING FATAL AND OTHER SERIOUS HIGHWAY ACCIDENTS

The Department of Transportation has participated in the activities of the Governor's Highway Safety Committee for a number of years. In recognition of the fact that highway accidents might be partly due to road conditions, including geometric design or faulty signing, the Department's participation includes the investigation of fatal and serious highway accidents by the Director of Planning. The Director of the Bureau of Planning prepares a report to the Commissioner on each fatal or serious highway accident whenever some factor relating to the work of the Department may be involved.

008-6 LEGAL RESPONSIBILITY

The Department will not defend employees for traffic violations while operating State vehicles during working hours. The insurance company that provides the liability policy on State vehicles will represent an employee who operates a State vehicle that is involved in an accident, when recovery by the other party is sought through litigation.

008-7 SEATBELT USE

All State employees and their passengers shall wear seat belts when they are traveling in State owned vehicles or when traveling on official business for the state in privately owned vehicles.

008-8 ACCIDENTS ON CONSTRUCTION PROJECTS

Residents are to report any accident on a construction project to the Division Traffic Engineer immediately.

The Resident should immediately document in the Project Diary, weather and pavement conditions, signing in place and any other items that may have a bearing on the accident. In the event the accident occurred in the vicinity of a construction operation, the type of work, equipment in use, location of flaggers or traffic officers, including all other traffic devices in place at the location of the accident, should be recorded. Pictures should be taken if a camera is available.

The Division Traffic Engineer, in company with project personnel, will review each individual accident on a construction project as soon as possible, to determine if corrective action or a change in the Traffic Control Plan is needed. If a change is needed, the Resident will take the necessary action to make the change. In addition, the Resident will advise the Traffic Engineering Division, Accident Records Section, of the accident, either directly or through the Resident's direct supervisor.

Serious accidents involving personal injury or death require that a Department Investigator be notified at any time of day or night. Residents shall contact an Investigator directly in the Office of Legal Services and Audit at (207) 624-3020. The Department's Investigators are John Poor and Cathie Hinds. The Resident shall also prepare and submit an Accident Report to the Office of Legal Services and Audit.

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Section 009 Time Sheets -- 3 Pages

TIME SHEETS

009-1 GENERAL

All employees must submit time sheets every other week to record actual hours worked and hours charged to various types of leave, to substantiate the payment of salary, and to provide proper distribution of the salary to projects and cost centers. Travel expense vouchers may be submitted weekly. It is important that time sheet and expense charges be made to the same account for the same time period.

The Residents are directly responsible for notifying the employees working on their project of the proper coding required by the employee's assignment.

The following procedure will apply to the preparation and routing of Time Sheets and Expense Vouchers for field inspection personnel.

The responsibilities of the Residents with respect to Time Sheets and Expense Vouchers of employees assigned to them are as follows:

1. Verify correct coding- Project Identification Number (PIN), Appropriation, Function, Activity.
2. Verify correct recording of time worked and employee benefits used.
3. Check consistency of the time worked with expense voucher.
4. Review for reasonableness and compliance with travel regulations.
5. Verify that all travel expenses are actually incurred.
6. Verify the proper use of State owned vehicles, as applicable.
7. The Resident shall sign the Time Sheets and Expense Vouchers by Friday afternoon (weekly for Expense Vouchers and every other week for Time Sheets).

009-2 TIME SHEET INSTRUCTIONS

The on-line time sheet form is located on the MDOT Intranet Website, under Free 2000, under Free 2000 Login, under Timesheet/Leave. At this location, the employee's time sheet for the current pay period is in view. To view time sheets for other pay periods, click on "New Date". Although this form is largely self-explanatory, please note the following:

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1. The column entitled "Desc" provides a dropdown menu for the description of all possible pay status types, including work (work), sick leave (sick), vacation (vac) and even work without pay (work w/o pay).
2. Enter the hours worked for each date shown, as applicable. Salaried employees (Senior Technician, AE, CE I, CE II classifications) shall enter 8 hours for a full day worked or 4 hours for a half-day worked. Salaried employees assigned as Residents or Inspectors will receive one extra hour of straight time or one hour of compensating time for each day worked in the field that the Contractor works. This extra hour must be shown on a separate coding line as straight overtime (str ot) or compensating straight time (earn scomp), AND it must be noted in the Comments section, located at the bottom of the form, that the employee was working on an active construction project on the days when this extra hour is shown on the Time Sheet. When salaried employees work on Saturdays or Sundays, this time must be shown as straight overtime or straight compensating time, also. Salaried employees working on a Holiday are reimbursed for the actual time worked, plus 8 hours for the Holiday. Again, the hours worked on the Holiday must be shown as straight overtime or straight compensating time. Hourly paid employees (Transportation Aide, Assistant Technician, Technician) shall be compensated at 1 ½ times the straight time rate once they have worked more than 8 hours in a day, or more than 40 hours in a week. This overtime must be shown as premium overtime (prem ot) or earned premium compensating time (earn pcomp). Hourly paid employees working on a Holiday are reimbursed for the actual time worked plus 8 hours for the Holiday. The hours worked on the Holiday must be shown as premium overtime or earned premium compensating time.
3. Many of the pay status types, under "Desc" do not need to have the PIN, Appropriation, Function and Activity manually input. For example, sick leave (sick), vacation time (vac) and holidays (holiday) can be inserted in the "Desc" column, the appropriate number of hours input for the appropriate date, then the "Save Changes" button can be clicked and the coding will automatically be inserted.
4. Each time an employee finishes working on the Time Sheet, it is a good idea to click "Save Changes", even if the Time Sheet is complete. When the Time Sheet is ready to be submitted, the employee clicks the "Accept/Sign" button, which will take the employee to another screen that will request that an electronic signature be inserted. If the employee does not know this electronic signature, they should contact their direct supervisor.

Additional information on Time Sheets can be found on the MDOT Intranet under Free 2000, under Free 2000 Login, under Free 2000 Web Portal, under Help, or directly at <http://mdotweb/helpf2k.htm>.

009-3 SALARY ADVANCES

New employees, including seasonal employees, may request a salary advance upon completion of one week's work. This advance is to assist the employee to phase into the State's biweekly payroll system.

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1. The appropriate Program Manager must approve the request for a salary advance.
2. Employees must complete one week's work before receiving a salary advance.
3. The salary advance must be in even dollars and will not exceed the gross wage earned in the first week of employment.
4. The salary advance will automatically be deducted from the employee's first paycheck.
5. Employees requesting a salary advance should contact the Payroll Section of Finance & Administration for further information.

SECTION 100

GENERAL CONDITIONS

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Section 106 Quality -- 3 Pages

QUALITY

106-1 ROLES REGARDING QUALITY

This section defines the roles and responsibilities of Department and Contractor personnel in assuring the quality of the Project.

106-2 QUALITY STANDARDS

This section outlines applicable standards regarding the quality of various items of work on the Project.

106-3 MATERIAL QUALITY

Sources of material, use of Department furnished materials and maintenance of quality during handling and storage of materials is discussed. For questions regarding manufactured products, refer to the Department's Approved Products list, which can be found on the DOT web site (www.maine.gov/mdot).

The Resident will need to obtain copies of material storage agreements made between the Contractor and owners of private property where material is to be stored. After completion of the work, all storage areas must be returned to an acceptable condition.

Any materials that do not meet specifications may be rejected by the Resident, and must be removed from the Project.

The Contractor will perform any sampling and testing necessary to control the Quality of materials being used. Samples and tests for Acceptance will be taken and performed by the Department. In addition to normal Acceptance testing, the Resident may obtain samples or tests at any time if the material appears defective or when a change in the product or construction process has occurred.

106-4 QUALITY CONTROL

The Resident must approve Quality Control Plans (QCPs) submitted by the Contractor. Following submission of the Plan, the Resident and the area Acceptance Testing Supervisor review it and must notify the Contractor within 14 days of receipt that the Plan is approved, or that it is being returned for revision. Work cannot commence on any item covered by the Plan until it is approved. Review the plan carefully to assure that it meets

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the minimum requirements outlined in the specifications. A QCP details the personnel, equipment and processes that will be employed by the Contractor to meet the level of quality specified in the Contract. Once approved, it becomes part of the Contract documents and should be enforced as such.

The Contractor is required to maintain records of all QC tests and inspections. These should be used to supplement the Department's own testing and inspection in assuring the quality of the material being incorporated into the Project. QC reports must be submitted to the Resident by 1:00 PM on the next working day following the construction activity, unless the Resident has agreed to some other arrangement. In addition, the Department may review and obtain copies of QC reports at all reasonable times.

Section 106.4.6 details the steps to be taken in the event that the Contractor fails to follow the QCP. These actions provide the Resident with an important tool in ensuring compliance with the QCP.

106-5 QUALITY ASSURANCE

Section 106.5 of the Standard Specifications provides an overall description of the inspection process, including steps to be taken in the event that unacceptable work is found.

106-6 ACCEPTANCE

Acceptance of material is based on visual inspection of the construction process, monitoring of Contractor QC, manufacturer's certification and Acceptance sampling and testing.

Acceptance of Hot Mix Asphalt and Portland Cement Concrete is based on statistical Acceptance Methods A or B, or on Method C Verification. Consult the Special Provisions to determine which Acceptance method will be used for specific items on the Project. In general, large quantities of material will be accepted using Method A, smaller quantities using Method B, and non-critical items using Method C.

Regardless of which method is used, it is important to note that visually defective material may be rejected even if the random sample location does not fall in the questionable material. If the Contractor so requests, three samples of the material will be taken for testing, and the results statistically analyzed.

The Contractor may remove and replace any defective material prior to knowing the random sample location. Once the Contractor is aware of the Acceptance sample location, they cannot reject the material being sampled unless it is found to be visually defective and the defect was not readily apparent prior to sampling, such as a dry batch in the middle of a load of HMA.

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Acceptance Methods A and B use Quality Level Analysis, as outlined in 106.7. The Department may reject material that is found to be below a minimum Pay Factor.

Method C work may be randomly sampled for verification, and will be accepted or rejected as outlined in the related material specification.

106-7 QUALITY LEVEL ANALYSIS

This section explains the procedure for analyzing test data. Section 106.7.1 provides a step-by-step methodology for determining the percentage of the material in a Lot that is within the specified tolerance for a given property (e.g., density, entrained air content, etc.). It also shows the computations used to compute the appropriate Pay Factor for the material in order to determine price adjustments. These calculations are generally computed using a spreadsheet that is available to all Residents and Inspectors.

Section 106.7.2 outlines the procedure for determining Statistical Outliers. An outlying value, or outlier, is a test result that is markedly different from the rest of the data in that Lot. Most Lots need not be analyzed for outliers, as they are quite rare. However, if a test result is suspected of being an outlier, the calculation to verify this is quite simple, and again, a spreadsheet is available for this calculation. If a value is found to be an outlier, notify the Testing Engineer. An investigation will be initiated to determine whether or not the outlying value should be removed from Pay Factor computations.

106-8 NON-CONFORMING WORK

This section describes provisions for work that is unacceptable, has not been authorized or was not inspected.

106-9 WARRANTY PROVISIONS

The Contractor must guarantee that the Project will be free from Warranty Defects (as described in the specification) for one year following Final Acceptance. If a Warranty Defect occurs within one year, the Contractor must submit a Remedial Work Plan for approval. If the Contractor does not perform the Remedial Work or if emergency repairs must be undertaken, the Department will perform or contract for the Remedial Work and charge the Contractor for it.

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MEASUREMENT AND PAYMENT

108-1 GENERAL

This Section describes, in general, Departmental policies and acceptable methods for measuring and computing contract quantities for progress and final payments. Sections 200 through 600 and 900 of this Manual explain in more detail, the requirements and procedures to follow.

There are two systems in use and acceptable to the Department for documenting and measuring quantities for payment: the traditional "paper" method and the computer software program "Field Manager - Field Book" method. Residents are encouraged to use the software program when feasible.

If the Resident chooses to use the paper method, he/she will have for project records, a Final Quantity Computations Book, a Final Quantity Book, a Project Diary, and a Construction Book. Other fieldbooks may be needed, such as a Drainage Book, depending on the complexity of the project. If Field Manager is used, the project records will consist of an Item History to Date instead of the Final Quantity Book, a Daily Diary, and Inspectors' Daily Reports. The Inspector's Daily Report is needed to generate progress estimate quantities. A Construction Book is almost always necessary; it is policy of the Department and good record practice that original field measurements must be entered in a bound fieldbook. The Final Quantity Computations Book may or may not be required, depending on the extent of computations needed to figure quantities.

Section 900 of this Manual explains further, and in more detail, project records required. It is suggested that you study Section 900 before proceeding beyond Sections 108 and 109.

For anyone needing training in the use of Field Manager, the Contracts Section will provide instruction in the application of this software program. You should contact the Contracts Section either directly or through your Supervisor for help.

108-2 QUANTITIES FOR PROGRESS PAYMENTS

After the contract has been awarded, the Contracts Section will initiate the first payment, Mobilization. The Resident will receive either a paper copy of the first estimate paid or an electronic transfer, depending on whether or not Field Manager is used. The Resident should advise the Contracts Section, preferably before the contract is awarded, whether he or she will use the paper route or Field Manager to make progress payments; the Department urges the use of Field Manager.

It is important to our highway and bridge contractors that they receive prompt and full payment of all monies due them for work satisfactorily performed. Unnecessary delay in paying the Contractor

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increases his or her cost of doing business, and these costs are ultimately passed on to the Department in the form of higher bid prices on future contracts. The Contractor is to be paid, on each progress estimate, the full estimated value of the work satisfactorily completed. The Resident should not hold payment of money due the Contractor other than what is sufficient to cover work still remaining to be done under a particular item. Quantities should be current to the end of the pay period, particularly for hot mix asphalt items because of the time-dependent nature of the asphalt escalator price adjustment specification. If a significant overpayment or underpayment is detected following the submission of a progress estimate, an additional estimate correcting the error should be submitted to the Contracts Section immediately. Section 108.2 further explains procedures for making progress payments

Contract specifications require the Department to pay the Contractor once a month, but it is policy to make a progress payment every two weeks. The estimate will be forwarded to the Contracts Section, either electronically or on a paper copy, for payment. The Contracts Section will process the progress estimate for payment minus a retent. This retained amount, as required in the contract specifications, is intended in part, to cover any minor overpayments that may have been made inadvertently.

Retainage is withheld when the total dollar value of all estimates paid reaches 50 percent of the estimated cost of the contract, at which time 5 percent of the cost of each subsequent progress estimate is deducted. Calculation of the retent is part of the software program that computes total amount due the Contractor for any particular pay period.

Quantities for progress payment will be estimated with the help of the following guidelines:

Quantities paid by the unit: Progress estimates can be based on a percent of the estimated quantity or on actual field measurements of the work done to date. The Resident is cautioned not to pay too high a percent of the estimated quantity without first checking the Engineer's Estimate for accuracy.

Quantities paid lump sum: The Resident may pay a percent of the bid price, as work progresses; amount paid is dependent on amount of work don and on judgment. Contract specifications will state, for some items paid lump sum, what portion to pay as work progresses.

Quantities paid load count: Whether by weight or by volume, quantity to date can be readily determined from daily totals entered in the Final Quantity Book/Item History to Date.

Quantities paid by the hour or force account: Hourly work items and force account work are determined from Daily Reports of Labor and Equipment Rental.

Regardless of the methods used to arrive at quantities for progress payments, the Resident will keep on file the notes and measurements used to document payments.. These records may be needed to explain to Auditors and to the Contractor how quantities were determined.

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108-2.1 PROGRESS ESTIMATE FORM - PAPER

Estimates must be made out, using red ink, on the computerized print-out generated by the Contracts Section. The first form the Resident will receive will be labeled "Payment Voucher Summary" number 0001, and it will show partial payment for Item 659.10 - Mobilization. The Resident will also receive, at the same time, "Progress Estimate" number 0002. Present policy is to fax the completed estimate form to the Contracts Section for processing; the resulting "Payment Voucher Summary" and the next "Progress Estimate" will be sent to the Resident as e-mail attachments.

Tracking of funding allocations requires separate cost figures for highway and bridge expenditures, for what is federally participating and federally non-participating, and for town and utility reimbursements. Each category of funds is designated by a number as, for example: 0001 for highway, 0002 for bridge. Work done under the original contract items or added to the project, whether unit price, lump sum or force account, must be coded to the correct category, i.e., highway, bridge, non-participating, etc.

Progress Estimate, Final Quantity Estimate, or Final Estimate During the progress of work, the Resident will place a checkmark on the "Progress Estimate" line. When the project is closed out with the Contracts Section, the "Final Quantity Estimate" line will be checked and the words "Final Quantity Estimate" will be written on the "Comment" line in the upper right-hand corner of the estimate. The Final Estimate will be made out by the Contracts Section when the retent is paid off.

Pay Period Ending - Year, Month, Day The date, entered by the Resident, should be the end date for the period the work has been done. This end date will be as current with the work as is practicable; it will be the middle and/or the last day of the month and not the first day of the next month for the purposes of figuring asphalt escalator price adjustments.

New Items This section is used to make modifications to the contract, such as: new items added by work order paid by agreed unit price, lump sum or force account, categories added, or work made non-participating.

Modifications are made as follows:

Catg #: Enter the appropriate four digit category number.

Item # (Or None): The item number can be obtained from the Bid Item Dictionary. If the item does not appear in the Dictionary, print the word "None" in its place, and write a very brief description of the item or work order in the "Description" column.

Authorized Quantity: Enter the estimated quantity shown on the Work Order. If there is no work order, enter the actual quantity.

Quantity to Date: Enter the quantity you want to pay at this time. Figures can be carried to two decimal places.

Unit Price: Enter the unit price shown on the Work Order, or defined in the contract or in the Standard Specifications.

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RWO/EWO: Enter the work order number and type of work order.

Description: Enter a description only if "None" was entered as the Item #.

Changes to lump sum items will be done as separate line item entries under the New Items section described above. The lump sum item originally in the contract will show a zero quantity for payment and will be re-entered under New Items with the new price.

The "New Item" procedure, or more pertinently, contract modification, will be processed by the computer and print it in the body of the next estimate at the end of the appropriate code section or in a newly coded section.

Standard Specifications provide a mechanism for paying for certain items added to the contract without the need of a price quote from the Contractor. The following is a list of items commonly used and how to pay for them:

<u>To Pay For</u>	<u>Use Item</u>	<u>Unit Price</u>
Rock Excavation	203.20 Com Exc	6 X Bid
Struct. Rock Excavation - Drainage	203.20 Com Exc	16 X Bid
Excavation for Slope Blanket	203.20 Com Exc	2 X Bid
Struct Rock Excavation - Major Str	206.082 Str Ea Exc - Major Str	6 X Bid
Str Ea Exc - Major Str, Below Grade	206.082 Str Ea Exc - Major Str	1 ½ X Bid
Str Rock Exc - Mjr Str, Below Grade	206.082 Str Ea Exc - Major Str	9 X Bid
Str Rock Exc - Mjr Str, Below Grade	206.092 Str Rock Exc - Mjr Str	1 ½ X Bid
Aggr Sub Crse - For Foundations	304.10 Aggr Subbase Crse - Grav	2 X Bid
Aggr Sub Crse - Slope Blanket	304.10 Aggr Subbase Crse - Grav	2 X Bid

Stockpiled Materials This section is used by the Resident to pay for stockpiled materials. Standard Specifications, Section 108.4, allows for the payment of non-perishable materials stored for future use on the project.

Departmental policy is as follows:

1. Partial payments may be made for certain materials delivered to the project but not yet incorporated into the work.
2. Payment will be shown on the progress estimate as a separate line item entry.
3. Materials will not be paid until the Contractor furnishes the Resident with copies of receipted bills.
4. As the stockpiled material is incorporated into the project and paid under the bid item, the stockpiled quantity should be reduced proportionally.
5. When work involving the stockpiled item is complete, that portion remaining in the stockpile, if any, shall be reduced to a "0" quantity on the progress estimate.

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Payment for a stockpiled item is entered on the progress estimate as follows:

Catg #: Enter the appropriate four digit category number. Refer to New Items above, if necessary.

Item #: Enter the same item number as shown for the pay item in the contract.

Quantity To Date: Enter the quantity you wish to pay at this time. Figures can be carried to two decimal places.

Unit Price: The unit price for payment under the stockpiled item is determined from receipted bills. The unit price as figured x the quantity should equal the dollar amount shown on receipted bills.

After the first estimate is processed with the above information, the stockpiled item will appear in the body of the next estimate directly following the item as originally bid.

Retent Modification This line is used by the Contracts Section to control the retent status of the Project.

Body of the Estimate The Resident fills in only the "Quantity to Date" column of this section for each item that has changed since the previous estimate. The total quantity to date may be an increase or a decrease from the previous estimate. Entries will be made in red ink.

Quantities will be entered as follows: whole numbers to the left of the decimal point and tenths and hundredths, if required, to the right of the decimal point. Quantities or percentages can be entered to three decimal places. Numbers are free read; for example, 2 is the same as 2.0 or 2.00.

For quantities with a unit of Lump Sum, show the quantity for progress payment from 0.01 to 1.00. Be careful to place the number on the correct side of the decimal point, i.e., whole numbers to the left and tenths/hundredths to the right.

For items with a unit of Each, show the quantity as a decimal, for example, for a Field Office, 0.33 or 0.67 or 1.00.

If you are adding a Lum Sum item by work order, enter the quantity for payment as 1 L.S. and not 100% L.S. If payment shows as 100% L.S., the mistake of paying 100 L.S. items can result.

108-2.2 PROGRESS ESTIMATE FORM - FIELD MANAGER

Progress estimates may also be submitted to the Contracts Section electronically, using the Field Manager construction management software program.

To use Field Manager, the Resident must import the database file of his or her project to the Field Manager program. This file will be obtained from the Contracts Section, either by network transfer or by floppy disk. If a Resident is using Field Manager solely for the generation of progress estimates, it will be necessary to generate an IDR (Inspector's Daily Report) posting the quantities for each item that needs to be paid, prior to each progress estimate submittal. Once the IDRs' have been generated and

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saved, the next estimate can be added. After adding and before generating the next estimate, it should be checked for accuracy. When the Resident is confident in its accuracy, he or she then generates it.

When an estimate is generated, a file is automatically created in the “outbox” folder of the “fieldmgr” folder, which is accessed by using “Windows Explorer” or “My Computer”. This file should then be transferred to the appropriate project folder located on the Network Neighborhood at Dotaug1/\$com-Cons/Field ManagerProjects for processing by the Contracts Section. If network connections are not possible, the file can be transferred by using a floppy disk.

When the Contracts Section receives the file, it is then processed in the Transport System and a “turnaround” file is created. This file is then picked up by the Resident, as described above, and imported back to the Field Manager program before the next estimate can be generated.

108-3 QUANTITIES FOR PAYMENT

Method of measurement and payment for items in the contract and for extra work are as follows:

1. Plan Quantities.
2. Lump Sum Quantities.
3. Measured Quantities.

Standard Specifications, under Sections “Method of Measurement” and “Basis of Payment” state how items in the contract are to be paid.

Plan Quantities Quantity for final payment will be the figure shown in the Schedule of Items as defined in the contract specifications or as mutually agreed to by the Resident and the Contractor.

If the Standard Specifications state, that for some items, final payment will be based on the quantity shown in the Schedule of Items, more commonly referred to as the “plan quantity”, that figure will be paid whether the amount is estimated correctly or not. It may be altered only if a design change is made in the field. Example items are: granular borrow backfill and structural excavation for bridge abutments, granular borrow backfill for multi-plate pipes, and shoulder rehabilitation.

Final payment can also be based on plan quantity by agreement between the Resident and the Contractor. Examples are: common excavation and gravel. For such an agreement to take place, two conditions have to be met: (1) the estimated quantity must be reasonably accurate and (2) work done under the item must be to the same limits as shown in the Engineer’s Estimate. Reasonably accurate is defined as the Estimate being within five percent of the true figure. The Resident must check the Estimate before proposing the agreement. Errors and changes to limits of work will be taken into consideration and corrections made. Payment based on “plan quantity” will be documented by notes of inspection and acceptance entered in the project records.

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Lump Sum Quantities Some items in the contract will be designated lump sum for payment as defined in the Standard Specifications. Examples are: field office, structural concrete, and maintenance of traffic. "Lump sum" quantities are documented by notes of inspection and acceptance recorded in the project records.

Measured Quantities Payment for some items in the contract will be determined from measurements and computations of the actual work done. Sources for measured quantities can be: surface area measurements, three-dimensional volume measurements, average end area measurements, delivery slip measurements, weight measurements, hourly measurements, and force account measurements.

Surface Area Measurements. By specification, some items in the contract will be measured and paid based on surface areas. Examples are: clearing, butt joints, cold recycled-in-place pavement, and rehabilitation of structural concrete deck slab. Measurements and sketches will be entered in a bound fieldbook; these can be taken in the field or scaled off the plans or a combination of both. Computations will be done in the same fieldbook or in the Final Quantity Computations Book.

Volume Measurements. Items measured by volume will be specified in the Contract. Examples are: common excavation, borrow, gravel, and concrete. Volumes can be figured using three dimensional field measurements, such as for roadway undercuts, or trench boulders. For large quantities, the average end area method will be used to figure earth excavation, rock excavation, and borrow. Any basic route survey textbook will explain in detail the average end area method. "Typical factors" will be used for figuring aggregate subbase course - gravel. Computer programs are available from the Survey Section to compute borrow and excavation.

If the Resident chooses to figure his/her own quantities rather than having the Survey Technicians do this, he/she must consider correcting between stations on curves as on ramps, for example. Also, it must be remembered that the average end area method is not usually accurate between any two stations, particularly if the areas cross sectioned differ considerably. This method is only accurate when at least three cross-sectional areas are used to compute a quantity.

Load Count Measurements, by Volume: Items paid load count will be identified by Special Provision in the Contract. In addition, Standard Specifications allow load count Measurement up to specified maximum limits. Load count is used when it is not practical to measure the quantities by cross-section or by three dimensions. When materials are measured by load count, the following rules apply:

- a) A delivery slip must accompany each load.
- b) The slip must be of a printed format and it must be serially pre-numbered.
- c) It will contain the project number, item description, and truck number.
- d) It must be issued by the truck driver or Foreman present at the site and signed by him or her.
- e) The Inspector or Ticket Taker must witness every load dumped and as evidence, will sign the slip. Partial loads will be noted as: "3/4 full", for example.

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Volume need not show on the slip but the Inspector will measure every truck body and enter measurements in a bound fieldbook, signed and dated. The correct shrinkage factors will be applied when the quantities are figured for payment. Borrow and excavation measured load count are reduced 10 percent; gravel is reduced 20 percent; concrete, riprap, and loam are measured on a "yard for yard" basis, i.e., no shrinkage or swellage is applied. Refer to the Standard Specifications under the appropriate items for swellage and shrinkage factors.

Load Count Measurements, by Weight: Standard Specifications require that hot mix asphalt items be measured by weight. A delivery slip will accompany each truckload of mix delivered to the job. Slips will contain the following information:

- a) Slips will be serially pre-numbered.
- b) Weight of each batch and total weight of the load will show on the slip if the plant weigh system is computerized. If not, only the total weight of the load need show, and the slip must be signed by a certified weighmaster.
- c) The Paving Contractor's name must appear at the heading, in print.
- d) Every slip will be signed by the Ticket Taker.
- e) A cover slip showing the day's total will be made out and signed by the Contractor's Representative and the Resident.

All weigh slips for hot mix asphalt must be kept in the Resident's office for the duration of the project. When the Resident submits his/her records to the Contracts Section for final review and close-out, delivery slips may be discarded but the cover slips will remain with the project records.

The Resident or the Testing Technician will do some check weighing to verify the accuracy of the scales. Check weighing procedures are explained in Section 108, of the Standard Specifications.

Hourly Work Items. Extra work, unforeseen, is sometimes measured and paid by the hour. This work can be paid by using the hourly bid items in the contract, by force account or by a combination of both. Division 100, Subsection 109.07, of the Standard Specifications - Green Cover and Section 109 of this Manual explain in detail, rules covering extra work. The Daily Report of Labor and Equipment Rental will be used to document the hours of labor and equipment, and materials used. Authorization for the work by the Resident or by Work Order and description will be noted in the Remarks portion of the Report which will be signed by both the Inspector or the Resident and the Contractor's Foreman or Superintendent.

This Section, Quantities for Final Payment, is intended to describe only in general, methods used to measure and pay final quantities. The Resident will refer to Divisions 200 through 600 and 900 for more detailed discussion of the requirements for field documentation, measurement, and payment.

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CONTRACT MODIFICATIONS

109-1 GENERAL

Standard Specifications, Section 109.3, require the Contractor, as directed by the Resident, to perform extra and unforeseen work added to the contract by the Department. A supplemental agreement, in the form of a Contract Modification, will be written to authorize and to document the added work. If the Resident uses the computer program Field Manager, the contract modification process is part of the software program.

109-2 CONDITIONS REQUIRING CONTRACT MODIFICATIONS

Contract Modifications will be initiated and written by the Department, normally by the Resident, and will be signed by him or her. It will usually require the signature of the Contractor and may also require the signature of administrative personnel within the Department, as explained further in the next Subsection. A Contract Modification will be written when the following conditions are present on the project:

1. Changes in specifications.
2. Substitution of materials.
3. Changes or extra work within the scope of the contract.
4. Changes in design beyond the scope of the contract.
5. Changes that result in an increase or decrease of 25 percent or more in major items of the contract. A major item is one that exceeds 10 percent of the original contract amount, as awarded. These changes may result in an increase or decrease in unit bid prices. Section 109.1.2 defines a major change.
6. Changes in deadline dates, completion dates, or time extensions not covered elsewhere.
7. Additional driveways, copy to Right of Way team member.
8. Municipal Government, County Government, or other State Agency request for additional work or change in proposed work. If the Agency involved requests additional work, it will be required to pay the non-federal share. The Contract Modification will clearly state what portion will be paid by the Agency and will be signed by a responsible person from that Agency.

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109-3 CONTENTS OF THE CONTRACT MODIFICATION

The following information will be included in the content of the Contract Modification:

1. Description and location of work.
2. Reason for the change or for the added work.
3. Benefits to the project.
4. Procedures to be followed by the Contractor. Time constraints, Special Provisions, and Supplemental Specifications are to be made part of the Contract Modification, as applicable.
5. Price quotations, if required.
6. Time extensions and reasons for the extra time, if needed. A time extension is not granted unless the work directly affects the Contractor's progress, known as the "critical path".
7. Right-of-way acquisitions or easements if needed.
8. Cost estimates. The Resident will include with the Contract Modification, their estimate of the cost of doing the work, whether it is done by unit price, lump sum, or force account. The Resident should arrive at the cost estimate independently of the Contractor's figures. It should be more than just a review of the Contractor's numbers.
9. Approvals and signatures. The Contractor's signature should be on the Contract Modification; it signifies their concurrence in doing the work. A Contract Modification is a supplemental agreement and is not legally part of the contract unless it contains the signature of both parties. Contract Modification not considered to be Residents' Work Orders will be submitted to the Resident's Supervisor for their approval and signature. 109.4 - Resident's Work Orders and 109.5 - Work Orders Requiring Supervisor Approval of this manual explain further, and in more detail, under what conditions Work Orders are needed and what approvals are required.
10. Federal Participation. All work orders on federally funded projects must be designated "participating" or "non-participating", i.e., whether or not Federal funds will be expended in the costs involved. In general, the FHWA will participate in the cost of all work orders except when an outside agency such as a Town, County, or a private developer requests the work, or the work is beyond the scope of the contract and is of no direct benefit to the project. Conditions under which FHWA approval is needed are outlined in Subsection 109.6 of this Manual.

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109-4 RESIDENT'S WORK ORDERS

The Department has authorized the Resident to execute certain work orders at the project level without approval of their Supervisor, but subject to the following limitations:

1. Each work order is limited to \$10,000.00, not to exceed a cumulative cost of 3 percent of the awarded contract amount.
2. The Resident's authority is limited to construction of the project as intended and designed and does not extend beyond the original scope of the contract.

In addition to the above limitations, the requirements of 109.3 - Contents of the Work Order will apply, as necessary. All Resident Work Orders should be sent to their supervisor for informational purposes.

109-5 WORK ORDERS REQUIRING SUPERVISOR APPROVAL

The following types of changes are considered to be beyond the limits of the Resident's authority to approve and therefore must be submitted to the Supervisor for concurrence and signature:

1. Changes in geometric design of the project or structural design of bridges, including foundations, and culverts greater than 1.8 m [6 ft] in diameter.
2. Revision of typical plan cross-sections.
3. The addition, deletion, or relocation of any bridge or other structure which affects the function or intent of the approved design.
4. Changes in Right-of-Way.
5. The addition of work outside project limits. An exception is work necessary for erosion control, in which case the property owner's permission is needed and put in writing.
6. Changes that alter contract specifications or other requirements of the contract.
7. Changes that will affect the safety and operation of traffic other than what is allowed under the terms of the contract.

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8. Changes that result in an increase or decrease of 25 percent or more in major items of the contract. A major item is one that exceeds 10 percent of the awarded contract amount. These changes may result in increases or decreases in bid prices. Standard Specifications, Section 109.1.2 defines a major change.
9. Changes that exceed \$10,000.00 in cost and result in negotiated prices or payment by force account.
10. Changes which may require modification to previously approved environmental permits.
11. Changes or added work over \$50,000.00.
12. Quality Control/Quality Assurance provisions added to the contract.
13. Significant changes in completion dates or other time constraints, if not addressed as part of other work orders.

In all of the above situations, the Resident can obtain verbal approval from their Supervisor before the Contractor does the work, and will follow up by a signed Work Order. The Supervisor's approval will be noted on the Work Order.

109-6 WORK ORDERS REQUIRING FEDERAL APPROVAL

Every construction season, the Federal Highway Administration will designate certain federally funded projects as "Direct Involvement" projects. On these jobs the FHWA will be involved in the design and construction more so than on other projects, and will do on-site visits on a regular basis. The Resident should ask their Supervisor or the Designer if a Project is a Direct Involvement project.

Types of work orders described in 109.5 - Work Orders Requiring Supervisor Approval will also need concurrence from the FHWA on Direct Involvement projects. The Resident will obtain Federal approval verbally at the beginning of the Contract Modification process and prior to the work being done. Details of the conversation such as name of the FHWA Engineer and date the conversation took place should be recorded on the Work Order. A copy of the Contract Modification should be mailed to the FHWA for documentation. Resident's Work Orders should also be verbally approved and sent to the FHWA.

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109-7 METHOD OF PAYMENT FOR THE WORK

Standard Specifications, Section 109.7 - Equitable Adjustments to Compensation, specifies that payment for Extra Work will be made by any one or a combination of the following methods:

1. Agreed Unit Prices
2. Lump Sum

3. Force Account

If agreement cannot be reached between the Contractor and the Resident on methods 1 or 2, the Contractor must accept payment on a force account basis. Reference is made to Standard Specifications, Sections 109.3 - Extra Work and 109.7.2 - Basis of Payment.

Agreed Unit Price includes miscellaneous extras such as, but not limited to: labor, materials, equipment, supervision, overtime, travel time, benefits, small tools, transportation, profit, overhead, and other incidental items of work.

Lump Sum is all-inclusive and includes extraneous items such as: profit, overhead, regular and overtime labor, supervision, benefits, materials, equipment, and miscellaneous small tools.

Force Account should be used only when either of the following conditions is present:

1. The extent of the work is difficult to predict, and therefore the cost cannot be estimated with any degree of accuracy.

2. The Resident and the Contractor cannot come to an agreement on unit prices or lump sum prices.

Force Account should be viewed as a last resort and every effort should be made to reach an agreement with the Contractor using Agreed Prices or Lump Sum. Standard Specifications, Sections 109.7.3, 109.7.4, and 109.7.5 explain in detail how to calculate payment made by Force Account.

The following is a brief summary of the contents of Force Account noted above:

Materials: Actual cost supported by receipted bills plus 15 percent mark-up.

Labor: Payroll cost for regular and overtime, plus 90 percent for laborers and foremen directly involved in the work.

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Equipment: "Blue Book" rates, available from the Assistant Contract's Engineer.

Mark-Ups: The Prime Contractor is allowed a 5 percent mark-up on a subcontractor's bill for profit and handling of paperwork. If force account work is involved, a 90 percent mark-up is allowed on payroll labor rates and a 15 percent mark-up is allowed on materials. No further mark-ups are permitted.

Regardless which method is used to pay for extra work, whether agreed unit prices, Lump Sum, or Force Account, estimating the cost before the work is done is necessary. The Resident should have an idea of what the work will cost before the Contractor submits their price. The figures will be submitted to the Supervisor with the Contract Modification; other documentation, such as receipted bills and price quotes, will remain in the Resident's project files. Back-up documentation and cost estimates for Resident's Work Orders will be kept in the project files on site also.

SECTION 200

EARTHWORK

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CLEARING

201-1 GENERAL

REFERENCES:

a. Construction Manual

Section 104.4.6 Utility Coordination

Section 203 Earthwork

Section 607 Fences

b. Standard Specifications

Section 104.3.11 Responsibility for Property of Others

Section 104.3.12 Forest Protection and Laws

Section 201 Clearing Right-of-Way

Section 203.09 Preparation of the Embankment Area

Section 607 Fences

Section 717.07 Herbicide

This work shall consist of clear cutting, selective clearing and thinning, tree trimming, removing single trees and stumps, and disposing of all stumps and debris, as per plans, specifications, and/or as directed by the Resident.

201-2 RECOMMENDED GUIDELINES

1. Clearing

a. Standard Specifications permit Clearing and Tree Removal work to be started prior to approval of the Schedule of Work, providing the method of operation does not establish a source of water pollution or cause soil erosion.

b. Layout of outside Clearing Limit Lines as indicated on the plans is done by the Contractor and verified by the Resident or the Inspector prior to any cutting. These limits may be marked as the Contractor desires, but in such a manner that there will be no mistake as to the limits intended. It is most important that the Clearing subcontractor and their workers fully understand the meaning of the markings used.

c. If it is necessary to clear areas not indicated on the plans, such areas will be designated by the Resident. A Contract Modification designating both a change in design and a change in quantity will be necessary for these additional areas.

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d. Inspection of clearing during the actual work consists of checking to make sure that the proper areas are being cleared. Prior to embankment construction, all cleared areas should be checked to be sure stumps are cut as close to the ground as possible, and that debris has been removed.

e. The Inspector shall assure that herbicides are applied to areas, as required, by Certified Pesticide Applicators only. All Herbicides shall be approved by a Department of Transportation landscape architect.

f. It is suggested that the contractor be encouraged to add a coloring agent to the herbicide so that continuous inspection may not be necessary.

g. For answers to any questions that arise in regard to spraying of herbicides, contact the landscape section of the Environmental Services Division.

EXHIBIT 201-A (Photograph of a cleared area.)



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2. Selective Clearing and Thinning

a. Selective Clearing and Thinning is marked by personnel from the Landscape Section. At least two weeks notification should be given to them, through the Resident, that the Project is ready to be marked. The Contractor or their subcontractor should notify the Resident when they are about ready to do this work.

b. Specifications require that stumps and stubs that remain shall be cut off as close to the ground as practicable.

c. Selective clearing and thinning is best inspected from the finished or near finished roadbed unless this work is done prior to excavation. The traveling public will see the area from this vantage point. It is also important that dead trees, stubs and branches within the R/W, and those that can be seen from the roadway be cleaned up.

EXHIBIT 201-B (Photographs of a scenic area before and after Selective Clearing.)



BEFORE SELECTIVE CLEARING



AFTER SELECTIVE CLEARING

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3. Removing Single Trees and Stumps

- a. The marking of individual trees to be cut should be done by the Contractor and verified by the Inspector prior to removal. The method of marking of single trees should be clearly understood by the Inspector and by the Contractor. This is particularly important in urban areas where removal of the wrong tree may justifiably incur the wrath of an abutter.
- b. If removal of a single tree is questionable, check with plans, R/W, and property owner to assure that removal is required.
- c. Stumps designated on the plans to be removed shall be completely removed by the use of excavating equipment unless the use of such equipment will be detrimental to the adjacent property or to the Project. If such removal will be detrimental, it shall be done by the use of a chipper at the bid unit price for that equipment. Note that if a stump is cut out with a chipper it cannot be paid for as "Removing Stumps". It should be paid for at the hourly bid price for the chipper, an agreed price, or as Extra Work.
- d. Where large stumps occur in urban areas they should be removed, or cut or chipped to below the level of lawns, even if such action is extra work.
- e. Property adjacent to trees that are cut should be fully protected. The Contractor is responsible for damage to abutter's lawns and other property.
- f. Removal of trees and trimming, necessary by public utilities, is discussed in Division 800, Utilities, of this Manual.

201-3 MEASUREMENT, PAYMENT AND FIELD DOCUMENTATION

a. Field Documentation

Project Diary, Inspector's Diary/Inspector's Daily Report: The Resident or Inspector will keep notes describing the subcontractor's clearing and selective clearing operations; equipment, personnel, and station to station limits of work will be noted. Workers and equipment need not be recorded every day unless there are frequent changes.

The Contractor, or more commonly the clearing subcontractor, will take the clearing limits from the plans and flag them in the field. If the Resident makes substantial changes or if the limits are not shown on the plans, a clearing list will be made up by the Resident and a copy given to the Contractor.

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The Inspector will note that Clearing is completed to limits shown on the plans; wording similar to the following is suggested: "Checked Clearing, Sta. 1+150 to Sta. 1+275 left and right and found it to be completed in accordance with Plans and Specifications." (Signed and Dated)

Entries will be made in the Inspectors Diary or in the Final Quantity Book.

Single trees and stumps removed as called for on the plans will be documented by individually recorded notation. Notes will include location, kind, size, date measured, and Inspector's initials and will preferably be made in the Final Quantity Book. If not possible, entries must be made in some other field book.

b. Measurement and Payment

Final quantity for payment can be plan quantity providing the estimated quantity is accurate and work is done as estimated. The Resident will adjust the plan quantity, upward or downward, according to changes made in the field.

Should the Resident find it necessary to establish new limits for the entire job, final pay quantity will be figured from these revised limits flagged in the field. A list of new limits will be made part of the project records.

Whether the Resident makes final payment based on plan quantity or based on a list of revised clearing limits, he/she must substantiate final payment by notes stating that clearing has been completed and accepted to limits flagged. These notes will be made in the Final Quantity Book or in the Construction Book.

Areas required to be cleared and not shown on the plans will be documented by length and width measurements. Measurements will be recorded in the Final Quantity Book, if possible, or in some other bound field book.

Clearing or removal of trees or stumps required to install fences shall be considered incidental to the appropriate fence items under Section 607 of the Standard Specifications.

Single trees and stumps required to be removed outside clearing areas will be field counted and entered directly in the Final Quantity Book for payment. All measurements will be signed and dated.

Final quantity for payment will be entered in the Final Quantity Book and labeled as such; reference to measurements, clearing limits flagged, and statements of inspection will be made as necessary. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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EXHIBIT 201-C CONSTRUCTION BOOK OR INSPECTOR'S DIARY

201.11 CLEARING				
STA.	(M) WIDTH	LEFT (M) DIST.	(M ²) AREA	
1+100	0			✓
	2.5	20	50.0	
1+120	5.0			✓
	8.5	20	170.0	
1+140	12.0			✓
	12.0	60	72.0	
1+200	12.0			✓
	9.0	20	180.0	
1+220	6.0			✓
	4.5	5	22.5	
1+225	3.0/0			
2+200	0/6.0			
	8.0	20	160.0	✓
2+220	10.0			✓
	10.0	80	80.0	
2+300	10.0			✓
	7.5	20	150.0	
2+320	5.0/0			
TOTAL AREA = 884.5 M ²				

⑦

1+100 to 1+225 and 2+200 to 2+320 LT
Area inspected and found to be
cleared according to plans.
JRM 6/14/00

Field Meas. and Calc. by JRM 6/17/00

Herbicide applied to cleared areas.
JRM 6/20/00

Calc's rd by: ~~SLB~~ 6/21/00

884.5 M² / 10000 = 0.88 HA

EXHIBIT 201-D FINAL QUANTITY BOOK

201.11 CLEARING				EST	3	HA	①
QTY	REF	Ent By	DATE				
0.88	BEZP 7	SLB	6-21-00				
1.20	BEZP 8	"	"				
0.94	BEZP 10	SLB	6-30-00				
TOTAL:	3.02	HA					
		Calc by: SLB	7-1-00				
		Adj by: JRM	7-12-00				
FINAL PAY QUANTITY				3.0	HA		
		SLB	7-1-00				
		Adj by: JRM	7-12-00				

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EXHIBIT 201-E FINAL QUANTITY BOOK

201.23 REMOVING SINGLE TREE - TOP ONLY						EST	9	EA
DATE	STATION	OFFSET	DESC.	DIA.	REF.	ENTRY	DATE ENT	REMARKS
3-01-01	5±100	6.5MLT	Maple	450mm	Bk2Pg 20	<i>Shantz</i>	3/1/01	
"	5±160	7.0MLT	Oak	525mm	"	"	"	
3-02-01	6±200	7.1MLT	Pine	600mm	Bk2Pg 21	<i>Shantz</i>	3/2/01	
3-03-01	8±455	6.0MRT	Pine	575mm	Bk2Pg 22	<i>Shantz</i>	3/3/01	
"	8±710	7.0MRT	Maple	500mm	"	"	"	
"	9±120	6.5MRT	Oak	650mm	"	"	"	
3-04-01	10±325	7.5MRT	Locust	450mm	Bk2Pg 23	<i>Shantz</i>	3/4/01	
"	10±800	6.0MRT	Mountain Ash	400mm	"	"	"	
"	11±435	6.5MRT	Maple	575mm	"	"	"	
3-18-01	4±680	7.5MLT	Pine	600mm	Bk2Pg 37	<i>Shantz</i>	3/18/01	Added by Resident
FINAL PAY QUANTITY: 10 EA								
						<i>Shantz</i>	7-7-01	
						Y'd by: J.R.M.	7-10-01	

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REMOVING STRUCTURES AND OBSTRUCTIONS

202-1 GENERAL

References:

a. Standard Specifications

Section 202
Section 104.3.13
Section 203.05

b. Standard Details, Sheet 202[1]

c. Supplemental Specifications and Special Provisions

Building and structure demolition may be partially or entirely covered by Special Provisions or Supplementary Specifications; describing the scope of the work, disposition of materials, availability date and completion date.

202-2 LAYOUT AND CONTROL

Building areas reserved for the owner until a specific date should be marked out. Pavement removal and rumble strips would be painted or marked by the Contractor or Subcontractor.

202-4 CONSTRUCTION

a. Building removal

Right-of-Way personnel are usually responsible for arranging the removal of hazardous materials such as asbestos before the demolition is put out to contract, but sometimes the Resident has this duty along with ensuring the property is rodent-free.

The Contractor may salvage useable materials unless the Contract states a portion is to be retained by the State. Disposal of unwanted materials must be in accord with Maine Department of Environmental Protection and local rules. This usually means these materials must go to secure sites

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licensed to handle demolition debris; especially materials such as asphalt shingles and asbestos. Burning of buildings is not currently allowed on or off the site.

Special Provisions and Specifications usually define the extent of the foundation removal; otherwise only the building would be removed and the foundation filled.

b. Bridge Removal

Removal of superstructures or portions of bridges is much the same as buildings. On Bridge Act projects, the Resident should advise the Town they have first refusal of the materials.

c. Removal of Bituminous and Concrete Pavement

Pavement millings often become property of the Contractor, unless the Special Provisions state they are to be retained by the State. Currently millings may go to a hot top plant or be used for gravel. Typical sections of the plans indicate the depth and grade of the milling. Butt joints and rumble strips are done as per the Standard Details.

Concrete Pavement is usually broken into manageable pieces before being excavated. It may be used as fill material to specifications or wasted in an area approved by the Resident.

202-5 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

As stated before, it is important that disposal of materials comply with environmental rules. The Resident must be informed of the destination of materials removed from the project. The work should be inspected for compliance to the contract terms or Extra Work Orders.

Project Diary, Inspector's Diary/Inspector's Daily Report: The Resident or Inspector will keep notes describing, for example, demolition of buildings, removal of bridge superstructures and substructures, removal of pavement and other obstructions for which there is a pay item in the contract. Station to station limits of work done by the Contractor, if appropriate, and disposal will be noted. Disposal of materials usually consists of hauling to a waste dump, turning over to a State or Town Official, or stockpiling for future use.

Measurement and Payment

Rumble strips are paid by the length. End stations and/or lengths must be recorded in a book.

Milling of bituminous pavement and concrete pavement removal are paid by the surface area. Milling may be to certain depths and/or slopes, requiring inspection of these details. Locations and measurements of surface areas

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should be in a book. Concrete pavement used in fills should be broken into pieces of size to meet embankment specification.

Building and bridge removals are usually paid lump sum. An entry in the Final Quantity Book with reference to diary entries of the work is sufficient documentation. Removal of bridge railing may be paid by the length, necessitating field measurements in a bound book. Special Provisions of the Contract may require that certain components of the existing bridge become property of the State or the Town. The Resident should obtain the signature of the individual receiving such materials.

Final quantity for payment will be entered in the Final Quantity Book and labeled as such.

For items to be paid plan quantity, such as removing existing pavement, the estimated quantity must be accurately figured and the actual work limits must be the same as those shown in the Engineer's Estimate. The Resident may have to adjust the estimated quantity to reflect field changes. As for lump sum items, the Resident will make references to Diary notes verifying that work has been done as estimated. These notes may be made directly in the Final Quantity Book. If the plan quantity is a "throw-in" quantity, i.e., has no basis other than a guess, the work in question will have to be field measured.

Removal of curb, fence, and guardrail will be incidental to the work in general. No separate payment will be made unless specific pay items exist in the contract for removal of these items.

All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work.

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Section 203A Borrow & Section 203B Embankment -- 16 Pages

BORROW

203A-1 GENERAL

References:

- (1) Construction Manual, Section 203 - Excavation and Embankment
Section 700 - Materials
- (2) Standard Specifications, Section 203 - Excavation and Embankment
- (3) Special Provisions & Supplemental Specifications
- (4) Standard Details Highways & Bridges
- (5) Project Plans and Typical Sections
- (6) Construction Notes/General Notes

When there is not enough excavation material within the right of way to construct the embankments, it is necessary to obtain borrow. The Inspector should compare test results of the borrow with visual inspection of the same to see any obvious change. Make sure that all borrow from x-sectioned areas of the borrow pit is used in approved areas and not on haul roads, equipment yards, or for sanding of roads in winter. If material is used off the project, document the truck number, quantity, where it was used, and, if possible, obtain delivery slips in accordance with specification requirements. Prior approval for such use of materials is not to be given under any circumstances.

The restoration of pits is discussed in Section 105.8.6 of the Standard Specifications and is covered in Section 657 of this Manual and the Supplemental Specifications for individual projects.

In those situations where a Contractor has further use for a pit on State work, it may be possible to obtain a waiver by sending a letter to the Resident requesting deferment of the required rehabilitation until such time as the Commission may allow. A request of this nature must be by submitting a Change Order from the Project that originally had the rehabilitation specified and also a Change Order from the Project that intends to do the rehabilitation work. This can also be done even if more than one Contractor is involved, if letters from both parties indicate that the rehabilitation will be done by the last Contractor to work the pit.

There is the occasional situation where the Contractor desires to use material that exists within the Right of Way. The applicable specification is Subsection 104.05 of the Standard Specification and the policy

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of the Department is discussed in Subsection 104.05 of this Manual. No charge for materials removed from within the right of way will be made against the Contractor.

Whenever a Contractor requests the use of material from within the Right of Way and beyond the excavation limits, this request must be presented to the Resident in writing. The Resident will supplement the Contractor's request by following Section 104.05 of this Manual. If permission is granted to use this material, the terms for final acceptance of the area will be established in writing to the Contractor.

Borrow pit quantities should be available to pit owners who request them after the quantities have been determined and checked. These final quantities are public records. The quantities should be given to the pit owner via letter with a copy to the prime contractor and also to any involved sub-contractors.

203A-2 LAYOUT AND CONTROL

Borrow pits will be approved by the Resident, stripped by the Contractor, and then original x-sections should be taken. The Inspector should become familiar with the original location of the material taken from the pit. It is very important that control for x-sections (Permanent Bench Marks and ties to Base Lines, can be reproduced in order to insure accuracy of final sections in relation to original sections.

Although the Contractor is responsible, the Resident and Inspector should be aware of the location of property lines, municipal roads, and local ordinances regarding buffer zones and the proximity of property lines to the limits of excavation.

The area x-sectioned should be staked out. Limits should be clearly flagged and the Contractor's Supt. shown the stakes. Material removed beyond the staked limits may not be paid for if there is no reasonable way of determining the quantity. It should also be pointed out that the flagged stakes at the pit limits are to be preserved until final x-sections have been taken.

203A-3 TESTING REQUIREMENTS

- (1) Gradations: As per the project Minimum Testing Requirements; sampled in roadway as it is being placed.
- (2) Compaction: As per the project Minimum Testing Requirements, each layer
- (3) Preliminary samples taken in pits are informational only.
- (4) Samples for testing of material designated for use as Underwater Backfill may be obtained from approved Granular Borrow Pits.

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203A-4 CONSTRUCTION

Following is a list of various circumstances under which Granular Borrow may be used:

- (1) At designated locations as shown on plans.
- (2) To maintain traffic.
- (3) To mix with excavation when it is too wet to use otherwise. (Sandwich Construction)
- (4) In undercut areas.
- (5) To backfill muck areas.
- (6) As backfill under water.
- (7) In muck areas prior to placing rock fill.
- (8) As foundation material for culvert pipes or other structures.

Granular Borrow should NOT be used under the following circumstances:

- (1) To stabilize common borrow.
- (2) With excavation that has become too wet to work on as a result of rain, snow, sleet or fog.

Information regarding other construction phases of borrow is covered in Section 203.3C, Embankment, of this Manual.

203A-5 INSPECTION

The Inspector, after being assigned duties by the Resident, should become familiar with the Plans, Cross-Sections, Standard and Special Provisions before commencing inspection duties. The Inspector should clarify any questions or doubts they may have concerning the inspection work with the Resident.

The possibility of misuse of materials is to be checked constantly when more than one material is being used from one pit, or when one large pit is being used for more than one job. Contractors should not be allowed to use material from cross-sectioned areas for locations that are to be later measured in place or otherwise measured for quantity unless a Change Order has been submitted to change the method of measurement.

Pits that are operated during extremely cold weather must have a disposal area within the x-sectioned pit limits where frozen material can be placed so it will be measured in the final x-sections for the pit. A situation similar to that above is encountered in pits that have many large boulders to be removed at the pit. In this case the best practice is to have the Contractor bury them within the x-sectioned area. In this way the voids are essentially filled and there is no problem in determining the true volume of the unused boulders.

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The Inspector should be sure where the Resident Engineer has approved using haul roads and what agreements exist. They must always watch for misuse of materials on the project and check waste areas to see that usable material from the project or borrow is not being used by the Contractor to help build entrance roads/or roads to pits. This might happen after a heavy rain or when the roads get soft.

It sometimes becomes necessary to measure borrow or excavation by truck measure; in this case a delivery slip must accompany each load. Truck bodies must be measured to substantiate quantities paid. Measurement shall be to the nearest 0.1 ft. and shall be recorded on a page in the Inspector's Diary set aside for that purpose. If the truck has removable sideboards it should be so noted opposite the measurements.

Partial loads are not to be estimated by the number of cubic yards. The quantity for payment will be estimated by the fraction of the load used or remaining and noted on the slip by the Inspector, for example: $\frac{1}{4}$ load, or $\frac{1}{3}$ load used.

Length, width and depth measurements for measured in place materials should be recorded directly into the Final Quantity Book. If not feasible, such measurements may be recorded in a Construction Book or in the back portion of the Inspector's Diary. All measurements must be signed and dated. Borrow measured in place is limited to 5,000 m³ [6,500 yd³] per project and must be swelled 15 percent. Refer to Section 203.18, Method of Measurement, of the Standard Specifications.

Unless it is absolutely necessary, materials should not be removed from x-sectioned areas of pits for use in locations that require in-place measurement or truck measurement of quantities. Materials for such use should be obtained from unsectioned areas of pits, unsectioned pits, or after final x-sections have been taken. If particular or emergency conditions dictate the necessity of taking these materials from a x-sectioned pit, the trucks involved must be measured as previously stated above and all pertinent facts such as date, time, truck number, destination and use must be recorded in the Inspector's Diary and/or in other appropriate project field books. Each load must also have a delivery slip signed by an Inspector at the point of delivery if possible. The above procedure is required due to the necessity of properly documenting these quantities so they may be deducted from the borrow pit quantity as determined by original and final x-sections.

Delivery slips are, of course, required for all truck measured materials, regardless of their source. Their use will also eliminate the complicated procedures of documentation, measurement and computations, when materials requiring other than pit measure are removed from x-sectioned pits.

203A-6 BORROW - FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This subsection describes the record keeping necessary to document and measure borrow required to meet the fill requirements of the contract.

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Field Documentation Project Diary, Inspector's Diary/Inspector's Daily Report: Standard Specifications, Section 203.03 and 203.04, require that no excavation suitable for embankment construction be hauled off the Project. The Resident or the Inspector is to make note of wasted excavation and the nature of it, since the more excavation the Contractor removes from the project, whether authorized or not, the more borrow is needed to construct the embankments.

The Resident or the Inspector will keep daily notes in the Project Diary or the Inspector's Diary on the Contractor's operations. Name of the pit that borrow is being hauled from and station to station limits it is being placed, whether in the core of the embankment or in waste storage areas. These areas, which are beyond the 1:1 slope from the finish shoulder break, are to be reserved for the placement of grubblings or other excavation not suitable for constructing the core of the embankment. The Contractor is not allowed to place borrow in these areas if there is waste excavation available.

Ideally, the Contractor should complete all excavation operations prior to hauling borrow to the project. If borrow is placed on the job before all excavation is complete, the Resident should advise the Contractor that they are doing so at the risk of having some borrow deducted from the final pay quantity. No excavation is to be removed from the project if it can be placed either in the core of the embankment or in waste storage areas. The case may arise, usually because traffic has to be maintained on the existing road, where borrow has to be hauled to the job before excavation is complete. The result is that good excavation is wasted; in this situation the Contractor is not penalized. Discussions relating to these matters must be noted in the Diaries.

Borrow diverted for the Contractor's own use must be documented as well; materials used to maintain a haul road or town road, or to grade the equipment yard is all to be deducted from borrow if the material comes from a sectioned pit.

Grade Check Book: As stated previously under Section 203.5 - Excavation, documentation of subgrade checks is a requirement of the Department, whether the operation is in a cut or in a fill. Refer to Section 203C-6, Grade Check Book, for further discussion of grade checks.

Measurement and Payment Borrow: Borrow cannot be paid plan quantity. An exception is when the plans require backfill behind abutments and around multi-plate pipes to be granular borrow or gravel borrow. Standard Specifications, Section 203, Method of Measurement, allow backfill around bridge structures to be paid plan quantity.

When the Designer estimates quantity of borrow required for the project, they make assumptions that may or may not be representative of field conditions, particularly on bridge projects. The quantity of excavation estimated to be available for fills is, to some extent, guesswork. Some of the excavation may or may not be suitable for embankment construction or a situation may exist on the job that makes excavation not available in a timely manner; an example would be traffic maintenance on the existing roadway. The result is that the actual quantity of borrow used on the job is usually not what is estimated.

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For these reasons, final quantity of borrow must be determined from actual measurements. The Resident will use the following methods or a combination thereof:

Cross Sections By Standard Specification, the contract bid price for borrow is based on the material being measured in its original position, i.e., in the pit. If measured any other way, the quantity must be adjusted as explained below. Original cross-sections are taken in the pit after the Contractor has stripped the surface and before excavating and hauling operations begin. The Survey Crew should flag the pit limits to alert the equipment operators not to remove material beyond the outer limits of the original cross-sections. Final sections will be taken after the pit has been graded and before grubblings, loam, or other material that can support a growth of grass has been spread.

Borrow pushed up and beyond the edge of pit at its perimeter will be deducted from the overall quantity measured for payment. The Survey Section uses a “total station” computer program to take cross-sections and to compute quantities; a print-out of each cross-section is available.

Load Count It is frequently not practical to figure borrow quantities by cross-sectioning the source. Since nearly all borrow pits are commercial pits and therefore are available to the public, it is hard for the Contractor to guarantee or even assure the Resident that all material taken out of a sectioned pit will be hauled to the job.

Load count, providing the total quantity measured is less than 5,000 m³ [6,500 yd³], offers an alternative to the cross-sectional method. There are two problems common to load counted material: trucks not being fully loaded and drivers reporting more trips than actually hauled. For these reasons, it is advisable to assign an Inspector or ticket taker to witness and to collect delivery slips for every load hauled. If, because of lack of personnel, this cannot be done, the Resident or Inspector assigned must do a random check of the Contractor’s hauling operations. He/she should do a “time study”, i.e., determine how long it takes for a driver, or more than one, to make a round trip from the pit to the site, and also to visually observe if the trucks are fully loaded.

Section 203.18, Method of Measurement, Standard Specifications, requires that borrow by load count must be reduced to 90 percent of the quantity so measured.

In-Place-Measure A third method of measuring borrow is to compute the quantity in its final position, more commonly called “in-place-measure”. This method is particularly suited to bridge projects. The procedure to follow is to figure the total quantity in the embankment from the design template to original ground or to bottom of grubbing limits. The excavation placed in the fill would be deducted from the total embankment and the resulting figure would be swelled 15 percent for final payment.

If earth excavation that is placed in fills is measured in its original position, it will be shrunk 15 percent before being deducted from the total embankment quantity. If it is measured in its final position, i.e., in the embankment, it will be deducted at 100 percent of the quantity so measured. If it is measured load count, it will be shrunk 25 percent before deduction.

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If rock excavation that is placed in fills is measured in its original position, it will be swelled 33 percent before being deducted from the total embankment quantity. If it measured in its final position or by load count, it will be deducted at 100 percent of the quantity so measured.

Borrow Deductions When the Resident computes the final pay quantity of borrow, he/she must determine if any of the material should be excluded from payment.

Unless directed by the Resident, all usable excavation will be placed in the core of the embankment and all waste excavation will be placed in waste storage areas, either as shown on the plan cross-sections or as directed in the field. Only excess excavation can be hauled offsite. Borrow diverted for the Contractor's own use or placed in unauthorized areas will be at his/her expense. Standard Specifications, Section 203.18 - Method of Measurement, states that material placed outside the embankment will not be eligible for payment.

For deduction purposes, the following situations are to be considered:

Borrow is placed ahead of excavation operations which results in a surplus of excavation: Common excavation and rock excavation wasted will be swelled 15 percent before deduction; reference is made to Section 203.04, Standard Specifications.

Excavation is hauled off the job instead of being placed in the embankment and then later replaced with borrow because of convenience and ease of operation to the Contractor: The quantity of excavation that could have been placed in the embankment will be deducted from borrow at 100 percent of the quantity so measured.

Excavation is placed in the embankment beyond the design template in concentrated areas as opposed to being distributed throughout all fills, thus creating "fat" slopes: Earth and rock excavation placed beyond the pay limits defined in Section 203.18, Standard Specifications, will be deducted from borrow at 100 percent of the quantity so measured.

Borrow is placed in embankments beyond the design template, the result being "fat" slopes: Quantity placed beyond the pay limits defined in Section 203.18 will be deducted from borrow. Deduction will be made at 100 percent of the quantity so measured.

Borrow is diverted for the Contractor's own use: Material used to dress the Contractor's equipment yard or a waste dump, or to upgrade a haul road or town road will not be included for payment. Deduction will be made at 115 percent of the quantity so measured; refer to Section 203.03.

Final quantity for payment will be entered in the Final Quantity Book. Subtotals, and deductions making up the final quantity for payment will be entered in the Final Quantity Book and referenced back to source. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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EMBANKMENT

203B-1 GENERAL

The success of an embankment depends upon proper preparation of the foundation, use of suitable materials and proper placement and compaction of materials.

The composition of the soil and its moisture content dictate the type of compaction equipment most suitable for use on embankments. Vibratory type equipment has proved most suitable for sandy soils and sheepsfoot rollers for clay or silty soils. Moisture content may be controlled either by adding water or by aerating and draining the material. At least ½ inch per foot pitch from center line to the outer edge of embankment, as required by specifications, will be necessary for adequate drainage.

Sometimes there are special controls for certain areas. For example, the embankment area within 15 m [50 ft] of a bridge abutment, a box culvert or a structural plate culvert is moisture-density controlled, where outside this area it may be layer method.

203B-2 LAYOUT AND CONTROL

The Contractor is responsible for project layout. The resident should inspect any proposed benchmarks, location for grade and line, utility conflicts and drainage easements.

Additional easements of some nature or the right to work on somebody's property are required in certain cases. Sometimes unforeseen drainage runoffs or the flattening of sideslopes for stability make easements necessary. Reference section 104.2 of the Standard Specifications for information regarding Right of Way changes.

203B-4 CONSTRUCTION

a. Layer Method The layer method will be used on all Projects unless otherwise specified. The material shall be deposited and spread upon compacted material in full width layers not more than 200 mm [8 in] in depth, loose measure. Clay or loam soils shall be compacted by use of sheepsfoot or tamping type roller having a minimum weight on each tamper, under working conditions, of 1725 kPa [250 psi] of cross sectional bearing area. Sand or gravel soils shall be compacted by vibratory type compaction equipment or by pneumatic tired equipment and, if necessary, by the addition of water. A combination of the above or other methods capable of producing equivalent results may be used. The compacting operations shall be continued until each layer is compacted to its full depth and width.

With approval, the Contractor may place layers in excess of 200 mm [8 in] and less than 600 mm [24 in], loose measure, providing the specified compaction requirements are obtained and the Contractor

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agrees to make necessary test excavation for the Resident to determine density. The Contractor will be required to demonstrate that the compaction equipment and methods are obtaining satisfactory compaction.

Satisfactory compaction for the purpose of the demonstration is defined as not less than 90% of the maximum density. The maximum density shall be determined in accordance with AASHTO T180, Method C or D, corrected by the Soils Laboratory Adjustment Chart, available at the MDOT Central Laboratory, Bangor, Maine. Field density tests will be made in accordance with AASHTO T191, adjusted to include only the material passing a 19 mm [$\frac{3}{4}$ inch] sieve or by an approved method using a calibrated nuclear device.

b. Moisture Density Controlled Embankments

The Resident should be aware of the problems that may be encountered in a moisture-density controlled embankment and has the responsibility of seeing that soils testing personnel are on the Project and that they keep up with the minimum density tests (compactions) required.

The basic theory of moisture-density control is that the dry density of the soil being tested is compared, on a percentage basis, to the density of a sample of the same soil that has been compacted under controlled conditions. This laboratory test is called a "Proctor Test". The lab tests are made on soils of varying moisture content and the results plotted on a graph. (See Figure 203-C, Typical Proctor Test) The resultant curve clearly indicates the maximum density at optimum moisture of the material being tested.

The field density test taken to compare with the Proctor is the practical application of the basic formula:
(1) Density = Weight / Volume

Much of the difficulty that many Contractors have in obtaining compaction is directly related to lack of moisture in the material. The curve obtained by the Proctor tests clearly shows that maximum density is most easily obtained at, or near, the optimum moisture content. With moisture content at very much less than optimum, more compactive effort is necessary to compact the soil to a given density. The same is true for soils that are much above the optimum moisture with the additional fact that they often appear unstable, particularly fine grained soils. Soils that have a moisture content so high that all the voids are filled with water cannot be compacted and the moisture content must be reduced.

For most sandy type soils in well drained areas, it is nearly impossible to get too much water into them. Conversely, in silty or clay bearing soils, if optimum moisture content is greatly exceeded (over 3 or 4%), as it may be extremely difficult, or impractical to remove the excess water.

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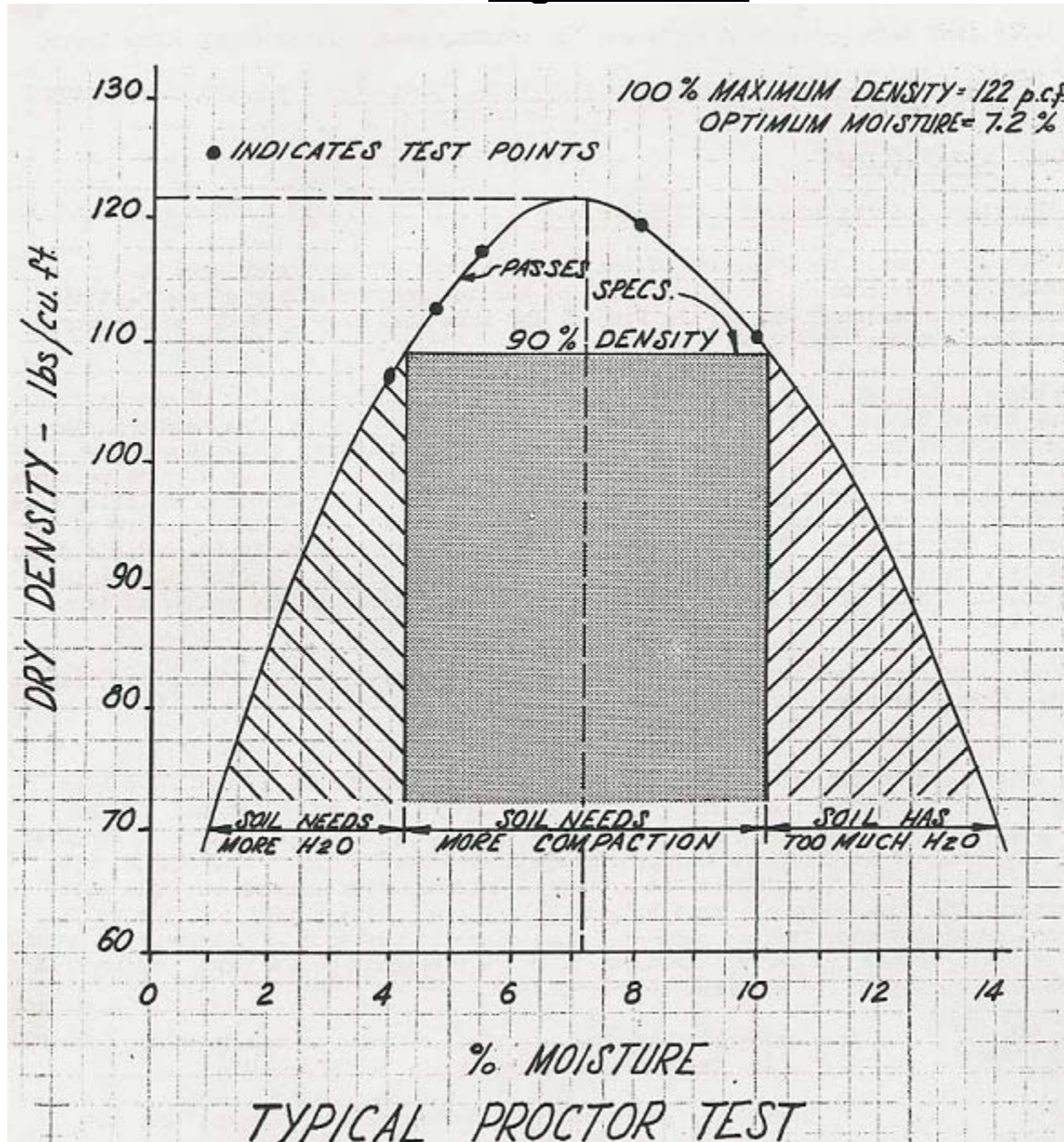
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Figure 203-C



The Resident should watch compaction test results closely for a consistent pattern of under compaction or over compaction. Many things can cause this, but it is most likely that the material may have unknowingly or gradually changed so that the original Proctor is not valid. This most commonly will occur in a cut section where compaction tests are made on subgrade, or on materials subject to degradation from traffic. The Resident should never hesitate to have additional Proctor tests made if there is even a suggestion of a change in the material.

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Compaction tests should not be taken as valid if heavy or vibrating equipment is operating nearby nor should tests be taken in frozen soils. Such tests are almost always invalid, due in part at least, to frost buildup on soil particles and the resulting changes in volume and moisture content.

In cold weather, compaction tests must be made before the ground freezes. If the tests fail and the material freezes before additional compactive effort is applied, then the area is unacceptable and the work either must stop in that area or the frozen material must be removed before more fill can be placed. If frozen material is removed it must be placed beyond the 1 ½ to 1 slopes or in other areas where uncompacted material may be used. The Contractor should not be allowed to place this material beyond the theoretical slope limits. If this is done, it must be deducted from final quantities on "Borrow" jobs.

When fill is placed over frozen material, either previously compacted embankment or original ground, the Specification criterion of allowing only 1.5 m [5 ft] of material including base courses and frozen ground will then govern the construction of the embankment. It must be remembered that each layer must be compacted to specifications even over the frozen ground. The depth of frost should be determined for the actual area involved, not assumed from other remote data.

Where embankment construction is on weak or unstable soils it is often placed over a specified period of time. This is done to allow underlying materials to gain enough strength to support the increasing load imposed by the fill by letting settlement and equalization of soil pressure occur gradually and to prevent sudden shear failures. Surcharges or overloaded embankments are often constructed the same way to speed up settlement. The Soils Report should be closely studied in this regard to make sure that surcharges are located in all locations recommended by the report.

In wet areas requiring fill the initial layer should be free draining granular material whether the specifications call for it or not. This will eliminate, or at least help to prevent, capillary rise of water up into the embankment and possible subsequent frost action due to excess moisture in the overlying fill. Rock fill can be used over the granular blanket, but caution is urged in the use of rock fill directly on wet old ground as this can cause point loading on soft material and result in rupturing or disturbing materials that would otherwise have carried the loads as designed.

On Projects requiring considerable quantities of borrow, the Contractor should be encouraged to leave long fill areas several feet below subgrade and to bring them up to subgrade entirely with borrow. This will provide more uniform material at and near subgrade and will result in a smoother road due to less differential frost action.

c. Sandwich Construction

A system of constructing alternate layers of wet clay excavation and granular material, called "Sandwich Construction", can be an effective means of overcoming harmful disadvantages of using entirely clay fill, such as excessive settlement, weak shear strength, and to utilize material that is otherwise too wet to use. This method has the effect of providing drainage to increase the rate of

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consolidation and also providing stable working platforms for heavy construction equipment. Sandwiching utilizes clay materials without danger of over compacting or overstressing the soil. The granular layers, providing drainage faces to increase consolidation rates, should be built in sufficient thickness (usually 200 mm [8 in]) to adequately distribute wheel loads to underlying clay layers so as not to exceed the shear strength of the clay material. In some cases it may be possible to make the required density tests on the clay after the next layer of granular material is placed. When this system of construction is used, a Change Order to request a waiver of modification of the density requirements on the clay material is often necessary.

Sandwich construction must be done carefully with light weight equipment being used as much as possible in order to keep the clay layers uniform and relatively smooth. The system works best when there are at least two, and more if possible, areas to construct. This gives the clay layers time to drain and consolidate while the sand layer is being compacted in the alternate locations.

Another method of modified sandwich construction that has been successful, particularly when the clay material is more silty, is to place alternate 200 mm [8 in] deep layers with granular material on top and mix the material to a depth of 300 mm [12 in] with a large disc harrow or a pulvimixer. The mixing is paid for at the bid price for Item 631.09 Aerator. The depth of mixing must be carefully controlled, as much deviation will change the relative percentages of the two materials and will change the "Proctor" of the material being tested.

In either of the above cases the top layer of material should be clay. This is to seal the top and provide a smooth working surface that can be kept graded and properly drained. The bottom layer should be granular material to provide a relatively even working platform, as well as provide a layer for the water to drain through when the following layers are placed and compacted.

The economics of using sandwich construction should be considered well in advance as a large amount of granular type borrow will be required. These methods of sandwich construction are used only in those cases where the moisture content of the clay material is over optimum and when the clay material, which could not possibly be used alone, would otherwise be wasted.

Due to high moisture contents, sandwich fills may sometimes weave and roll under the compaction equipment. Unless the clay breaks through in "boils" this should not overly concern the Inspector. The "weaving" or "rolling" will usually disappear as the underlying layers drain out and consolidate.

d. Toe Loads

On some projects toe loads are designed to act as counterweights to the roadway embankment. The toe loads must be constructed at the same time as the embankment to the extent that the roadway core should not be constructed above the depth of the toe areas until the toe load areas are completed. This is to keep the underlying soils from becoming overstressed and resulting in a shear failure.

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The most important factor to keep in mind regarding toe loads is that they are designed for weight not for a specific elevation. The soils report will give the density of the material that was assumed for the toe load computations. The main thing to remember is that toe loads that have settled should not have material added to them just to keep them at or to construct them to a certain elevation. The elevation that is often indicated on the plans is informative only and should be used as a guide with the actual weight of the embankment as the controlling factor. Toe fill areas should always come into mind as waste disposal sites.

e. Use of Soils

Best possible use should be made of the excavations which are available on the project. Many soils are unsuitable because of their natural state. They can cause instability in the embankment or have some other detrimental effect. Underlying material that is about to shear can often be spotted by the alert Inspector. Leaning trees or a slight rise in the soil adjacent to an embankment are tell-tale signs of an impending shear failure. Also, obvious cracks in the embankment, particularly if the cracks follow a crescent shaped pattern on one side of the embankment are a sign of failure, either in the embankment itself or in the material underlying the embankment.

If any of the above situations occur, work in the area should be stopped immediately. The Inspector should notify the Resident who will take the necessary steps to combat or correct the situation. The solution may take any of several forms such as adding toe loads to counteract the possible impending failure; removing some of the material if it is possible; just keeping traffic and equipment off the area; or following the recommendations of the Soils Section of the Materials & Research Division.

Occasionally, soils will be encountered that were not evident when the soils report was made. If this occurs, this material may be considered for use in embankments as described for sandwich type construction if it is too wet for normal use, it may be used in toe fill areas, or if absolutely necessary the material may have to be wasted.

Backfill for muck areas should be pushed on, not end dumped, so that loose muck will be cleaned from the bottom of the excavation.

Winter construction of embankments presents numerous problems, particularly in regards to freezing of materials as previously discussed. During winter months, construction will have to be slowed considerably in order to meet the requirements of the Specifications. In some cases it may be necessary to suspend operations completely until more favorable weather occurs.

The use of granular borrow merely to enable the Contractor to continue working should not be done unless it is economically justified. If granular borrow costs no more than common borrow then there is no reason not to use it for this purpose.

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203B-5 INSPECTION

All embankments shall start in the lowest portion of the fill. Layers shall be placed longitudinal to the center line and full width. The Inspector should see that all requirements of each type of embankment are met.

Using the layer method, the Inspector should see that the layers are the correct depth before being compacted. The Inspector will check the depth by selecting a certain point and checking the elevation before and after the material has been placed and will check grades at center line and right and left of center line to see that a crown is being maintained. The Inspector will also be responsible for adherence to the minimum testing requirements for compaction and insure that the compaction equipment is producing the necessary density. He should also make sure that borrow material meets specifications, and that it is free from oversized rocks, frozen material, and foreign or organic matter. Compactive effort must be changed if the type of material used changes appreciably. It is generally accepted that soils which are not compacted to 90 percent of their maximum laboratory dry density will, in time, exhibit internal shrinkage and settlement.

After the Contractor has placed and compacted the initial layer (which may vary in thickness, depending on the type of terrain to be covered) and has established a uniform working platform, they then will proceed to place the first 200 mm [8 in] layer of embankment material over the entire area.

After this first layer is placed, suitable compaction equipment will proceed to compact this layer to its full depth and width. Once this compaction operation has commenced, the Inspector must count the number of passes that the compacting machinery makes over the entire layer. A density test is then taken and the results correlated with the number of passes. This density test is used as a guide for the determination of the number of passes which must be made by the compacting machinery on each layer to result in a density of 90%.

Once the number of passes has been determined, each successive layer shall be subjected to the same number of passes without any density tests. Should any appreciable changes in materials or source of material occur, the entire procedure must be repeated. A brief description of the observed compaction operations shall be noted in the diary. This account should include the date, type of material, type of equipment, moisture content, number of passes over each layer, and any other pertinent information.

When moisture and density controlled type of embankment construction is called for, compaction tests are required on the subgrade in the cut sections and on each layer of embankment material where applicable.

For moisture and control density method of compaction, the Inspector should check grade and depth of layers the same as with the layer method. The compaction requirements are met by taking density tests at random and at questionable locations.

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To determine the laboratory density (Proctor), a sample from each excavated cut section and samples from each borrow source must be procured to determine their maximum dry density and optimum water contents. This procedure must be followed regardless of the type of embankment construction called for in the contract. (See 203-3 Testing Requirements)

The Inspector should know where on the Project rock fill can be placed. It should be determined what the possible locations for guard rail are on the project so that no rock is placed in these areas where it will interfere with the guard rail posts. All rock is to be dumped on the layer being placed and then pushed into position. All voids in the surface of each layer should be filled so that earth fill or material placed on top of the rock fill does not drop into the voids at a later date. Use clay or cohesive type soils over the last layer of rock fill if possible. A fine sandy fill material can gradually filter down into the voids and cause future settlement.

Where pre-compacted embankments are constructed for the installation of culvert pipes, the material selected should be cohesive enough so that the specified trench width can be excavated without the sides of the excavation collapsing, thereby destroying the effectiveness of the design.

The preparation and protection of the subgrade is very important. The Inspector must see that all subgrade is properly graded, compacted, and kept free of ruts, pot holes, and free from continuous travel along the same wheel ruts, which would cause an uneven compaction. The placement and compaction of an embankment should not proceed in the presence of excessive moisture that is evident by rutting, pumping, cracking, or collapse. Operations should be halted and the material should either be allowed to dry, or be manipulated and aerated or if moisture is extensive, it may require the removal and replacement of the subgrade material by undercutting. If the subgrade moisture is excessive, then the use of a geotextile fabric (ref Section 620 of this manual) may be warranted to strengthen and separate subgrade material from the borrow material or the implementation of an underdrain system may be used to control the moisture and strengthen the embankment.

At the time the embankment is built, the Inspector can, with a hand level and rule, use elevations already established on rail grades or grades on riser stakes at the shoulder to check each section.

Frequent checks of the embankment or excavation by using the elevations on side hubs, which were set prior to work in this area, should be made by the Inspector. The same methods are used to check subgrade in cuts as are used for embankments.

Many Inspectors find it convenient to check subgrade elevations by using a field book set up for each Station showing distance below finish grade at the edge of pavement and at subgrade break points. Subgrade can usually be checked by hand level and rule, or with a string using graded risers. Fill placed beyond the 150 mm [6 in] tolerance slope line, whether it is muck, grubbing, usable excavation or borrow must be authorized by the Resident by letter or a "Resident's Directive" to the Contractor. In the authorization the Resident should set forth stipulations such as limits to which loam and seed will be paid. In addition to the above letter or directive, the Inspector should note in their diary

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the nature of any material placed beyond designated embankment lines. This will permit future determinations to be made regarding whether or not deductions should be made from pit-measured materials.

Fill may be placed up to 300 mm [12 in] beyond the designated slope lines in waste storage areas when the area beyond the slope line is composed entirely of waste materials. There should be no deduction to borrow quantities in this instance.

In placing backfill around a structural unit such as an abutment or retaining wall, it is paramount that the backfill be placed simultaneously on each side to avoid creating unbalanced stresses in the unit. Backfill around a structural unit where an approach fill will be constructed for the support of a pavement requires placing and compacting in a manner to ensure against detrimental settlement.

It is required by the Standard Specifications that the Contractor provides and maintain drainage during the grading of the roadway. Keeping the grade smooth and slightly higher in the center for quick runoff of rain water and maintaining ditches open for free drainage will help to prevent saturated subgrades.

Where seepage is encountered in cut sections, immediate draining with temporary ditches will benefit working conditions. Observations should be made of the effects of the flow of surface water on backslopes. The points of water concentration should be noted and repaired. Ditches and channels should be kept in a well drained condition with no standing water.

**Maine Department of Transportation
Bureau of Project Development
Pit Authorization**

PROJECT NUMBER: _____

DATE: _____
TOWN: _____

_____ is authorized to haul _____ from _____ in accordance with the State of Maine, Department of Transportation, Standard Specifications, Highways and Bridges, Revision of December, 2002, and applicable DEP regulations.

Pit size over 30 Acres:

DEP Permit No: _____

Pit size 5-30 Acres:

Notice of intent, filed with DEP, to comply with Performance Standards: _____

Date received by DEP: _____
or in lieu of above, DEP Permit No.: _____

Rehabilitation, Section 106, Standard Specifications:

- Grading 1:1 slope
- Complete Rehabilitation

Pit size less than 5 Acres:

Rehabilitation, Section 106, Standard Specifications

- Grading 1:1 slope
- Complete Rehabilitation

Pit operation meets local ordinances

Contractor's Representative

Date

Resident Engineer

Date

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EXCAVATION

203C-1 GENERAL

References:

- (1) Construction Manual, Section 203 - Excavation and Embankment
Section 700 - Materials
- (2) Standard Specifications, Section 203 - Excavation and Embankment
- (3) Special Provisions & Supplemental Specifications
- (4) Standard Details Highways & Bridges
- (5) Project Plans and Typical Sections
- (6) Construction Notes/General Notes

203C-2 DESCRIPTION

This work consists of the construction of a graded roadbed, upon which the base and wearing courses will be built, generally referred to as earthwork. Excavation is that part of the earthwork that is removed, suitable material is used to form the embankment portion of the roadbed, unsuitable material shall be disposed of as specified by the resident or standard specifications. Roadway excavation is obtained from within the right of way or construction limit lines exclusive of drainage channels and structural excavation. It may be comprised of earth, solid rock, loose rock or any combination of these materials. When there is insufficient excavation to complete the embankment to the required lines and grades, then the balance of the fill must be made up of borrow.

B: Types of Excavation The following terms used in this section are explained below.

1. Muck Excavation Muck excavation provides for the removal and disposal of saturated or unsaturated mixtures of soil and organic matter that is not suitable for embankment or foundation material
2. Grubbing Excavation Grubbing excavation consists of the removal and disposal of all stumps, roots, and other objectionable material when clearing is required.

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3. Common Excavation Common Excavation consist of the removal and disposal of muck excavation, grubbing excavation, rock excavation less than 2 m³ [2 yd³] material encountered in excavating for permanent stream channel diversion, channel widening or straightening, or excavation that is not otherwise classified and paid for.
4. Rock Excavation Rock excavation shall consist of removing hard igneous, metamorphic and sedimentary rock which cannot be excavated without drilling and blasting or drilling and splitting and all boulders, solid mortared stone masonry, concrete masonry, each having a volume of 2 m³ [2 yd³] or more.
5. Unclassified Excavation Unclassified excavation shall consist of common excavation and rock excavation as classified above and not measured separately.

203C-3 LAYOUT AND CONTROL

The contractor is responsible for project layout. The Resident should inspect any proposed benchmarks, location for grade and line, utility conflicts and drainage easements.

203C-4 TESTING REQUIREMENTS

Refer to the project Minimum Testing requirements

203C-5 CONSTRUCTION

Before the start of any earthwork operation, the Resident should review the project with the Contractor on the subjects of layout, limits and scope of work, the use of excavated and excess material, the location and use of any potential waste areas, and establish a schedule and procedure in order to avoid any potential misunderstandings and delay to progress of the work is avoided.

The Standard Specifications 656 establishes the Contractor to submit a Soil Erosion and Water Pollution Control Plan (SEWPCP). The Resident should observe the area(s) of the earthwork that will be exposed to the elements, the length of exposure, as well as the contractor's operations in or adjacent to streams or other waterways. The Resident should be prepared to restrict the size of the exposed area and the length of exposure, or require changes in the Contractor's operation or SEWPCP to avoid or minimize contamination, siltation or obstruction of any waterway. It is essential that temporary soil and water pollution controls be coordinated and performed in conjunction with all earthwork operations to insure effective and continuous erosion and water pollution control.

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The Project Resident may determine that dust abatement is required during earthwork operations. The Resident should insure that it is done, either under provisions of the contract or by contract modification, using water or approved dust control materials. Liberal use these dust controls is encouraged to minimize air pollution, improve driving vision and retain subgrade quality.

When excavating, all suitable material for use as topsoil should be stripped and salvaged for use as loam. If areas especially designated on the plans as fields do not have usable topsoil, notes should be made in the Diary to this effect. All materials on the project should be used unless the Resident gives written authorization to waste them.

The existing ground underlying proposed embankments, within the limits of assumed one-to-one slopes extending outward and downward from the finished shoulder lines, should be prepared in a manner to provide a firm and unyielding support for the roadbed. All heavy sod, organic material, and unstable soils should be removed from the area and the foundation compacted to the extent necessary to support the embankment and to permit attainment of the required density. The stability of fills will be improved through the removal of silty solid or frost susceptible material and backfilling with selected material from the excavation or, if the contract so provides, with granular backfill material. The limits of such undercutting or excavation below subgrade should be carefully established by the Inspector.

Rounding of slopes should be done according to the plans. The slopes and banks of existing ditches and channels are to be rounded or modified to allow vehicles which have left the road to safely traverse such roadside features. The proper time to call this to the attention of the Contractor's Superintendent is at the beginning of the earth excavation, otherwise it may be harder to accomplish the desired results. See Exhibit 203C for slope rounding procedure.

On projects that have very deep cuts and/or relatively long flat slopes it is good practice to check the elevation of the existing ground at the ground slope intersection to make sure it agrees with the plan x-section. This is to make sure that the slope stakes are set correctly for the Contractor's use. It can be an expensive and time consuming process if the cut is wrong and has to be corrected. Diary notes of checks made are desirable.

Uniformity of materials in the top portion of the roadbed, or frost susceptible area, is a very important factor in road construction. When a pocket of material that is dissimilar to that surrounding it is found in a cut, the odd material should be removed to about 600 mm [2 ft] below subgrade and replaced with material similar to that surrounding the pocket. It makes no difference if it is a silt or clay pocket is in a gravel or sand cut or a sand pocket is in a clay cut.

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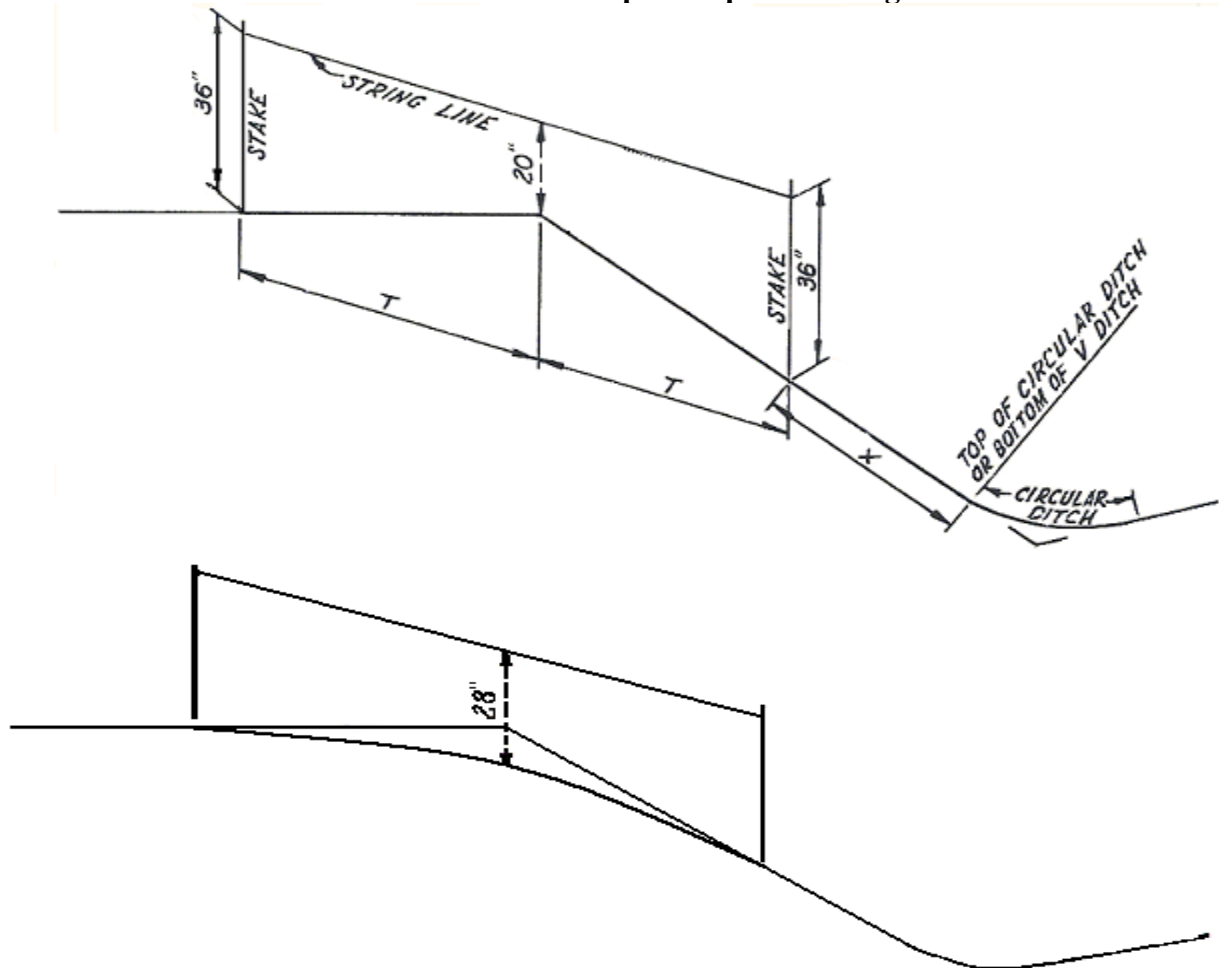
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Exhibit 203C: Top of Slope Rounding



Where $X=5'$ or less, $T=X$; otherwise $T=5'$

Set string line high enough to clear the slope break, e.g. 36\".

Measure from string to breaking point, e.g. 20\".

Halve the difference and add to the original distance from string to slope break.

This gives the required measurement from string to slope rounding.

Example: $36'' - 20'' = 16''$

$16'' \div 2 = 8''$

$20'' + 8'' = 28''$

Solution: The measurement from the string to the rounding is 28\".

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When a very abrupt change from a cut to a fill area occurs and the materials differ, it may be well to consider the advantage of carrying the tapered end of the cut further into the cut area and backfill with embankment material to provide a longer wedge of transition. The removal of this material should be paid for as the type of excavation applicable to the cut area. Confirmation to the Contractor can be by a Resident's Directive.

It is not unusual to find either springs or seepage areas in cuts. These are sometimes associated with layers or pockets of granular materials in clay or silty areas. When these springs do occur and are too far from side underdrains or are too much for a side underdrain to handle, it is usually desirable to take positive steps to prevent local saturation of the subgrade and base. Again, uniformity of materials is essential. The recommended solution is to construct a bed of Type "B" Underdrain sand approximately 450 mm [18 in] thick 1.5 to 1.8 m [5 to 6 ft] below finish grade. Type "B" Underdrain pipe is embedded in the sand bed, in a herringbone or other pattern and outletted at the most convenient and practical location. The backfill over the sand bed should be the same type material as that in the surrounding area. The above situations should be strictly controlled. The necessary work can be paid for directly by unit bid prices through Change or Extra Work Orders, or by Force Account work if necessary.

The basic intent of undercutting is to stabilize the subgrade. If it is at all possible, one of the first considerations should be to drain the undercut area. Undercuts are generally backfilled either with subbase material, or with borrow or granular borrow. In most cases, aggregate subbase is the better choice. Many jobs do not have an item for Granular Borrow and often its cost is not much, if any, different than aggregate subbase material. If good Granular Borrow is available at a lesser price it should, of course, be used for this purpose. The Resident should keep in mind that heavy and continued trucking by the Contractor may disturb the subgrade to the point where normally stable areas may become completely unstable to the extent that undercutting appears to be necessary. This situation is most likely to occur during the winter period between November and May with the ground often alternately freezing and thawing. If this occurs, the Resident should not direct the undercutting of an area just for the convenience of the Contractor. It is the Resident's obligation, to stop or temporarily suspend the work and prevent any further disturbance of the subgrade. If work is stopped for this reason, the damaged subgrade must be corrected by the Contractor at their cost before resuming work in that area.

The bottom of undercuts should be reasonably smooth to provide uniform depth of backfill. The maximum width should be to the point where a 1:1 slope line from the outside shoulder edge intersects the bottom of the excavation.

Generally speaking it is the prerogative of the Contractor to place excavated material from a cut area wherever desired on the Project. It is possible however, for the Resident to make suggestions to the Contractor that certain materials are placed in certain locations. The following information is quite general in nature and is worthy of consideration on any project.

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Excavated clay or silt materials can be placed in relatively deep fills without fear of future problems. Again, uniformity of materials in the frost susceptible area is more important than having strictly non-frost susceptible materials.

On projects with extensive cuts and considerable borrow, the Inspector and the Resident should make sufficient checks to be sure the Contractor is leaving sufficient locations in which to place any material to clean up after the borrow has been placed. This is as much a problem when borrow is being placed as when the excavation is being done. Usable excavated material should not be wasted. This is basically the responsibility of the Contractor and, if necessary, it should be brought to the attention of the Contractor that an equivalent amount of borrow will be deducted from final quantities. The Inspector should keep a load count of any usable materials wasted on borrow jobs, as well as the dates, locations, and vehicle numbers.

In those cases where the Resident feels additional excavation beyond slope limits is authorized, such authorization shall be by a Contract Modification. Approval shall be obtained before doing the excavation work at the particular location, if this is at all possible.

Any rock that is encountered during excavation shall be measured and paid for as a separate item. The rock shall be completely or sufficiently cleared of overburden so that correct measurements of the rock can be made.

The excavation of rock is not usually a particular problem until it comes to cleaning up. In those cases where there is extensive cleanup of rock debris, it may be necessary to waste the material. It is important that the Inspector and Resident keep in mind the fact that there will be "Cleanup" and leave some specific locations where rock debris can be utilized in such a manner as to enhance the Project and save the use of "borrow".

Payment for the removal of rock beyond the neat lines indicated on the plans should always be authorized by Contract Modification and may be done for any one or several of the following reasons:

- a) To save opening up a borrow pit and the resulting rehabilitation costs.
- b) To keep from extending a shallow borrow pit over a large area.
- c) To make a safer more maintenance free project. This may be an extremely important consideration where rock cleavage planes lay so that pieces of the rock may slide off and become either a hazard or a maintenance problem.
- d) To increase snow storage space. This is most important in long rock cuts.

It is the practice on most construction projects involving grading work to utilize as much waste excavation material as possible to the benefit of the road. Such materials as grubbings, wet clay, muck, etc. are placed in slope areas where high supporting strength is not necessarily needed.

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When there is surplus excavation material on a project, it may be used to flatten slopes of the embankment or to improve the appearance of the project within the right of way. If this is done, the Resident should be fully aware of any other phases of the project that may be affected by this use of surplus excavation, such as culvert pipes and the consideration of the possible necessity of extending them and the extra loam, seed and hay mulch that may be required due to flattening slopes. These and other possible considerations should be ascertained and payment, if any, to the Contractor determined well ahead of the actual directive to the Contractor to proceed. This is particularly important in cases where there is no apparent benefit to the State, whereupon the Contractor will sometimes agree to do necessary appurtenant work at his own expense. All agreements of this nature must be agreed upon by the Contractor in writing either by letter or by signing a Contract Modification covering the work.

Should the Contractor construct slopes that are obviously bulging beyond the allowable maximum, they should immediately be instructed to remove the excess material. If, upon the receipt of such an order, the Contractor fails to move the material in question, they should be ordered in writing to remove it.

When waste material has to be taken to locations off the project, it is necessary that the Resident give written authorization to the Contractor for each location or each waste area.

Factors to be taken into consideration when approving a waste area are:

- 1) Surrounding terrain: Will this area blend with the rest of the country side when loamed and seeded or will it be obvious to passersby.
- 2) Entrances should be angled away from oncoming traffic when possible and should be no wider than one truck width-from the roadway to at least 30 m [100 ft] beyond the Right of Way or Construction Limit Line (whichever is farthest). This is to provide a natural screening effect for the waste area and also the access road, even after the area is selectively thinned.
- 3) Will the area tend to erode due to natural water courses and possibly present an unsightly appearance in the future?
- 4) Is there an adjacent waterway that may be subject to damage from erosion or slides?
- 5) All necessary permits shall be obtained by the Contractor before the Resident issues a permit.

The Inspector should make a note in the diary when materials are used on the Project in this manner. The Resident should make a point of finding suitable areas on the project within the neat lines of the fill slopes beyond the 1 ½ to 1 slope limit.

203C-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT This subsection describes the recordkeeping necessary to document and measure excavation. It is recommended that you read Division 900 of this Manual to better acquaint yourself with general project record keeping.

a. Field Documentation Project Diary, Inspector's Diary/Inspector's Daily Report. By specification, the Contractor is required to place usable excavation within the slopes of the embankment; no excavation

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can be hauled off the project without the Resident's approval. It is their responsibility to determine what material can be used on the job, or can be wasted, or stockpiled for future use. This becomes particularly important on a "borrow job" as the amount of wasted excavation directly affects the amount of borrow required. A project is a "borrow job" when material from off the project is required to meet the fill requirements of the contract.

The Resident, or the Inspector if one is assigned to cover excavation items, will keep daily notes of the Contractor's activities relative to earth and rock excavation. Entries will be made documenting station to station limits of material excavated and locations where placed. It is important to record such information as: material directed to be placed within the core of the embankment or in waste storage areas within embankment limits, or to be stockpiled for future use on the project, or hauled to waste dumps off the job.

Circumstances surrounding the hauling of excavation off the project must be explained, particularly if the project is a borrow job. Material suitable to be placed in the embankment but wasted without the Resident's permission will be deducted from borrow. Likewise, material only suitable to be placed in waste storage areas outside the core of the embankment but wasted without permission will also be deducted from borrow. Excess excavation, not required for embankment construction, will be hauled off the project and disposed in waste dumps or other locations approved by the Resident.

Excavation that the Contractor stockpiles away from the job for future use on the Project will or will not be measured for a second payment, depending on whether or not the Resident has allowed stockpiling. Standard Specifications, Section 203, Basis of Payment, allows payment for the rehandling of excavation when it is not possible for the Contractor to do otherwise.

Added undercuts, changes in ditches either in grade or offset, changes in backslopes, changes in excavation limits to the approaches and drives must also be noted and measured for payment.

Grade Check Book It is a requirement of the Department that the Resident or Inspector spot check the Contractor's grading operations to assure that fine-grading is done within construction tolerances stated in the Specifications. It is recommended, although not a requirement, that a "Grade Check Book" be made part of the project records. This book will serve as a convenient and ready reference for checking subgrade, sidewalks, ditches, and backslopes on mainline and side roads, and also for keeping track of what areas the Contractor has fine-graded and what areas have been spot checked. This book should be set up prior to the start of excavation and borrow operations so that the Resident, when in the process of figuring offsets and grades, will discover possible errors in the plans and will also become familiar with the geometrics of the job before work begins.

Whether or not the Resident uses a Grade Check Book, some written documentation must be entered in the project records that the Contractor's fine-grading operations have been checked and approved. These entries may be made in the Project Diary, Inspector's Diary, directly in the Final Quantity Book, or in the Grade Check Book if there is one.

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b. Measurement and Payment

Earth Excavation Final quantity for payment can be the figure shown in the Schedule of Items in the contract, more frequently called the “plan quantity”. The Resident may pay plan quantity as final payment but the following two conditions must be met: the quantity estimated (Engineer’s Estimate), must be reasonably accurate, and the limits of excavation in the field must approximate those estimated. The plan quantity must be adjusted, upward or downward, because of changes made in the field and also because of increases or decreases in quantity of rock excavation estimated. The Engineer’s Estimate must be reviewed to assure that rock is not included in the quantity of earth figured. Changes will be measured and recorded directly in the Final Quantity Book or in the Construction Book. Types of changes are described under Field Documentation, above.

Field changes and added work will be measured by load count, by length, width, and depth, or by original and final cross-sections. Load count will be reduced by 10 percent to arrive at a quantity equivalent to what would be measured in its original position. Computations may be done in the Final Quantity Book, in the Construction Book, or on computation sheets that are part of the Final Quantity Computations Book. If the Resident uses the computer program “Field Manager”, the Item History to Date will be generated in lieu of a Final Quantity Book.

Wasting of excavation without the Resident’s permission will be measured and deducted from borrow. Measurement will be by load count or by length, width, and depth. Load count excavation will be reduced to 90 percent for deduction purposes; excavation measured in-place off the project will be deducted at 100 percent of quantity so measured.

Muck and grubbing excavated beyond limits shown on the plans will not be measured for payment unless the Resident has authorized a change in the limits. Lateral excavation limits for muck excavation are determined by the intersection of the bottom of the excavation and a 1:1 slope line drawn down from the finish shoulder break. Borrow placed in overexcavated areas will not be deducted unless the excavation beyond lateral limits is deliberate or due to negligence by the Contractor.

Rock Excavation Unlike earth excavation, the actual quantity of rock excavated will not agree with the Engineer’s Estimate. Since soundings are normally taken some distance apart, original ledge cross-sections drawn on the plans do not accurately describe top of ledge, particularly where there is earth overburden. Abrupt changes in elevations are not always detected and also, boulders may be mistaken for solid ledge. This lack of detailed information results in errors in the estimated quantity, and therefore the “plan quantity” cannot be used to make final payment. If earth is paid plan quantity, it must be adjusted according to actual quantity or rock paid.

Rock has to be re-sectioned before removal; but, if the Contractor does not want to strip ledge prior to blasting, top of ledge elevations can be determined, by recording from a known elevation, depth the drill rig has to go before hitting solid rock. Standard Specifications, Subsection 203.04 General, requires that

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the Contractor remove overburden before original cross-sections are taken; it is the Resident's prerogative, therefore, whether or not to allow the Contractor to leave the earth in place before blasting.

Quantity of ledge for payment will be figured from "new" originals to the design cross-section if rock is removed to the construction limits described in Section 203.05 of the Standard Specifications. No payment will be made for rock removed beyond the design cross-sections unless the Resident has directed a change in design. Standard Specifications, Section 203.18 Method of Measurement, defines pay limits. Quantities will be computed by the average end area method.

Boulders, concrete, solidly mortared masonry, all defined in the Standard Specifications, Section 203.01(b), and small quantities of rock such as ledge nubbles, will be measured in three dimensions. Boulders encountered at subgrade during excavation operations will be measured as rock excavation and the portion estimated to be above subgrade will be deducted from earth excavation. A "pay" boulder is defined in Section 203.1(b) referred to above.

The situation may arise where ledge is not measured in its original position but is measured load count or in its final location as riprap or rock fill. The quantity so measured will be reduced to 75 percent to determine the amount of rock excavation for payment; the reason being that ledge swells after it is excavated. Measurements and sketches, if needed for clarification, will be entered in a bound field book, which would be the Construction Book or the Final Quantity Book.

If the job is bid "unclassified", the Resident should make note of the elevation of actual top of ledge where backslopes are designed on a 1/4:1. In deep ledge cuts, pay limits of earth overburden have to be adjusted depending on the elevation of the ledge.

If the Contractor wastes rock without the Resident's permission and the result is an increase in the amount of borrow needed to meet the fill requirements of the contract, the quantity of rock wasted will be deducted from borrow at 100 percent of the quantity so measured. All measurements and load counts will be entered in a bound field book.

All quantities for payment will be entered in the Final Quantity Book and referenced to the source document. There must always be a trail of reference from the Final Quantity Book to the original record. The final quantity for payment must be labeled as such and signed, checked, and dated. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

Standard Specifications provide a mechanism for paying for specific items added to the contract without requiring a quote from the Contractor. The following is list of items commonly used and how to pay for them:

<u>To Pay For</u>	<u>Use item</u>	<u>Unit Price</u>
Rock Excavation	203.20 Common Exc	6 x Bid
Struct. Rock Exc – Drainage	203.20 Common Exc	16 X Bid
Excavation for Slope Blanket	203.20 Common Exc	2 X Bid

Maine Department of Transportation - Contracts Division Waste Area Permit

Project No: _____

Town: _____

Upon receipt of written permission from _____
(Property Owner)

_____ is authorized to place waster material from this project at
(Contractor)

_____, in accordance with Sections 107 & 108, State of Maine,
(Description of Waste Area)

Department of Transportation, Standard Specifications Highways and Bridges, Revisions of December 2002.

If this waste area is located within a wooded area, a screen of trees (min. width of 30m (100 ft) shall be maintained between the near edge of the waste area and the Right of Way or Construction Limit Line. If the width of the entrance to the waste area in a wooded area exceeds 5m (16ft), this entrance shall be replanted with trees compatible with the adjacent area. These plantings shall extend for a length of 30m (100ft) along the entrance road. or as otherwise directed by the Engineer.

All waste areas and entrances to the waste area shall be uniformly graded to drain, loamed or covered with other earthly material that will support growth of grass, seeded and hay mulched.

All trees which are damaged, uprooted or otherwise moved as a result of the waste material, and trees which have had waste material placed around them to the extent that they will die, shall be cut and removed.

Grading, Loaming, Seeding and Hay Mulching shall not be paid directly, but shall be incidental to other items in the contract.

The contractor is responsible for relocating and disposing of waste, in accordance with the Department of Environmental Protection Regulations, Chapter 404 (Storage and Disposal of Inert Fill).

Approval: _____
Project Resident

Agreed: _____
Contractor's Representative

*original copy to Contractor and additional copy for Resident's file.

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Section 204 Shoulder Rehabilitation -- 2 Pages

SHOULDER REHABILITATION

204-1 GENERAL

References:

- (1) Construction Manual, Section 700 - Materials
- (2) Standard Specifications
- (3) Project Plans
- (4) Typicals
- (5) Construction Notes
- (6) General Notes

204-2 DESCRIPTION

This work consists of rehabilitating existing shoulders by grading and compacting shoulders and furnishing, placing, grading and compacting new shoulder aggregate to required grade.

204-3 LAYOUT AND CONTROL

The contractor, when necessary, does layout.

204-4 TESTING REQUIREMENTS

Refer to the project Minimum Testing Requirements.

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204-5 CONSTRUCTION

The Inspector and the Contractor should do a site examination of the existing shoulder and determine what, if any, unsuitable materials such as sod, tar strips, high spots from winter sand, drives, etc should be removed before placing the new aggregate. After the removal of unsuitable materials, the surface of the existing shoulder should be graded and compacted approximately parallel to the proposed finished paved shoulder surface. This removes some of the winter sand buildup and places it on the outside of the shoulder, providing a firmer base to place the new aggregate. The Standard Specifications address the type and thickness of the new aggregate to be placed. After the new aggregate is placed and fine-graded to the specified tolerance, it is compacted to where it is suitable for paving at the time of paving.

204-6 INSPECTION

Inspection of shoulder rehabilitation consists of monitoring the progress of the work daily for compliance with material requirements, proper cross slopes and adherence to the Standard Specifications. Measurement of rehabilitated existing shoulder will be the number of square meters [square yards] shown in the Schedule of Items in the contract, unless it has been added to or deducted from by the Resident. Field documentation will be made daily of areas worked, crew, and type of equipment, and entered in a bound book. It should also note all areas that have been accepted.

204-7 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

The subsection describes the record keeping necessary to document and measure shoulder rehabilitation.

Field Documentation Project Diary, Inspector's Diary or Daily Report: The project Resident or Inspector will keep notes describing the contractor's operations, such as; whether the Contractor grades existing material back or ahead to fill in low areas or hauls in new aggregate. Station to station limits of work done and the checking and acceptance of cross-slope will also be noted.

Measurement and Payment Final quantity for payment will be that shown in the schedule of items or adjusted as follows: changes are made to the station to station limits or width of work described in the contract, the Resident or Inspector will record these changes in the Final Quantity Book or in a Construction Book. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

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Section 205 Shoulder Reconstruction -- 2 Pages

SHOULDER RECONSTRUCTION

205-1 GENERAL

References:

(1) Construction Manual, Section 203 - Excavation and Embankment

Section 700 - Materials

(2) Standard Specifications, Section 205 - Shoulder Reconstruction

(3) Project Plans

(4) Typicals

(5) Construction Notes

(6) General Notes

205-2 DESCRIPTION

This work consists of reconstructing existing shoulders by excavating and furnishing, placing, grading and compacting new aggregate to the required cross slope.

205-3 LAYOUT AND CONTROL

The contractor does layout.

205-4 TESTING REQUIREMENTS

Refer to the project Minimum Testing requirements.

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Section 205 Shoulder Reconstruction -- 2 Pages

205-5 CONSTRUCTION

Excavation is done after the shim has been placed on the travelway. This is accomplished with an all-purpose excavator, which has the ability to cut to very accurate line and grade. After excavating to the required cross section, the new aggregate is placed, graded and compacted.

205-6 INSPECTION

Inspection of shoulder reconstruction consists of monitoring the progress of the work daily for compliance with material requirements, proper cross slopes, depths and adherence to the Standard Specifications. Measurement of reconstructed shoulder will be the number of square meters (square feet) shown in the schedule of items in the contract, unless, it has been added to or deducted from, by the Resident. Field documentation will be made daily of areas worked, crew, and type of equipment, and entered in a bound book. It should also note all areas that have been accepted.

205-7 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

Field Documentation Project Diary, Inspector's Diary or Daily Report: The Resident or Inspector will keep notes describing the Contractor's progress of work in this item. Information recorded will be: removal and disposal of existing excavation, source of new material, comp active effort, checking cross-slope and area or work by station to station limits.

Measurement and Payment Final quantity for payment will be that shown in the schedule of items. If the Resident changes the station to station limits of work or width shown in the contract, they or the Inspector will record these changes in the Final "Quantity Book or in a Construction Book. Final Quantity will then be adjusted according to the changes. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their work.**

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Section 206 Structural Excavation -- 5 Pages

STRUCTURAL EXCAVATION

206-1 GENERAL

References:

(1) Construction Manual and Standard Specifications

Section 206

Section 603

Section 604

Section 605

(2) Special Provisions and Supplemental Specifications

(3) Standard Details Highways and Bridges

(4) Project Plans

(5) Construction Standard for Excavations

This section includes excavation for culverts, catch basins, manholes, underdrains and structures; below subgrade or below the design slopes. Excavation for inlet and outlet ditches is not included in this section. Earth excavation for drainage and minor structures is incidental except for excavation lower than 300 mm [12 in] below the pipe or structure. Earth excavation for major structures is usually paid as per schedule of items in the Contract, except for structural rock excavation.

206-2 LAYOUT AND CONTROL

Layout is done by the Contractor, but the Resident should inspect the proposed location for grade and line, utility conflicts, and drainage easements.

206-3 TESTING REQUIREMENTS

Compaction testing and gradation testing of stone and granular backfill are done as per the List of Minimum Testing Requirements.

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206-4 CONSTRUCTION

Excavation should be as per OSHA's "Construction Standard for Excavations" as required by specifications. Suitable excavation should be utilized in the Project. Cross culverts should be backfilled with the original excavated material to lessen the chance of differential frost heave.

Underground utility locations should be located on the surface by the utility company, but care must be taken in digging in the vicinity, as the depth of the facility is seldom known.

Examination should be made of all excavated areas to insure the location, elevation, and dimensions are accurate; the foundation is firm and compacted with adequate bearing capacity; and it is dry.

In examining excavated footing areas, the material encountered should be compared with the borings shown on the plans. If the material encountered is sufficiently different, the Resident should be notified to determine if any changes in the design of the footing are warranted.

Unstable material, which will not provide a firm foundation for a pipe or structure, should be excavated and replaced with suitable excavation or granular material. Rock must be measured for payment in three dimensions or profiled with hand level and rule or instrument and rod. It may be necessary to undercut when in rock to provide a cushion under the culvert or structure as per plan or the Resident's direction. Undercut areas may be backfilled with broken rock, suitable excavation or granular material as directed.

Construction or installation of the facility will be as per Sections 509, 603, 604, or 605. Backfill must be per Specifications in 200 mm [8 in] lifts, except for the first lift on underdrains, which should be 300 mm [12 in] to protect the pipe from displacement or damage from compacting equipment.

Backfill density tests of drainage and minor structures are seldom taken, but it is the Inspector's prerogative to take tests if it is felt adequate compaction is not being achieved. Density tests of the backfill of major structures will be as per the testing schedule for the Project.

206-5 INSPECTION

Inspection of the installation of culverts, catch basins, manholes and is covered in Section 600 of this manual. Documentation of the work and measurements are placed in a Drainage or Construction Book. Field Measurements can be entered directly in the Final Quantity Book.

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Section 206 Structural Excavation -- 5 Pages

206-7 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This subsection describes the recordkeeping necessary to document and measure the excavation of earth and rock required to install culverts, bridge abutments, and other structures.

a. Field Documentation

Project Diary, Inspector's Diary/Daily Report, Drainage Book, and Construction Book: The Resident or Inspector will keep notes describing the Contractor's excavation operations required for the installation of drainage, bridges, and other structures. These notes will describe location and final disposition of the material, whether on the job or off the job.

Documentation of installation of culverts, underdrain, catch basins, and manholes will be entered in the Project Diary. If the drainage is extensive, a Drainage Book should be set up prior to the work being done and all notes pertaining to drainage work will be entered in the Drainage Book. Reference is made to Division 900 of this Manual for further explanation of the Drainage Book. Undercutting to provide a stable foundation, bedding, excavating rock, and material used to maintain traffic will be noted and measured for payment.

Documentation of excavation for bridge abutments, pier footings, wingwalls, retaining walls, multiplate pipes, and other major structures will be entered in the Project Diary or Construction Book. The Construction Book will be used if layout and/or field measurements and sketches are required. Typical measurements would be for rock excavation and undercutting. Division 900 of this Manual explains the Construction Book and how it is used.

Documentation of installation of other miscellaneous minor structures will be entered in the Project Diary or the Construction Book. The Construction Book will be used if layout and measurements for removal of rock or unstable foundation material are required.

b. Measurement and Payment

Drainage and Minor Structures Excavation for culverts, catch basins, and other minor structures is incidental down to 300 mm [12 in] below the flow line of the pipe or bottom of the base. Excavation required below that point for stable foundation or change in grade will be paid under the item "Structural Earth Excavation-Below Grade". That quantity will not be paid plan quantity; this figure is a "throw-in" and is not necessarily based on work anticipated to be done. Quantity for payment must be field measured. Measurements and sketches will be entered in the Drainage Book, signed and dated. Depth will be as directed by the Resident and the width will be the limits defined in Section 206.04 of the Standard Specifications and Sheet 605(1) of the Standard Details for underdrain.

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Rock excavation for drainage and other minor structures will be the quantity actually excavated to the pay limits defined in Section 206.04 of the Standard Specifications. Measurements and sketches will be entered in the Drainage Book, signed and dated.

Bedding material will be computed to the depth authorized beginning at the flow line of the pipe or bottom of the base in the case of catch basins; width will be as defined in the Standard Specifications.

Major Structures Section 206.04 of the Standard Specifications states that final payment for earth excavated for bridge abutments and piers will be the quantity shown on the plans unless the structure is founded on ledge. In this case, payment for earth and rock removed would be based on field measurements. Since top of ledge shown on the plans is typically inaccurate, new ledge originals would be needed. Original cross-sections will be taken at right angles to the centerline of bearing at close intervals.

Quantity of earth will be figured vertically from original ground or roadway subgrade to top of ledge and horizontally to pay limits shown on the plans or in Standard Specifications, Section 206.04. If the actual top of ledge is lower than the elevation shown on the plans, earth excavated below that elevation would be paid at 1½ times the bid price for structural earth excavation. Typically, the elevation of top of ledge is shown on the plans as, for example: 26 +/- . Such a designation would be interpreted to mean that only earth excavated below elevation 25 would be paid at 1½ times the price. Also, if the elevation of bottom of the footing were lowered due to a change in design, excavation below the original elevation shown would also be paid at 1½ times the price.

If the plans call for excavating into ledge for a footing, the Contractor is allowed a pay tolerance of up to 300 mm [12 in] below the elevation of the bottom of the footing. Rock excavated and concrete placed below the 300 mm [12 in] tolerance will not be paid. If the Resident directs the Contractor to remove rock below the bottom of footing elevation because of a change in design or because of the soft nature of the ledge, it will be paid at 1½ times the bid price for structural rock excavation.

“Pay” boulders, defined in Section 203.01(b) of the Standard Specifications, that are found partly within the excavation limits for drainage and major structures will be measured and computed for payment as follows: that portion estimated to be within the structural excavation pay lines will be paid as Item 206.07, Structural Rock Excavation, and the remainder will be paid as Item 203.21, Rock Excavation.

There will be no payment for rehandling structural excavation; the bid price includes excavating, rehandling as many times as necessary, and placing in its final position, whether it is in embankments, waste storage areas, or off the Project.

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Standard Specifications provide a mechanism for paying for specific items added to the contract without requiring a quote from the Contractor. The following is list of items commonly used and how to pay for them:

<u>To Pay For</u>	<u>Use item</u>	<u>Unit Price</u>
Struct Rock Exc-Major Structure	206.082 Struct Ea Exc – Maj Struct	6 x Bid
Struct Ea Exc–Maj Struct, Below Grade	206.082 Struct Ea Exc – Maj Struct	1 ½ x Bid
Struct Rock Exc-Maj Str, Below Grade	206.082 Struct Ea Exc – Maj Struct	9 x Bid
Struct Rock Ex-Maj Str, Below Grade	206.082 Struct Rock Exc –Maj Struct	1 ½ Bid

Final quantities of structural earth excavation-below grade and structural rock excavation will be entered in the Final Quantity Book and labeled as such. References will be made, as appropriate, to the Drainage Book or Construction Book for measurements and computations or labeled as original entries if the measurements are entered directly into the Final Quantity Book.

All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.

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Section 208 Sand Drains -- 2 Pages

SAND DRAINS

208-1 GENERAL

References:

- (1) Special Provisions and Supplemental Specifications
- (2) Construction Manual Section 200 - Earthwork
- (3) Standard Specifications Section 200 - Earthwork

Sand drains are vertical sand filled wells, placed to accelerate consolidation of soft soils under embankments by de-watering. The most common use has been in the proximity of bridges over soft soils where post-construction settlement is not acceptable. Jetted and augured sand drains have almost entirely been replaced by wick drains, due to environmental and economic concerns.

208-2 LAYOUT AND CONTROL

Layout, staking and numbering, will done be by the Contractor or Subcontractor. The location should be within 150 mm [6 in] of the designated plan locations.

208-3 TESTING REQUIREMENTS

Graduation tests on granular fill drainage layer and sand drain sand; testing of wash water to determine wash time. Submittals on equipment to be used and installation procedures.

208-4 CONSTRUCTION

Site preparation might include clearing, grubbing, excavation and/or fill to allow for placement of the granular drainage fill or blanket. Various types of rigs and methods are used to construct the drains; auguring cranes, air or water jetting rigs, etc. A typical jetting operation would be a specially fitted crane using a heavy mandrel suspended on cable. The head of the mandrel has water jets fed by hosing on a mounted reel on the crane. First, a casing, long enough to go below the granular fill, is driven by the lift and drop of the mandrel. Once the casing is driven to depth, the driving collar is removed from the casing and the mandrel enters the casing, jetting

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the hole to design depth. The mandrel is held at the bottom of the hole for a specified wash time to clear the hole.

After the mandrel is removed, the hole is filled with sand and the casing is removed. A dozer or loader is constantly moving the levee containing the jetting and wash water as drains in an area are completed.

An auguring operation might be used in areas of underground debris or obstructions.

Water from the drains is carried horizontally by a sand blanket layer or/and stone drains as the fill is loaded. Recent constraints might require the jetting water be treated.

208-5 INSPECTION

Care must be used to not damage the drainage blanket, either by placing it too thick for the support or damaging it with equipment.

Trial drains are initially run for satisfactory completion. Once this is accomplished, inspection consists of recording locations and depths of each drain in a Sand Drain Book and observing procedures. The penetration rate of the mandrel would be specified along with the washing time for the area, requiring the attention of the inspector. Depth of drains should be randomly checked with a weighted tape, but the contractor should make provisions for determining the depth of penetration at any time.

208-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Field Documentation

Sand Drain Book, Construction Book The Resident or Inspector will keep notes describing the Contractor's progress on the item. Crew, equipment and which drains are being worked on will be made part of the entries. The Inspector should set up a grid chart or a progress chart in the office with each drain located and numbered, as each drain is accepted it should be identified on the chart.

Measurement and Payment

The Inspector will enter measurements in a Construction Book specifically set aside for sand drains and labeled as such. This book should be organized before the work is done. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

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WICK DRAINS

209-1 GENERAL

References:

- (1) Special Provisions and Supplemental Specifications
- (2) Construction Manual Section 200 - Earthwork
- (3) Standard Specifications Section 200- Earthwork

Wick drains are prefabricated vertical drains placed to decrease the settlement time of embankment over soft soils. The most common use is in the proximity of bridges over soft soils where post-construction settlement is not acceptable. The geotextile wrapped plastic core of the wick has channels, permitting the upward movement of water from soft soils, de-watering and consolidating as fill is placed. Jetted and augured sand drains have almost entirely been replaced by wick drains, due to environmental and economic concerns.

209-2 LAYOUT AND CONTROL

Layout, staking and numbering, will done be by the Contractor or Subcontractor. The location should be within 150 mm [6 in] of the designated plan locations.

209-3 TESTING REQUIREMENTS

Graduation tests on granular fill drainage layer. Submittals on equipment to be used and installation procedures.

209-4 CONSTRUCTION

Site preparation might include clearing, grubbing, excavation and/or fill to allow for placement of the granular drainage fill or blanket. Various types of rigs and methods are used to install the wicks. A typical rig would be a specially fitted crane using a mandrel of diamond shaped cross-section, through which the wick passes; an anchor of steel rod or plate on the head of the mandrel prevents dirt from entering and anchors the wick when the mandrel is withdrawn. Penetration of the mandrel is accomplished in various ways: chain drive, cable

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pull-down, weight and vibration, vibratory hammer, etc. The contractor must provide means of determining the depth of the wick at any time.

When the wick is installed to the designated depth, the mandrel is withdrawn above grade, leaving the anchored wick material. The wick is cut off, leaving excess above the working surface. This procedure is repeated at the many locations. The granular drainage layer or drainage blanket provides for horizontal movement of water from the wicks, out of the fill area, as it is loaded.

209-5 INSPECTION

Care must be used to not damage the drainage blanket, either by placing it too thick for the support or damaging it with equipment.

The drains are paid by the linear meter [foot]. Trial drains are initially run for satisfactory completion. Once this is accomplished, inspection consists of recording locations and depths of each drain in a drain Book and observing procedures.

209-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Field Documentation

Wick Drain Book, Construction Book The Resident or Inspector will keep notes describing the Contractor's work, crew equipment and which drains are being worked on will be made part of the entries. It is recommended that the Inspector keep a grid chart or progress chart in the office with each drain located and numbered. As each drain or block of drains are accepted, they should be identified on the chart.

Measurement and Payment

The Inspector will enter measurements in a Construction Book. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

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Section 211 Inslope & Ditch Excavation -- 2 Pages

INSLOPE AND DITCH EXCAVATION

211-1 GENERAL

References:

- (1) Standard Specifications, Section 211 - Excavation and Embankment
- (2) Special Provisions
- (3) Project Plans
- (4) Typicals
- (5) Construction Notes
- (6) General Notes

211-2 DESCRIPTION

The construction of Inslope and Ditch Excavation consists of removing winter sand buildup and other accumulated earth material from existing inslopes and ditches or creating new ditches to improve surface runoff. The type of equipment used is usually a rubber-tired all-purpose excavator. These machines have the control to cut to very accurate line and grade.

211-3 LAYOUT AND CONTROL

Layout is done prior to construction by the Inspector. This is accomplished by spray painting on the existing pavement the limits of required inslope and ditching. These limits are taken from the Construction Notes and verified in the field. For new ditch excavation, the Inspector will layout the limits and the contractor will do the stakeout according to the New Ditch Typical.

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211-5 CONSTRUCTION

Excavation is usually done after the shim has been placed on existing paved shoulders, or, in the case of gravel shoulders, after mainline shim and new shoulder aggregate has been added. This establishes the control point at the edge of shoulder. Excavation may be designated for slope flattening in guardrail elimination areas or other areas noted in the Construction Notes or Plans; otherwise, it is hauled to an approved waste dump. It should be kept in mind that old or worked-out pits can be often utilized as suitable waste areas. In designated stone ditch areas, the ditch excavation is paid separately from the stone to the original ditch lines. All disturbed soil should receive immediate erosion control measures.

211-6 INSPECTION

The Inspector, after being assigned their duties by the Resident, should become familiar with the Plans, Typical and Special Provisions. The Inspector should clarify any questions or doubts concerning the inspection work with the Resident. Occasional checks should be made on grade and smoothness of the ditch and slope, flow of runoff, proper functioning of the drainage system, and cleanup of all areas disturbed, including waste disposal areas.

211-7 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Field Documentation

Project Diary, Inspector's Diary/Daily Report: The Inspector will keep notes relative to grade, smoothness, and acceptance. Conditions of acceptance are noted under Inspection.

Measurement and Payment

Measurements will be entered directly in the Final Quantity Book or in a Construction Book. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

SECTION 300

BASES

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AGGREGATE BASE AND SUBBASE COURSE

304-1 GENERAL

References:

- (1) Construction Manual
Section 106
- (2) Standard Specifications
Sections 105, 106, 304, and 700
- (3) Special Provisions & Supplemental Specifications
- (4) Standard Details Highways and Bridges
- (5) Project Plans, Particularly the Typical Sections

This work consists of placing Aggregate Base and/or Aggregate Subbase material above subgrade and below the pavement grade. The material used is granular, screened or crushed material and must conform to the specification requirements.

304-2 LAYOUT AND CONTROL

Layout for line and grade, break points, and other control points is done by the Contractor.

304-3 TESTING REQUIREMENTS

Aggregate Base and Aggregate Subbase

- (1) Gradations: As per list of Minimum Testing Requirements; sampled in roadway as it is being placed.
- (2) Compaction: As per List of Minimum Testing Requirements, each layer

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Preliminary samples taken in pits are informational only.

304-4 CONSTRUCTION

Contractors sometimes stockpile crushed or screened base material before placing it on the roadway. Constant attention by the contractor to proper methods of stockpiling, thus preventing segregation of fine or coarse aggregates is very important. Aggregates must pass Specifications when placed on the roadway. If a retest of a failing graduation fails, the material must be removed. If the retest passes, the material is assumed to be passing Specifications.

Aggregates are placed on a fine-graded subgrade full width, but where maintaining traffic is a concern, only one side at a time can be placed. Specifications require layers to not exceed 300 mm [12"] in depth, but the Resident may allow placing the gravel full depth if tests show densities can be obtained, and the Contractor agrees to digging to test the lower portion. Vibratory rollers, often used for compacting, are more capable of achieving passing densities than static machines, providing rolling is done before traffic gets on the course. The aggregates should be dumped on top of the layer being placed and pushed ahead to mix the material; end dumping is not permitted. Leveling equipment should cut into the edge material of the previously placed side, while placing the second side, to achieve uniformity.

Special Provisions usually require a surcharge of material placed above grade, if traffic is to be routed on the base or aggregate subbase for a designated period of time. The surcharge of material is removed in the fine grading operation and may be placed in areas designated in the Special Provisions. The placement of a surcharge may be avoided by placing milled or reclaimed pavement as the top of the Aggregate Subbase Gravel.

Fine grading of the base or subbase is usually done with a grader and checked by using a string set on rail grades on side stakes.

304-5 INSPECTION, MEASUREMENT & FIELD DOCUMENTATION

The grade of the top of the fill or the bottom of the cut [subgrade] must be checked for grading within tolerances of the Specifications before the Base or Subbase is placed. This is done using a hand level and rule, or stringline and rule from grades set on side stakes. The inspector should document the area checked in a construction book; noting the grade was within specifications and to plan, and signing and dating the entry.

The inspector should observe placement of the gravel for procedure, segregation, oversize rocks or clay balls. Fine grading of a lower Aggregate Subbase Type "E" course, if used, is not necessary before placing the upper, Type "D" course. Density testing is required on the lower and upper layers as per the Minimum Testing Schedule.

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a. Field Documentation

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's aggregate base and subbase operations. Information recorded will be: name of pit the material is coming from, station to station limits where it is placed, and whether placed in one lift or two lifts.

The Resident is responsible for quality assurance testing; he/she must assure that a Technician from the Department is available to do the testing required. Tests the Contractor may take are not to be counted toward the total number needed; these tests are to be considered as quality control for the Contractor's benefit only. Reference is made to Section 901 of this Manual for further discussion of "Minimum Testing requirements".

Gravel can fail gradation or density or both. Corrective action directed by the Resident will be documented; more compactive effort may be required or material failing in gradation may have to be removed.

Grade Check Book: The Department requires that the Resident or Inspector do random checks of subgrade and top of gravel to assure that the Contractor is placing gravel within construction tolerances. Checks should be done between stations as well as on station. Reference is made to Section 203 (Excavation) and to Section 901 of this Manual for further discussion of the Grade Check book.

b. Measurement and Payment

Final quantity for aggregate base and subbase can be figured by any one or a combination of the following methods:

1. Plan Quantity

Quantity for payment can be plan quantity providing the Engineer's Estimate is accurate and the work is done to the limits estimated. It is often the situation that side street and mainline approaches and drives are changed to match field conditions; the Estimate should be adjusted to meet these field conditions as necessary. Payment by plan quantity should be documented by written agreement in the form of a Resident's Work Order or a memo to the Contractor. The agreement should state that the plan quantity will be adjusted upward or downward if changes are made in the field. Changes will be measured by three dimensions or load count described below.

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Gravel can also be bid plan quantity. The quantity on the schedule of items is the final quantity with adjustments made upward or downward if changes are made in the field. Changes are documented as described above.

2. In-Place Measurement

If the estimated quantity has no basis, commonly referred to as a “throw in” figure, gravel for the project will have to be refigured. Typical factors, derived from the typical sections, should be used for mainline travelway and shoulders where possible. Three-dimensional measurements and/or plan dimensions can be used for drives, approaches and intersection areas. Gravel used to backfill undercut areas or to provide bedding for drainage can also be measured and computed by three dimensions to limits authorized. For drainage, depth will be figured from flow line of the pipe and width will be figured to the lateral pay limits defined in Subsection 206.04 of the Standard Specifications.

3. Load Count

Gravel can be measured load count if there is not a large quantity involved. By specification, gravel measured load count will be reduced 20 percent for payment to arrive at an equivalent quantity measured in its final position. Refer to the Standard Specifications, Subsection 304.06 for clarification.

4. Pit Measure

Gravel can be bid pit measure. Original sections must be taken before the pit is utilized on the Project. Care must be taken that any overburden, tailings, or unacceptable materials are left in the pit to be deducted from the total during the taking of final sections. Gravel stockpiled before original sections are taken will be paid for at 90%. Gravel can be deducted from the pit total at 90% for truck measure or 115% for in-place measure. Tailings used as stone ditch protection will be deducted at 100%.

Standard Specifications provide a mechanism for paying for specific items added to the contract without requiring a quote from the Contractor. The following is list of items commonly used and how to pay for them:

<u>To Pay For</u>	<u>Use item</u>	<u>Unit Price</u>
Aggre Sub Crse – For Foundations	304.10 Aggr Subbase Crse – Gravel	2 x Bid
Aggre Sub Crse – Slope Blanket	304.10 Aggr Subbase Crse – Gravel	2 x Bid

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Final quantity for payment will be entered in the Final Quantity Book and labeled as such. Reference will be made to grade checks, measurements, load count delivery slips, and computations in the project records, as necessary. Measurements and delivery slip totals must be entered in a bound book, which can be the Final Quantity Book or the Construction Book. Reference is made to Section 901 of this Manual for further discussion of field books. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

**Maine Department of Transportation
Bureau of Project Development
Pit Authorization**

PROJECT NUMBER: _____

DATE: _____
TOWN: _____

_____ is authorized to haul _____ from _____ in accordance with the State of Maine, Department of Transportation, Standard Specifications, Highways and Bridges, Revision of December, 2002, and applicable DEP regulations.

Pit size over 30 Acres:

DEP Permit No: _____

Pit size 5-30 Acres:

Notice of intent, filed with DEP, to comply with Performance Standards: _____

Date received by DEP: _____
or in lieu of above, DEP Permit No.: _____

Rehabilitation, Section 106, Standard Specifications:

- Grading 1:1 slope
- Complete Rehabilitation

Pit size less than 5 Acres:

Rehabilitation, Section 106, Standard Specifications

- Grading 1:1 slope
- Complete Rehabilitation

Pit operation meets local ordinances

Contractor's Representative

Date

Resident Engineer

Date

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Section 307 Full Depth Recycled Pavement -- 3 Pages

FULL DEPTH RECYCLED PAVEMENT

307-1 GENERAL

References

(1) Construction Plans

(2) Special Provisions

307-2 LAYOUT AND CONTROL

Control reference points for centerline control will be established by the MDOT. These reference points could range from telling the Contractor to split the existing pavement to having a MDOT survey crew establish centerline. The Contractor will be responsible for all other survey work, construction layout, staking out work, setting grades (profile grades), and quality control to assure accuracy. It is recommended that the Contractor's work be spot checked for accuracy.

307-3 MATERIALS

The existing bituminous pavement and 50 mm± [2 in] of the underlying gravel shall be pulverized into a homogeneous mass so that 100 % of the material will pass a 50 mm [2 in] square mesh sieve.

If pavement conditions warrant (such as poor \times -slope), new aggregate may be added prior to the pulverizing operation. In general, new aggregate shall meet subsection 411.02 Untreated Aggregate Surface Course of the Standard Specifications. Reclaimed pavement or pavement millings (which may be available from previous projects or a current one) are also a good material to consider using in these instances.

307-4 TESTING REQUIREMENTS

Refer to the Minimum Testing requirements to determine the type and quantity of tests required. Refer to the Special Provisions for any other requirements. Generally speaking, the minimum testing requirements are 1 compaction test per 600 meters [2000 ft] per lane width for mainline, and 1 per 1200 meters [4000 ft] for shoulders.

At this time, the method for determining compaction begins with a proctor or target density determined in the field. This is accomplished by designating a 90 meter [300 ft] section as the control section. The contractor

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then pulverizes this section, grades the section, adds water to get material up to optimum moisture content (water may be added prior to grading), and compacts with vibratory roller (meeting specifications) until the nuclear density readings show an increase in dry density of less than 16 kg/m^3 [1 pcf] for the final 4 vibratory roller passes. Once this target density is determined, the remaining tests must meet 98 % of the target density.

307-5 CONSTRUCTION AND INSPECTION

The contractor is responsible for the following:

1. All lay out is done prior to starting work.
2. Maintaining control points and layout throughout construction.
3. Assuring that the pavement is pulverized full depth.
4. Assuring the material is blended into a homogeneous mass.
5. Assuring 100 % of the material will pass a 50 mm [2 in] square mesh sieve.
6. Grading the pulverized material ($10 \text{ mm} \pm$ [? in] typical grading tolerance) to the lines and grades set forth by the contract and by MDOT personnel.
7. Compacting the pulverized material to meet density requirements.
8. Maintaining until paving can be completed.

The Inspector/project personnel are responsible for enforcing all specifications and requirements and accepting the quality of work done. Grading operations (both profile and x-sectional) should be carefully checked, as this will have a great impact of the smoothness of the finished product. Compaction should be closely monitored.

307-6 MEASUREMENT AND DOCUMENTATION

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's operations on the road and in the plant.

Cold In-Place Recycled Pavement. Field notes will include weather conditions, station to station limits of work, and description of equipment used: pulverizer, grader/spreader, rollers. The Inspector will also document inspection procedures and check measurements of work done, such as: depth of grinding operations, cross-

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slope, and density of the finished product. Any added aggregate or recycled pavement used as necessary to restore cross-slope will also be noted, tested, and measured for payment if required.

Plant Mixed Recycled Pavement. Field notes will be the same as for cold in-place recycled pavement with additional documentation regarding plant inspections.

Method of Measurement

Final quantity of recycled pavement can be figured by either of the two following methods:

Plan Quantity. Quantity for payment can be “plan quantity” providing the estimated quantity shown in the Schedule of Items is reasonably accurate and work is done to the limits estimated. Payment by plan quantity should be documented by written agreement such as a memo or Resident’s Work Order, between the Resident and the Contractor. The agreement must stipulate that the plan quantity will be adjusted upward or downward if changes are made in the field. Quantities paid “plan quantity” will be documented by notes of inspection and acceptance entered in the Project Diary, or directly in the Final Quantity Book.

In-Place Measurement. If the estimated quantity is not figured accurately enough to pay as a final figure, the final pay quantity will be determined from field measurements, or will be refigured from the plans, or a combination of both. Length will be distance between stations and width will be field measured. Frequency of width measurements will depend on road width consistency. All measurements, and sketches if required, will be recorded in a Construction Book or directly in the Final Quantity Book and signed and dated. Irregularly shaped areas such as ramp and side street approaches and intersections will be broken down into basic geometric shapes and measured by length and width. Dimensions taken from the plans, and corresponding notes of inspection and acceptance are also recorded in a Construction Book or the Final Quantity Book.

Added Material. If specified in the contract, material added to maintain cross-slope in areas not designated on the plans or in the construction notes will be paid separately under the item used. Measurement will be by load count reduced by 20 percent for final payment. Every load will be documented by a delivery slip that has been signed and dated at the point of delivery by the Resident or Inspector. Daily totals will be entered in the Final Quantity Book. Refer to Section 304.06 - Method of Measurement of the Standard Specifications for further explanation of shrinkage factors.

Final Quantity. Final quantity for payment will be entered in the Final Quantity Book and so labeled. References will be made to statements of inspection and acceptance, plan dimensions, field measurements, and delivery slips, as necessary. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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PM-RAP

308-1 GENERAL

References

- (1) Construction Plans
- (2) Special Provisions

308-2 LAYOUT AND CONTROL

Control reference points for centerline control will be established by the MDOT. These reference points could range from telling the contractor to split the existing pavement to having an MDOT survey crew establish centerline. The contractor will be responsible for all other survey work, construction layout, staking out work, setting grades (profile grades), and quality control to assure accuracy. It is recommended that the contractor's work be spot checked for accuracy.

308-3 MATERIALS

Recycled Asphalt Pavement (RAP) that has been milled from this Project or other Projects will be screened or crushed, mixed with emulsified or foamed asphalt and placed as a base course of pavement.

Prior to construction, a mix design must be developed. Samples of the RAP are sent to the Department's Central Laboratory, where the optimum emulsion or foamed asphalt content will be determined. This process should be started at least two weeks prior to the start of the work.

If pavement conditions warrant (such as poor x-slope), new aggregate may be added prior to placement. In general, new aggregate shall meet Section 411.02 Untreated Aggregate Surface Course of the Standard Specifications. Reclaimed pavement or pavement millings (which may be available from previous projects or a current one) are also a good material to consider using in these instances.

308-4 EQUIPMENT

The plant will typically consist of a continuous flow pugmill mixer. The plant should be inspected by Testing personnel prior to paving. The plant should be capable of metering the correct amount of asphalt material

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according to the mix design. Pavers and rollers should meet the requirements outlined in Section 401 of the Specifications.

308-5 TESTING REQUIREMENTS

Refer to the Minimum Testing requirements to determine the type and quantity of tests required. Refer to Special Provisions for any other requirements. Generally speaking, the minimum testing requirements are 1 compaction test per 600 meters [2000 ft] per lane width for mainline and 1 per 1200 meters [4000 ft] for shoulders.

The method for determining compaction begins with a target density determined in the field. This is accomplished by designating a 100 meter [300 ft] section as the control section. The contractor places the Plant Mixed RAP and compacts with vibratory and pneumatic-tired rollers (meeting specifications) until the nuclear density readings show an increase in dry density of less than 16 kg/m³ [1 pcf] for the final 4 roller passes. Once this target density is determined, the remaining tests must meet 98 % of the target density.

308-6 CONSTRUCTION AND INSPECTION

The contractor is responsible for the following:

1. All layout is done prior to starting work.
2. Maintaining control points and layout throughout construction.
3. Identifying the source of RAP (this may be supplied by the Department).
4. Assuring the material is stockpiled properly.
5. Assuring 100 % of the material will pass a 37.5 mm [1 ½ in] square mesh sieve.
6. Assuring that the mixing plant is capable of producing a uniform mixture that meets the mix design requirements.
7. Compacting the material to meet density requirements.
8. Maintaining until paving can be completed.

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The inspector/project personnel are responsible for enforcing all specifications and requirements and accepting the quality of work done. Placing operations (both profile and x-sectional) should be carefully checked, as this will have a great impact of the smoothness of the finished product. Compaction should be closely monitored.

After a section of the Plant Mixed RAP is placed on the roadway, it must be allowed to cure for at least seven days prior to application of the Hot Mix Asphalt Pavement.

308-7 MEASUREMENT AND DOCUMENTATION

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's operations on the road and in the plant.

Cold In-Place Recycled Pavement. Field notes will include weather conditions, station to station limits of work, and description of equipment used: pulverizer, grader/spreader, rollers. The Inspector will also document inspection procedures and check measurements of work done, such as: depth of grinding operations, cross-slope, and density of the finished product. Any added aggregate or recycled pavement used as necessary to restore cross-slope will also be noted, tested, and measured for payment if required.

Plant Mixed Recycled Pavement. Field notes will be the same as for cold-in-place recycled pavement with additional documentation regarding plant inspections.

Method of Measurement

Final quantity of recycled pavement can be figured by either of the two following methods:

Plan Quantity. Quantity for payment can be "plan quantity" providing the estimated quantity shown in the Schedule of Items is reasonably accurate and work is done to the limits estimated. Payment by plan quantity should be documented by written agreement such as a memo or Resident's Work Order, between the Resident and the Contractor. The agreement must stipulate that the plan quantity will be adjusted upward or downward if changes are made in the field. Quantities paid "plan quantity" will be documented by notes of inspection and acceptance entered in the Project Diary, or directly in the Final Quantity Book.

In-Place Measurement. If the estimated quantity is not figured accurately enough to pay as a final figure, the final pay quantity will be determined from field measurements, or will be refigured from the plans, or a combination of both. Length will be distance between stations and width will be field measured. Frequency of width measurements will depend on road width consistency. All measurements, and sketches if required, will be recorded in a Construction Book or directly in the Final Quantity Book and

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signed and dated. Irregularly shaped areas such as ramp and side street approaches and intersections will be broken down into basic geometric shapes and measured by length and width. Dimensions taken from the plans and corresponding notes of inspection and acceptance also recorded in a Construction Book or the Final Quantity Book.

Added Material. If specified in the contract, material added to maintain cross-slope in areas not designated on the plans or in the construction notes will be paid separately under the item used. Measurement will be by load count, reduced by 20 percent for final payment. Every load will be documented by a delivery slip that has been signed and dated at the point of delivery by the Resident or Inspector. Daily totals will be entered in the Final Quantity Book. Refer to the Standard Specifications, Subsection 304.06 - Method of Measurement, for further explanation of shrinkage factors. Refer to the Special Provision for the latest method of paying for added materials.

Final Quantity. Final quantity for payment will be entered in the Final Quantity Book and so labeled. References will be made to statements of inspection and acceptance, plan dimensions, field measurements, and delivery slips, as necessary. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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FULL DEPTH RECYCLED PAVEMENT WITH ADDITIVES

308-1 GENERAL

References

- (1) Construction Plans
- (2) Special Provisions

308-2 LAYOUT AND CONTROL

Control reference points for centerline control will be established by the MDOT. These reference points could range from telling the Contractor to split the existing pavement to having a MDOT survey crew establish centerline. The Contractor will be responsible for all other survey work, construction layout, staking out work, setting grades (profile grades), and quality control to assure accuracy. It is recommended that the Contractor's work be spot checked for accuracy.

308-3 MATERIALS

The existing bituminous pavement and 50 mm \pm [2 in] of the underlying gravel shall be pulverized into a homogeneous mass so that 100 % of the material will pass a 50 mm [2 in] square mesh sieve.

If pavement conditions warrant (such as poor \times slope), new aggregate may be added prior to the pulverizing operation. In general, new aggregate shall meet Section 411.02 Untreated Aggregate Surface Course of the Standard Specifications. Reclaimed pavement or pavement millings (which may be available from previous projects or a current one) are also a good material to consider using in these instances.

308-4 TESTING REQUIREMENTS

Refer to the Minimum Testing requirements to determine the type and quantity of tests required. Refer to the Special Provisions for any other requirements. Generally speaking, the minimum testing requirements are 1 compaction test per 600 meters [2000 ft] per lane width for mainline and 1 per 1200 meters [4000 ft] for shoulders.

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At this time, the method for determining compaction begins with a proctor or target density determined in the field. This is accomplished by designating a 90 meter [300 ft] section as the control section. The contractor then pulverizes this section, grades the section, adds water to get material up to optimum moisture content (water may be added prior to grading), and compacts with a vibratory roller (meeting specifications) until the nuclear density readings show an increase in dry density of less than 16 kg/m^3 [1 pcf] for the final 4 vibratory roller passes. Once this target density is determined, the remaining tests must meet 98 % of the target density.

308-5 CONSTRUCTION AND INSPECTION

The contractor is responsible for the following:

1. All lay out is done prior to starting work.
2. Maintaining control points and layout throughout construction.
3. Assuring that the pavement is pulverized full depth.
4. Assuring the material is blended into a homogeneous mass.
5. Assuring 100 % of the material will pass a 50 mm [2 in] square mesh sieve.
6. Grading the pulverized material ($10 \text{ mm} \pm$ [? in] typical grading tolerance) to the lines and grades set forth by the contract and by MDOT personnel.
7. Compacting the pulverized material to meet density requirements.
8. Maintaining until paving can be completed.
9. Assuring the right quantities of additives are added and mixed thoroughly.

The inspector/project personnel are responsible for enforcing all specifications and requirements and accepting the quality of work done. Grading operations (both profile and x-sectional) should be carefully checked, as this will have a great impact of the smoothness of the finished product. Compaction should be closely monitored.

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308-6 CONSTRUCTION SEQUENCING

In general, the following sequence has been followed with success. The Contractor shall pulverize existing pavement and grade the material to within 25 mm \pm [2 in] of the profile and x-slope grade. Additives shall be added at an even rate of application and mixed thoroughly with the pulverizer. The Contractor shall then compact this material with a padfoot roller and then fine grade the material to within \pm 10 mm [? in] of finish grade. The contractor will then continue to compact this material until passing density tests are obtained. Compaction equipment may consist of a vibratory steel drum roller, rubber tired pneumatic roller, and a padfoot vibratory roller (all meeting minimum size requirements). Small amounts of water may be added at any time to aid in the mixing of the additives and in the compaction of materials. Subsequent pavement courses shall not be placed until the proper curing time has elapsed. Curing time depends on the weather conditions, type of additives, contract requirements, and other situations/conditions.

308-7 ADDITIVES

The following are some examples of additives used to date.

- A. Emulsion
- B. Cement
- C. Lime
- D. Calcium Chloride
- E. Asphalt

308-8 MEASUREMENT AND DOCUMENTATION

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's operations on the road and in the plant.

Cold In-Place Recycled Pavement. Field notes will include weather conditions, station to station limits of work, and description of equipment used: pulverizer, grader/spreader, rollers. The Inspector will also document inspection procedures and check measurements of work done, such as: depth of grinding operations, cross-slope, and density of the finished product. Any added aggregate or recycled pavement used as necessary to restore cross-slope will also be noted, tested, and measured for payment if required.

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Plant Mixed Recycled Pavement. Field notes will be the same as for cold in-place recycled pavement with additional documentation regarding plant inspections.

Method of Measurement

Final quantity of recycled pavement can be figured by either of the two following methods:

Plan Quantity. Quantity for payment can be “plan quantity” providing the estimated quantity shown in the Schedule of Items is reasonably accurate and work is done to the limits estimated. Payment by plan quantity should be documented by written agreement such as a memo or Resident’s Work Order, between the Resident and the Contractor. The agreement must stipulate that the plan quantity will be adjusted upward or downward if changes are made in the field. Quantities paid “plan quantity” will be documented by notes of inspection and acceptance entered in the Project Diary, or directly in the Final Quantity Book.

In-Place Measurement. If the estimated quantity is not figured accurately enough to pay as a final figure, the final pay quantity will be determined from field measurements, or will be refigured from the plans, or a combination of both. Length will be distance between stations and width will be field measured. Frequency of width measurements will depend on road width consistency. All measurements, and sketches if required, will be recorded in a Construction Book or directly in the Final Quantity Book and signed and dated. Irregularly shaped areas such as ramp and side street approaches and intersections will be broken down into basic geometric shapes and measured by length and width. Dimensions taken from the plans and corresponding notes of inspection and acceptance are also recorded in a Construction Book or the Final Quantity Book.

Added Material. If specified in the contract, material added to maintain cross-slope in areas not designated on the plans or in the construction notes will be paid separately under the item used. Measurement will be by load count reduced by 20 percent for final payment. Every load will be documented by a delivery slip that has been signed and dated at the point of delivery by the Resident or Inspector. Daily totals will be entered in the Final Quantity Book. Refer to the Standard Specifications Section 304.06 - Method of Measurement, for further explanation of shrinkage factors. Refer to the Special Provision for the latest method of paying for added materials.

Final Quantity. Final quantity for payment will be entered in the Final Quantity Book and so labeled. References will be made to statements of inspection and acceptance, plan dimensions, field measurements, and delivery slips, as necessary. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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FOAMED ASPHALT

309-1 GENERAL

References

(1) Construction Notes

(2) Special Provisions

309-2 LAYOUT AND CONTROL

Control reference points for centerline control will be established by the MDOT. These reference points could range from telling the contractor to split the existing pavement to having an MDOT survey crew establish centerline. The contractor will be responsible for all other survey work, construction layout, staking out work, setting grades (profile grades), and quality control to assure accuracy. It is recommended that the contractor's work be spot checked for accuracy.

309-3 MATERIALS

Pulverized material shall consist of a portion, or the entire existing bituminous pavement and, if specified, a designated portion of the underlying gravel, pulverized and blended into a homogenous mass. Pulverized material will be processed to 100 percent passing a 50 mm [2 in] square mesh sieve.

New aggregate, if required by the contract or job mix, shall meet the requirements of Section 411.02 Untreated Aggregate Surface Course.

Recycled material shall consist of material from the project or from off-site stockpiles that have been processed, prior to use, to 100 percent passing a 50 mm [2 in] square mesh sieve. The Resident shall conditionally accept recycled material at the source; it shall be free of winter sand, granular fill, construction debris, and other materials not generally considered to be bituminous pavement.

The Department will supply a mix design for the foamed asphalt based on test results from pavement and soil analysis taken to the design depth. The mix design, including the determination of optimum foaming characteristics of the asphalt binder, will be carried out using a Wirtgen WLB10 Foamed Bitumen Laboratory. The Department will provide the following information prior to construction:

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1. Percent of bitumen to be used.
2. Percent of water to be used in the foaming process.
3. Quantity (if any) of crusher dust to be used.
4. Quantity of lime or cement to be added.
5. Optimum moisture content for proper compaction and dispersion of foamed asphalt.
6. Additional aggregate (if required).

After a test strip has been completed, it may be necessary for the Resident to make adjustments to the design water and/or additive quantities being incorporated into the reclaim material.

309-4 EQUIPMENT

Pulverizer The modified milling or recycling machine shall be a Wirtgen Model WR2500, Caterpillar Model RR350, or equal, and, as a minimum, shall have the following features:

- A. A minimum power capability of 600 horsepower;
- B. Where the recycling depth exceeds 250 mm [10 in], the effective volume of the mixing chamber shall be increased in relation to the depth of cut;
- C. Two microprocessor-controlled systems, complete with 2 independent pumping systems and spraybars, to regulate the application of foamed bitumen stabilizing agent, separate from water (for increasing the moisture content of the recycled material), in relation to the forward speed and mass of the material being recycled;
- D. Two spraybars shall each be fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 155 mm [6 in] width of the chamber;
- E. The foamed bitumen shall be produced at the spraybar in individual expansion chambers into which both hot bitumen and water are injected under pressure through individual and separate small orifices that promote atomization. The rate of addition of water into hot bitumen shall be kept at a constant (percentage by mass of bitumen) by the same microprocessor;
- F. An inspection (or test) nozzle shall be fitted at one end of the spraybar that produces a representative sample of foamed bitumen;
- G. An electrical heating system capable of maintaining the temperature of all bitumen flow components above 150°C [300°F];
- H. A single bitumen feed pipe installed between the modified milling or recycling machine and the supply tanker. Circulating systems that incorporate a return pipe to the supply tanker shall not be used;
- I. The operator cabin shall be variable from right to left;
- J. A printer shall be included to record amounts of materials used.
- K. The recycler shall be fitted with a front breaker bar system to ensure that the reclaimed material is broken down to the sizing outlined in 309.02.

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In addition to the above features, it is an essential part of this specification that the recycler be capable of exactly reproducing the foaming characteristics produced by the foam lab, to ensure compliance with the mix design as well as correct dispersion of the foamed asphalt. To ensure that the recycling process in the field reproduces the lab mix design, the recycler shall be fitted with the same type of foam expansion chambers as the lab foaming unit.

Liquid Mixer Unit or Distributor Only tankers with a capacity exceeding 10,000 L [2500 gal] shall be used to supply the recycling machine with bitumen. Each tanker shall be fitted with two recessed pin-type tow hitches, one in front and the other behind, thereby allowing the tanker to be pushed from behind by the recycling machine, and to push a water tanker in front. No leaking tanker will be permitted on the job site. In addition, each tanker shall be equipped with the following:

- A. A thermometer to show the temperature of the contents in the bottom third of the tank;
- B. A rear feed valve, with a minimum internal diameter of 75 mm [3 in], capable of draining the contents of the tank when fully opened;
- C. Insulation to retain heat; and
- D. A calibrated dipstick marked at intervals of no more than 100 L [25 gal], for measuring the contents of the tank.

Placement Equipment Placement of the full depth recycled material to the required slope and grade shall be done with an approved highway grader or by another method approved by the Resident.

Rollers The full depth recycled material shall be rolled with a vibratory pad/tamping foot roller, a vibratory steel drum soil compactor and a Type II pneumatic tire roller. The pad/tamping foot roller drum shall have a minimum of 112 tamping feet 73 mm [3 in] in height and a minimum contact area per foot of 110 cm² [17 in²]. The vibratory steel drum roller shall have a minimum 2.15 meter [84 in] width single drum. The pneumatic tire roller shall meet the requirements of Section 401.10 and the minimum allowable tire pressure shall be 586 kPa [85 psi].

309-5 TESTING REQUIREMENTS

Refer to the Minimum Testing requirements to determine the type and quantity of tests required. Refer to Special Provisions for any other requirements. Generally speaking, the minimum testing requirements are 1 compaction test per 600 meters [2000 ft] per lane width for mainline and 1 per 1200 meters [4000 ft] for shoulders.

The method for determining compaction begins with a target density determined in the field. This is accomplished by designating a 100 meter [300 ft] section as the control section. The contractor places the

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material and compacts with pad/tamping foot, vibratory, and pneumatic-tired rollers (meeting specifications) until the nuclear density readings show an increase in dry density of less than 16 kg/m^3 [1 pcf] for the final 4 roller passes. Once this target density is determined, the remaining tests must meet 98 % of the target density.

309-6 CONSTRUCTION AND INSPECTION

The contractor is responsible for the following:

1. All layout is done prior to starting work.
2. Maintaining control points and layout throughout construction.
3. Identifying the source of additional material if required (this may be supplied by the Department).
4. Assuring 100 % of the material will pass a 25 mm [2 in] square mesh sieve.
5. Assuring that the pulverizer is capable of producing a uniform mixture that meets the mix design requirements.
6. Assuring the addition of materials (lime, asphalt, dust, and water) meet the mix design requirements.
7. Compacting the material to meet density requirements.
8. Maintaining until paving can be completed (minimum of 36 hours cure time).

The inspector/project personnel are responsible for enforcing all specifications and requirements and accepting the quality of work done. Placing operations (both profile and x-sectional) should be carefully checked, as this will have a great impact of the smoothness of the finished product. Compaction should be closely monitored.

It is advisable to talk with other Residents/Inspectors who have placed foamed asphalt to incorporate their suggestion and to get ideas about potential problem areas and solutions.

309-7 MEASUREMENT AND DOCUMENTATION

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's operations. Field notes will include weather conditions, station to station limits of work, and description of equipment used: pulverizer, grader/spreader, rollers. The Inspector will also document inspection

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procedures and check measurements of work done, such as: weight checks of added material, cross-slope, and density of the finished product. Any added aggregate or recycled pavement used as necessary to restore cross-slope will also be noted, tested, and measured for payment if required.

Method of Measurement

Final quantity can be figured by either of the two following methods:

Plan Quantity. Quantity for payment can be “plan quantity” providing the estimated quantity shown in the Schedule of Items is reasonably accurate and work is done to the limits estimated. Payment by plan quantity should be documented by written agreement such as a memo or Resident’s Work Order, between the Resident and the Contractor. The agreement must stipulate that the plan quantity will be adjusted upward or downward if changes are made in the field. Quantities paid “plan quantity” will be documented by notes of inspection and acceptance entered in the Project Diary, or directly in the Final Quantity Book.

In-Place Measurement. If the estimated quantity is not figured accurately enough to pay as a final figure, the final pay quantity will be determined from field measurements, or will be refigured from the plans, or a combination of both. Length will be distance between stations and width will be field measured. Frequency of width measurements will depend on road width consistency. All measurements, and sketches if required, will be recorded in a Construction Book or directly in the Final Quantity Book and signed and dated. Irregularly shaped areas such as ramp and side street approaches and intersections will be broken down into basic geometric shapes and measured by length and width. Dimensions taken from the plans and corresponding notes of inspection and acceptance also recorded in a Construction Book or the Final Quantity Book.

Added Material. If specified in the contract, material added to maintain cross-slope in areas not designated on the plans or in the construction notes will be paid separately under the item used. Measurement will be by load count, reduced by 20 percent for final payment. Every load will be documented by a delivery slip that has been signed and dated at the point of delivery by the Resident or Inspector. Daily totals will be entered in the Final Quantity Book. Refer to the Standard Specifications, Section 304.06 - Method of Measurement, for further explanation of shrinkage factors. Refer to the Special Provision for the latest method of paying for added materials.

Final Quantity. Final quantity for payment will be entered in the Final Quantity Book and so labeled. References will be made to statements of inspection and acceptance, plan dimensions, field measurements, and delivery slips, as necessary. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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PAVEMENTS

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BITUMINOUS PAVEMENTS

401-1 GENERAL

This work is to be accomplished with adherence to the latest revision of the Section 401 Supplemental or Special Provision, and Section 106 - Quality.

References:

(1) AASHTO Highway Materials-Part I and Part II

(2) Standard Specifications

Section 108 - Payment

Section 305 - Premixed Bituminous Base

Section 307 - Full-Depth Recycled Pavement

Section 310 - Bituminous Stabilized Base

Section 403 - Hot Bituminous Pavement

Section 409 - Bituminous Tack Coat

Section 425 - Recycled Bituminous Pavement

Section 608 - Sidewalks

Section 609 - Curbing

Section 612 - Bituminous Hand Sealing

Section 627 - Pavement Markings

Section 639 - Engineering Facilities

Section 652 - Maintenance of Traffic

Section 700 - Materials

Section 702 - Bituminous Materials

Section 703 - Aggregates

(3) Special Provisions

(4) Supplemental Specifications

(5) Standard Detail Sheets

(6) Special Detail Sheets

(7) Project Plans - Typical Sections

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Hot Mix Asphalt Pavements (Bituminous concrete or "Hot top") may be used as a base course, leveling course, binder course, surface course, or resurface course placed upon any type of prepared surface.

Mix types, pavement thickness, and number of lifts in each course may either be given in a Special Provision, Contract Proposal book, or on the plans along with any recent Specification changes (Supplemental Specifications), additions, or special requirements applying to each particular project.

401-2 LAYOUT AND CONTROL

Centerline layout and control will be determined by the level of treatment (scope) decided on for the project. The Department is responsible for locating the project limits, and providing minimal stationing control every 500 meters [1000 ft]. The level of layout and control will vary from full survey control that will be provided by the Department (normally using the services of a survey crew to provide centerline or some other reference line), the running of centerline by the Contractor with offset stakes if an accurate set of stakes is available, or by the splitting of the existing pavement by the Contractor for centerline control. It is recommended that the line used for control be checked for accuracy before its use.

On projects requiring shimming to improve rideability; correct settlements; modify crown, superelevation or cross-slope; improve drainage in flat areas or any other necessary adjustments; "mark-up" grades may be determined from levels, stringlines, straightedges, markups and Shim Quantity Reports taken by ARAN, or other accurate means of setting accurate relative grades. These grades are usually marked on the pavement with pavement-marking paint, or preferably on side stakes with the required grade or cross-slope that is required, so that the grades are clearly visible to the paving crew while paving.

401-3 TESTING REQUIREMENTS

a. GENERAL REQUIREMENTS

All Hot Bituminous Pavements produced for use on the Department's projects will be subject to Quality Control/Quality Assurance and evaluated using random statistical analysis as outlined in the most recent revision of Section 401 - Hot Mix Asphalt Pavements, and Section 106 - Quality.

The Following is a list of checks and certifications required prior to the use or placement of Hot Mix Asphalt Pavements on Department projects:

Plant Certification: Checked by QA staff for minimum production equipment and stockpiles

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QC Lab Check: Checked by QA staff for minimum testing equipment

Job Mix Formula: One (1) per mix per year, approved by the Department's Central Testing Lab. Layover Mix designs are permitted, though they should be confirmed by the Lab.

Gradation & Asphalt Content: See latest revision of Section 401 and 106

Compaction (Density): Wearing Course: See latest revision of Section 401 and 106

Deleterious Material & Absorption: See latest revision of Section 401 and 106

Elongation & Fractured Stone: See latest revision of Section 401 and 106

Bituminous Material: For performance-graded binder, the supplier shall furnish a Quality Control Plan and Certificate of Analysis to the Testing Engineer. They will be kept on file at the Bangor Testing Lab. With each shipment of material, a Loading Invoice and Statement of Certification (both from supplier) shall be furnished to the Resident Engineer/Inspector on the project.

b. HOT MIX ASPHALT SAMPLING

All testing will be conducted under Quality Control, Quality Assurance. (Section 106-Quality)

The Hot Mix Asphalt Pavement producer is responsible for controlling the production quality of the HMA at the hot mix plant in accordance with their Quality Control plan and the minimum Quality Control requirements outlined in Section 401-Hot Mix Asphalt Pavements, and Section 106 - Quality.

The paving contractor or subcontractor is responsible for controlling the delivery, laydown, compaction, and finishing quality of the HMA pavements in accordance with their Quality Control Plan, and the minimum Quality Control requirements outlined in Section 401- Hot Mix Asphalt Pavements, and Section 106 - Quality.

The Department is responsible for the random Quality Assurance mix sampling of HMA material prior to its final disposition, such as in the haul truck, the paver, or the transfer machine hopper. Random Quality Assurance samples (cores) for density will be cut from the roadway at predetermined random locations after the finishing operation is complete, and the HMA has cooled sufficiently to allow the cutting of a core without damaging it. The use of ice to cool the mat is suggested.

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All sampling will utilize random statistical analysis procedures, and will follow the Departments methods defined in the Section 401 - Hot Mix Asphalt Pavement, Section 106 - Quality, and the MDOT/ACM joint Testing Policy and Procedure Manual.

The Street Inspector should observe the cutting and removal of the cores by the Contractor. The cores and mix sample boxes are the sole property of the Department, and are to remain in the possession of the Department's representative until the samples can be secured in a core transport container or mix sample box and secured with a DOT approved locking device, to be transported to the acceptance lab.

After the cores have been cut, the Inspector will check them for damage, measure each core and record the thickness on the sample identification tag. The cores then should be examined for adherence of unrepresentative layers of gravel or previously placed bituminous layers. If unrepresentative layers are present, the core should be marked with marking paint pen or crayon to be trimmed at the testing lab. Cores not marked at the time of sampling will not be trimmed by the testing lab. If the Contractor has an acceptable pavement trim saw on the project site, and the Inspector agrees, the Contractor may be allowed to trim only the unrepresentative layer from the core sample. When the sample is to be transported to the testing lab, or even on-project, the core sample should be placed directly into the core transport container, with two copies of the sample identification tag for that sample placed either beneath, or wrapped around, the core sample for easy sample identification at the testing lab. If the core sample is to leave the possession of the Department's representative, the core transport container must be sealed and locked with the approved locking device. If damage is apparent on the core sample, and the Contractors QC representative agrees, the core should be recut in accordance with the current policy for core resampling.

Cores should be identified using an easily tracked method. Sample identification number, or simple core number should be marked on surface of the core.

A copy of all sample identification tags documenting core information -- location, mixture, and thickness, will be sent with the cores to the Acceptance Lab for density testing. The Resident and/or Inspector will be responsible for seeing that cores cut that day are delivered to the plant for testing as soon as possible. (Refer to most recent Section 401 - Hot Mix Asphalt Pavement)

The Acceptance Lab will report the results of the density tests to the Resident as soon as possible. This is typically done through electronic means, such as E-mail, or in certain cases, fax. In the event electronic delivery is not possible, arrangements should be made for mail delivery.

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It should be called to the attention of all concerned that considerable importance is placed on obtaining the required densities. As a result, after initial densities are checked and found acceptable, no one should relax the inspection or construction procedures. Procedures employed by the Contractor to achieve density that result in the damage of the HMA mat integrity, cause displacement, or cause the HMA aggregate be crushed shall be discontinued, and the damaged HMA mixture removed and replaced at no additional cost to the Department.

When failing densities occur on cores, any corrective action that is taken in regard to future work must be noted on the Street Inspector's daily report. Corrective action will most usually take the form of changing the roller pattern to increase the number of passes over the mix.

Corrective action that is more involved than the increase in roller passes or type of rollers would normally involve an amendment to the Contractors QC plan.

401-4 CONSTRUCTION

a. Pre-paving Conference

Before the placement of HMA pavements starts on the project, a Pre-paving conference is scheduled with all parties involved in the project.

(1) General

To properly coordinate Construction and Paving activities, a Pre-paving Conference will be held prior to paving operations. At that time, a full discussion of any and all paving problems should take place. The procedure is to be as follows:

- (a) The Resident will notify the area Project Manager two weeks prior to the anticipated paving date.
- (b) The Project Manager and the Quality Assurance Supervisor will set a time for the conference, to take place at the project or other designated site.
- (c) It will be the responsibility of the Resident and Project Manager to see that representatives from the Prime Contractor, the Paving Contractor, and other involved personnel of the Department are invited to attend.

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(d) The Quality Assurance Supervisor will instruct the area QA Inspector who will be assigned to the project to attend the Pre-Paving meeting, if available. The Project Manager and the Resident will be responsible for instructing the Street Inspector to attend the Pre-Paving meeting, and for obtaining a ticket-taker for the paving operation.

The meeting will be documented by the Department in the form of a memo to be retained in the Project Files. The importance of this Pre-Paving Conference cannot be over-emphasized. The utmost in cooperation is necessary in order to obtain the desired goal of a smooth, durable and skid-resistant riding surface. The discussion should cover all phases of the paving operation, testing requirements, and project-specific concerns of all parties regarding the paving operation.

(2) Site Examination

Before the Pre-Paving Conference, the Street Supervisor, Street Inspector, and Resident should go over the project together, observing the condition of the base, checking special areas to be paved, noting special drainage areas, and any other areas needing special attention.

The Resident should have a set of plans, and a copy of the Bid Book for the Street Inspector's use. While going over the project, the Resident can advise the Inspector on what changes have been made in the plans. The Inspector should be acquainted with the typical sections, super-elevated curves, paved widenings, driveways, gutters, and other details related to paving which are shown on the plans. They must also be aware of any general policy changes or Project changes that affect this phase of the work.

(3) Additional Items

The following additional items will be covered at the Pre-Paving Conference. Discussion will not necessarily be limited to these items.

- (a) Paving personnel to be assigned to the project.
- (b) Changes made in plans during construction.
- (c) Paving sequences.
- (d) Number of trucks for hauling mix.
- (e) Ticket takers.

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- (f) Job mix formulas.
- (g) Project forms.
- (h) Interpretations of special and supplemental or standard specifications.
- (i) Special requests by the Resident Engineer.
- (j) Determination of Acceptance Lab location.

(4) Weather

The surface upon which the mix is to be laid should be clean and dry. The use of "thick lift paving" may liberalize the strict interpretation usually placed upon the specification that mix not be placed on a wet surface. The fact that it is raining does not necessarily mean that the surface is too wet to be paved upon, particularly when paving upon gravel. In general, any pavement being placed that is 50 mm [2 in] or more in thickness would be considered "thick lift paving".

(a) When paving on gravel base, it would not be necessary to shutdown paving operations immediately if it started to rain. If, in the Resident's judgment, the rain is not causing a "wet surface" (401.07 of specifications), the Contractor may be permitted to continue placing the pavement course. The Contractor should be notified verbally or in written form that he is running the risk that placement will be suspended, and that mix in transit will not be placed if conditions change, and the Resident feels the conditions may be detrimental to the completed work. It should also be made clear that the Department cannot be held responsible if the work performed under the present conditions does not meet minimum acceptance criteria.

(b) When paving on a previously paved road, bituminous penetrated gravel, or reclaim material, the existing surface shall be dry to insure a proper bond between courses. Paving should not commence if it is raining. If the pavement is only damp and the weather is definitely clearing, the Department may determine that paving could begin.

When overtaken by rain, the Contractor may be allowed to continue until there is obvious free water on the existing pavement. It is not the Department's policy to allow the placement of pavements until all mix in transit is placed. No guarantee can rightfully be given to place all mix in transit, as the length of haul varies from project to project. However, the Contractor can have the covered loaded trucks wait on the Project with the provision that if conditions improve before the mix becomes too cold, he might eventually place the mix.

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(c) When placing a wearing course or level course, conditions must be such that the surface receiving the mix is thoroughly clean and dry. No mix should be placed on a damp surface unless overtaken by rain, and then only the mix that is in the truck unloading at the time, if the existing pavement is not too wet.

In summary, the thicker the lift, and the closer it is being placed to the lower portion of the entire pavement, such as a thick base course, the less stringent may be the interpretation of the "wet surface" requirement of the Specifications. Paving level and surface pavement courses in the rain should not be allowed. In all instances refer to the Contractor's QC plan on how they intend to handle wet conditions.

(5) Traffic Control

(a) Procurement of Flaggers: The Resident shall verify that the Contractor or Subcontractor has obtained the necessary Flaggers. The Resident or Inspector is responsible for the determination of the actual hours worked. Flaggers must conform to the Standard Specifications, Section 652.

(b) Use of Flaggers: The proper control of traffic through the work area is very important. The Resident or the Inspector must be sure that traffic is directed through the Paving Area in a manner that provides maximum safety for the workers and traffic with the least interruption of the work.

Three flaggers are normally used when traffic must be maintained immediately adjacent to the paving operation. They shall be instructed in the proper use of traffic control sign paddles and/or flags. Hand held signs have a standard STOP sign on one side and a SLOW sign on the other. Instructions regarding use of flags and paddles are in the Manual on Uniform Traffic Control Devices. The use of two-way radios to control traffic through the operation is required.

The first flagger should be posted about 150 to 250 m [500 to 800 ft] ahead of the paving operation to intercept on-coming traffic. They must always be sure to direct the traffic, when passing through, to the correct side of the road so as to keep it off the freshly laid mix. This flagger will have to move ahead intermittently to keep their relative position to the operation. Haul Trucks enroute to the paver must move with the direction of traffic, and should **NEVER** be given precedence over the traveling public.

The second flagger should be posted at a spot 60 m [200 ft] or so back of the beginning of the paving, where he also will intercept on-coming traffic. They also must always be sure to direct the traffic, when passing through, to the correct side of the road so as to keep it off the freshly laid mix. This flagger should move ahead only after the back-rolling is completed, and should be

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kept back far enough so that the stopping traffic does not damage the pavement. Haul trucks enroute to the paver must move with the direction of traffic, and should **NEVER** be given precedence over the traveling public.

The third flagger shall be used as needed, normally being placed at the paver or at the position that will best protect the workers, the work, equipment, and help traffic through the Construction Area.

When conditions do not allow for proper approach sight distance of a flagger or storage space for waiting vehicles, an additional flagger shall be used at the rear of the backlogged traffic or at a point where approaching vehicles have adequate stopping sight distance to the rear of the backlogged traffic.

b. PAVING WORK

The construction of a Hot Mix Asphalt Pavement course begins with the delivery of the mixture to the project. The HMA pavement should be a workable mixture that has been proportioned and mixed in accordance with the governing specifications. The pavement shall be constructed of the type of mixture, number of courses, and at the depth as specified for the Project.

The Street Inspector will work with the Resident in determining when an area is ready to pave, and what is expected as the final result. The Street Inspector will then be responsible for determining that the correct procedures are being used and the specifications are being followed.

The Inspector must take an active part in the actual functioning of the paving operation and should be adequately equipped with the tools of the job, both knowledge and incidentals such as notebooks, thermometers, stringline, straightedges, etc. Their knowledge of the operation should include an excellent working knowledge of the construction equipment being used by the Contractor, but not act as a supervisor or laborer for the Contractor.

c. PLANNING AND PREPARATION

Before actual paving begins, the Street Inspector will go over the entire project with the Paving Contractor's Superintendent and/or Foremen. At this time, they will review the Contractor's Quality Control Plan, and plan of operation.

The base ahead of the Paving operation should be carefully inspected before placing any Hot Bituminous Mixture. When paving directly on aggregate courses, areas with potholes should be corrected by re-grading. Gravel base should be rolled just ahead of the paver to key the loose material. When cold mix

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(cold patch) has been used for temporary patching, these patches shall be removed and replaced with hot mix before paving. When an existing pavement is to be resurfaced, the pavement shall be cleaned of dirt and other extraneous matter and all weak areas repaired. Pavements to be overlaid should be clean, dry, and free from foreign materials that may affect the long term performance of the overlay course.

Low or high areas found in the gravel base should be brought to the attention of the Resident. These areas should be re-graded and compacted.

d. PLACEMENT EQUIPMENT

Prior to paving operations, a careful inspection of all the equipment should be made. It should be checked periodically for general condition and proper adjustment. Knowledge of adjustments and the operation of equipment are of the utmost importance to the Inspector. The Inspector should have a working knowledge of the equipment being used in order to be able to detect, by visual defects in mat quality, or irregularities in the work, that the equipment is not functioning or being operated in the manner it should.

The Inspector shall not perform the duties of an operator, or to act as a laborer, as it is the Contractor's responsibility to maintain and operate their equipment properly. The Inspector should inform the Resident of any worn or malfunctioning equipment.

(1) Paving Machines:

The most important piece of equipment is the paver. There are many adjustments in the paver that directly affect the quality of the mat being spread. The Asphalt Paving Manual published by the Asphalt Institute, and by the equipment manufacturer, gives detailed points to check on pavers and other equipment.

Also available are handbooks by each manufacturer with detailed operating instructions and maintenance procedures. Some of the more important features to be checked on pavers are as follows:

- (a) Observe the governor on the engine to see that it is operating properly.
- (b) On machines with crawler type tracks, check adjustment of crawlers for proper tension. Track type pavers should move steadily, without lurching ahead with track turn.
- (c) On pneumatic tired machines, check tires cuts, gouges, and for correct and uniform air pressure. Over inflated tires can cause excessive wheel spin, and affect the uniform forces acting on the screed.

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(d) Check the screed for excessive wear and possible warping. Excessive use of the screed heaters can seriously warp the screed and affect the mat laydown quality.

(e) Check screed extensions for alignment and crown. Loose extensions can cause mat ripples and shadows.

(f) Grade or thickness controls, manual or automatic should be checked for proper operation and wear. Improperly maintained automation systems can dramatically increase the probability of a poor riding pavement surface course.

(g) Screed vibrators should be checked to see that they are all working. These help place the mat with a higher and more uniform density.

(h) Flow control gates should be properly adjusted. Improperly set flow gates can cause the head of material in front of the screed to fluctuate, causing variable mat depths, poor ride, and mat densities to fluctuate.

(i) Check the screed heater for proper working conditions. Improper heat can cause the screed to drag, leaving a poor mat texture, and porous appearance.

(j) Check that the push rollers on front of paver are clean and rolling freely. Rollers that do not roll freely can cause the paver's speed to fluctuate or travel as steered, causing variation in mat depth and texture.

(k) Check the augers for excessive wear. Worn augers can cause segregation as the material is moved ahead of the screed, cause mat streaking and varying mat densities.

(l) Do not allow the use of fuel oiling of the paver hopper before or during paving operations. Fuel oil use will cause mat defects, flushing areas, and will break down the structure of the bituminous pavement being placed.

(2) Rollers:

Rollers most commonly used for mix compaction are the two-axle tandem, static or vibratory, for knockdown rolling, the pneumatic roller (rubber tire) for intermediate rolling, and a two-axle tandem for final rolling. Each roller should be checked to see that it runs smoothly, reverses without jerking and that steel rolls are smooth, free of grooves, and unpitted. The watering system must function properly and the pads and scrapers must be in good condition.

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When pneumatic tired rollers are used, the tires must be of equal size, ply, in good condition, and equally inflated. The ballast and tire pressure are generally up to the Contractor's discretion, but should remain consistent throughout the placement of the pavement course. All wheels should roll true, without wobble.

In no instances will petroleum products be allowed to be used as release agents on rollers.

(3) Miscellaneous Tools:

A check should be made to see that the Contractor has available on the project an adequate supply of rakes, lutes, shovels, brooms, hand tamps and other small tools. Petroleum products may not be used as release agents on these tools. The Contractor shall have available portable barricades, cones or other means of protecting the freshly laid mixture from damage by traffic.

The Contractor should also have available when necessary, a sidewalk roller and a vibratory compactor.

The 10 foot straightedge, required by specification to be supplied by the Contractor, should be checked for straightness and readable available at the paving site.

e. SPREADING AND FINISHING

Hot Mix Asphalt is usually placed by a self-propelled paver. In irregular areas, the mixture may be placed and finished by hand.

The Contractor will mark a paver guide line, which is usually based upon the construction centerline or control line. Regardless of what method is used for a guide line, the Inspector must be especially concerned that the proposed pavement will be in the proper location and the alignment is true with no sharp "yanks".

401-5 MEASUREMENT AND DOCUMENTATION

a. FIELD DOCUMENTATION

Project Diary, Inspector's Diary/Daily Report, Paving Report, Tally Sheet, Test and Data Reports: The Resident or Paving Inspector will document on a daily basis, the Contractor's paving operations. He/she will keep notes regarding: station to station limits of paving, inspection problems, and observations regarding quality control, equipment, personnel, weather, and temperatures. It is strongly suggested that

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the Paving Inspector use the Paving Report; this document has a preprinted format that serves as a reminder to record all of this information. This report is to be filled in on a daily basis, prior to the start of the next day. If a ticket taker is available, he/she will keep a tally of all loads delivered by noting delivery slip number and location where placed. The primary purpose of the Truck Tally Sheet is to control the yield and to determine which loads are involved if a problem area develops. If the Resident can isolate the loads, he/she can correlate the questionable material with specific batching data on record in the plant and in this way the cause for the bad mix may be determined.

Contract specifications state that quality of mix will be controlled by following the Quality Assurance requirements of Sections 401 and 106 of the Standard Specifications. The Contractor will provide quality control by testing and inspection and will propose their quality control procedures by submitting a Quality Control Plan to the Resident for Departmental approval. The Standard Specifications, Section 401 outline the basic requirements of the Plan, and also procedures for quality assurance testing that the Department will perform.

Section 401 of the Special Provisions defines the Quality Assurance requirements at three levels: Methods A, B, and C. Method A provides for pay incentives and disincentives. Method B provides for disincentives only. Quality control and quality assurance procedures are the same for Methods A and B.

Method C is used for sidewalks, drives, and other mixes behind the curb that are generally referred to as "hand-placed". Quality control requirements are not as stringent as for Methods A and B. Section 401 defines the types and frequencies of Acceptance tests to be taken.

Special Provision, Section 403, designates which method is to be used for a particular pavement item, usually based on quantity. To better understand Quality Assurance procedures, and Methods A, B, and C, the contents of Standard Specification - Section 401 and Special Provision - Section 403 should be thoroughly read by the Resident and the Paving Inspector before paving operations begin. All Quality Assurance records will be filed together in the Testing File daily.

b. MEASUREMENT AND PAYMENT

The delivery slip for each load of hot mix asphalt delivered to the project will be signed at the point of delivery by the Resident, Inspector or Ticket Taker. Daily total quantities for each pay item will be documented by a cover slip signed by the Contractor's Representative and the Resident or Inspector, and will be entered in the Final Quantity Book; all entries will be signed and dated. Delivery slips will be kept in the Resident's field office until the records are submitted to the Project Review Unit for final review. At that time the weigh slips may be discarded, but the cover slips will be kept as part of the project records.

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Occasionally a load will be split between two pay items. Quantities will be determined by fractions noted on the slip, example: "pay ? load as hand-placed". A rejected load will be documented by a note on the slip stating the reason such as: segregation, dry load, or low temperature.

Check-weighing to verify the accuracy of the scales will be done twice during every five days of production. Subsection 401.074 of the Standard Specifications explains the check weighing procedures. This is normally performed by Testing personnel.

Pay factor computations for incentives, disincentives, and penalties will be part of the Testing File, but final cost figures will be entered in the Final Quantity Book with the digits 01 and descriptions added to the pertinent pay item number, for example: 403.20801 Incentive-HMA-9.5 mm.

Final quantity for payment will be figured in the Final Quantity Book from daily totals and labeled as such. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 411 Untreated Aggregate Surface Course -- 1 Pages

UNTREATED AGGREGATE SURFACE COURSE

411-1 GENERAL

References:

- (1) Standard Specifications, Section - 703.10
- (2) Special Provisions
- (3) Standard Detail Sheets
- (4) Project Plans - particularly Typical Sections
- (5) Construction Notes & General Notes

This item is usually used as shoulder gravel or in incidentals like driveway lips and small areas such as between curbs in traffic islands.

411-2 LAYOUT AND CONTROL

Contractor personnel establishes horizontal control. It is only necessary to indicate the outside limits when required.

411-3 TESTING REQUIREMENTS

Refer to the project Minimum Testing requirements.

411-4 CONSTRUCTION

The Standard Specifications are quite explicit regarding the method of construction.

411-5 INSPECTION, MEASUREMENT & FIELD DOCUMENTATION

Refer to Section 304 Aggregate Base and Subbase Course of the Manual for information. This material is handled and documented the same as for that item.

411-6 COMPUTATION OF QUANTITIES

Refer to Section 304 Aggregate Base and Subbase Course of this Manual for information. The material is handled and documented the same for this item.

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Section 424 Asphalt Crack Sealing and Filling -- 2 Pages

ASPHALT CRACK SEALING AND FILLING

424-1 GENERAL

References:

(1) Standard Specifications

Sections 105, 108

Section 700 - Materials (General Statement)

(2) Construction Notes

(3) Special Provisions

The purpose of crack sealing is to prolong the life of existing pavements, by preventing moisture from penetrating the roadway structure, and by preventing the spalling of material from the edges of the cracks.

424-2 LAYOUT AND CONTROL

Layout for placement is a protected and flagger-controlled work area. Caution should be used in determining when to move the lane closure ahead to prevent pickup of material in the travelway and at intersections.

424-3 TESTING REQUIREMENTS

The contractor shall submit a Materials Certification letter prior to acceptance, as specified in Section 700. Asphalt crack sealer may be subject to random sampling and testing by the Department.

424-4 CONSTRUCTION

It is essential that the work area is properly signed and protected before work commences. Usually there is no project approach signing erected for this type project, which is a moving type operation.

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Section 424 Asphalt Crack Sealing and Filling -- 2 Pages

In crack cutting, the objective is to create a uniform, rectangular reservoir centered as closely as possible over a particular crack while inflicting as little damage as possible on the surrounding pavement.

Crack cleaning and drying provides a clean, dry crack channel, free of loosened pavement or asphalt fragments in which the crack treatment materials can be placed.

Next, the crack treatment material is prepared for the recommended application, and placed in the proper amount into or over the crack channel to be treated. Material application consists of maintaining the material at, or near the recommended application temperature without overheating. Maintain a sufficient supply of heated material in the kettle, and properly dispense the right amount of material into the crack channels.

424-5 INSPECTION - MEASUREMENT AND FIELD DOCUMENTATION

For crack cutting, the cutting tips or blades need to be checked for sharpness to minimize spalling and cracking. Also, check to see that the cutting equipment follows the crack with less than 5 percent missed. Dirt and debris need to be blown from crack channels and surrounding pavement to well off of the edge of the pavement. The melting vat must be kept at least one-third full of material to reduce the chance of burning the material or introducing air into the pumping system. This material has to be circulated during idle periods. Allow the materials to cool sufficiently to prevent tracking, given the type of traffic control setup and ambient conditions.

Record that the work has been done as specified.

Include in the Project Diary personnel and equipment used daily. Field measurements will be recorded directly in the Final Quantity Book, or another bound book.

Final Quantity for payment will be recorded in Final Quantity Book and referred to measurements and comps as appropriate, signed and dated. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

SECTION 500

STRUCTURES

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Section 501 Foundation Piles -- 6 Pages

FOUNDATION PILES

501-1 GENERAL

a. References:

(1) Standard Specifications

Section 501 - Foundation Piles

Section 502 - Structural Concrete Materials

(2) Supplemental Specifications and Special Provisions

(3) Standard Detail Sheets

(4) Inspection personnel should receive Fall Protection Training prior to engaging in inspection activities on this item.

A pile is a structural unit that transmits loads into the ground. It does this by frictional resistance along the surface of the pile and/or by direct bearing of the pile tip. The type, size and length of piles have been determined from subsurface investigations and design loading conditions as shown or indicated on the plans.

Three types of piles most commonly used are timber, concrete, and steel. Each has its own particular structural advantage and economy. Availability, permanency, soil conditions, and type of structure are some factors that will determine the selection.

Pile driving equipment varies greatly and must be adequate to handle the sizes of piles called for. Bearing capacity may be determined with a Static load test, dynamic Load test or the wave equation analysis. (Section 501.07 of the Specifications)

501-2 LAYOUT AND CONTROL

Before layout for the pile locations and driving of the piles, it is necessary that all excavation is completed (Section 501.04 of the Specifications.) It is sometimes desirable to excavate below final grade as stated in 501-5 Construction Manual.

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Independent layout checks, as stated below, must be done before any pilings are driven. Whenever possible, an entire group of piles should be located before pile driving begins. This will reduce the chance of error within any given foundation unit.

When piles must be driven underwater, a horizontal template or grid is usually made of steel or timber. This not only locates the pile positions, but helps hold the pile in position while being driven. When using this method, care must be taken that the battered piles are correctly located in their final position at the correct elevation plane.

In order to minimize the possibility of errors in the layout of bridge structures, layout work and locations for pilings will be independently checked, before the Contractor starts any work related to such layout.

501-3 CONSTRUCTION LAYOUT

The initial layout will be done by the Contractor. The independent check will be done by MDOT project personnel. Each crew will keep separate layout notes and when possible make their layouts by completely independent methods. All notes will be in bound field books and are to be retained as a part of the project records.

501-4 SAMPLING AND TESTING

Timber Treated piles and Steel H-Beam Piles: Certification-Refer to Division 700, Materials

Cast-In-place Concrete piles: The concrete and concrete materials must be sampled and tested as required under Section 502 - Structural Concrete. A Certificate of Compliance will be required for the steel shells: The type, size and estimated length of the piles to be used will be found on the plans.

501-5 SPLICING

The splicing of steel piles should be kept at a minimum. Wood piles shall be spliced only in very unusual situations when permitted by the Engineer. Splices in steel piles will be made only as approved by the Engineer. The Inspector should be satisfied that splice welds are sound. Splice welds should also be watched closely during driving to make sure they do not fracture.

All welding must be done in accordance with Section 504 of the Specifications, as shown on plan details, or in accordance with the Supplemental Specifications.

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Swelling of the ground usually occurs in the area around timber or concrete piles due to displacement of the earth as the piles are driven. For this reason the Contractor often elects to excavate somewhat below plan grade, especially when driving piles under water. The area around the pile must be adjusted to plan grade after piles are driven.

The equipment used to drive a pile must be adequate to supply the necessary energy to produce the bearing capacity required of the pile. There are several different types of equipment, and many makes and models of each type. A check will be made in accordance with Section 501.03 of the Specifications to be sure the hammer will produce the required energy.

The design load and weight of the pile influence the choice of size and capacity of the pile driving hammer. Type of soil and driving conditions are other factors to be considered in determining hammer size and type. Hammers are powered by steam, air, diesel, gravity or mechanically induced vibrations. Movements of hammers are basically classed as drop, single acting, double acting and differential acting. The drop hammer is one in which the weight is raised by cable over a pulley and then allowed to drop by gravity. A single acting hammer is one in which the weight is raised by steam or air and dropped, with only gravity acting. A double acting hammer is one in which steam or air raised the weight and also accelerates the downward stroke. A differential acting hammer is a variation of the double acting type. The diesel hammer is a self-contained unit, including power plant, cylinder, piston or ram, fuel tank pump, injectors, lubricator, and lubed oil tank. The diesel hammer raises the driving weight by the exploding of gases in the cylinder. In falling, the weight compresses the fuel air mixture to explosive conditions and the cycle is repeated. Most diesel hammers are the single acting-type, although a few double acting types are manufactured.

Each manufacturer of air, steam or diesel type pile driving hammers designates each size of each type of their hammer by a number and the rated energy output of the hammer. This designated energy rating is usually the maximum energy that the hammer is capable of producing as determined by the manufacturer provided the hammer is in good repair and all power criteria are met. The energy output of a hammer may not, during the driving of a pile, be the same as the rated energy. For a double or differential acting air or steam hammer, there should be sufficient air or steam pressure at the hammer to operate the hammer at the number of blows per minute required for a given rating. The energy of air hammers will vary if the number of blows per minute deviates from the designated number.

Note that for single acting diesel hammers the number of blows per minute will be less at maximum energy. Energy is indicated by the length of the stroke. Some single acting diesel hammers have a mark on the top of the ram by which the maximum length of the stroke may be checked. A scale board or some other reference is required to determine the length of stroke for less than full strokes of the ram.

When driving friction piling, the piles are required to be driven to a bearing capacity as shown on the plans. When loading tests are not called for, the bearing capacity is determined by using the wave equation analysis.

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Care should be exercised in driving piles to prevent damage to the pile. Piles that break during driving are of little or no value, and may require removal or replacement or, if the break is below the ground, the driving of another pile close to it. Driving caps are required that afford some protection to the pile head against crushing by the hammer. Timber piles are required to be shaped to a close fit with the cap to preclude brooming, or splitting of the pile. Should soil conditions be such that the piles must be driven through a hard layer, proper methods and procedures for driving should be taken to preclude damage to reinforcing steel shells or metal shoes on timber piles by use of jetting, or other methods, as approved by the Engineer. Jetting is usually effective in most soils excepting very coarse and loose gravel, hardpan, and rock. In clay, plugging of jets has to be watched. Jetting is unsuccessful if material disturbed cannot escape or if jet washes fine material from coarse, thus affecting bearing values. If care is not taken, piles can be unintentionally driven out of alignment by this method.

Followers (a pile extension sometimes used to drive piles under water or locations where the hammer cannot operate or reach) shall not be used except in unusual circumstances as approved by the Engineer.

501-6 RECORD KEEPING.

Before pile driving operations may commence, the Inspector should check the pile driving device supplied by the Contractor and verify that it has been approved. The required blows per 25 mm [1 in] to develop the necessary capacity of the friction pile will be figured with the wave equation analysis unless the alternate approval method is specified on the plans, see Section 501.03 of the Specifications.

For the Alt. Approval method see Section 501.03 of the Specifications, practical refusal is defined as penetration of not over 25mm [1 in] in 10 successive blows when the hammer meets the requirement in table 1 in Section 501.03 of the Specifications. Any deviations must be authorized by the Engineer.

The actual permissible hammer weight and type will often depend on the particular site and soil conditions. In very soft soils, a light hammer may be sufficient when driving to absolute refusal (i.e. when there is no question that the pile will be driven to ledge). In soft soils when positive refusal is not definitely known, a light hammer may be used to an elevation approaching practical refusal conditions, at which time a heavier hammer shall be substituted to obtain the specified requirements. It should not be much different from the driven weight because a lighter and a heavier hammer may crumple or distort the pile. If the analysis indicates that the hammer is marginally acceptable, close attention must be directed to the efficiency level at which the hammer is working.

Piles must be inspected to be sure that they meet the requirements specified in Section 501.02 of the Specifications.

After a pile has been placed in position for driving, a check should be made to determine that it is plumb or has the correct batter. Determination should be made during the driving that the pile is retained in its correct

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position. Checking the batter of a pile may be made with a spirit level attached to a board which has one edge cut to the required pile batter.

Records of each pile shall be recorded on a Pile Driving Record and a pile layout sketch. For "record" piles, the blows per 500mm [1.67 ft] or per 25mm [1 in] shall be recorded for the entire length of the pile, as driven with the hammer. Records of complete driving of at least two piles are required for each foundation unit, i.e. each pier or abutment when they are hammered. "Record Piles" are not required for vibratory driven piles.

One method to record the driving of a record pile is as follows: each 500mm [1.67 ft] should be marked off prior to placing the pile in the leads (frame which holds the hammer and pile line). When the pile slows to about 10 blows per 500mm [1.67 ft], each 25mm [1 in] should be marked.

The scale board on the leads may also be used for this process. Records for all other piles should include driving the last few 25mms [inches] together with any other information, such as sudden changes in penetration due to changes in soil resistance and any changes in batter or movement of the pile.

The Pile Driving Records are used to record the actual observations of the work being performed and are the original documentation. All the Pile Driving Records, Pile Location Sketches and Pile Driving Logs shall be filed in the Final Computations File.

Quantities shall be summarized in the Final Computations Files and totals transferred directly into the Final Quantity Book.

501-7 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This Subsection describes the record keeping required to document the installation and measurement of foundation piles.

Field Documentation

Project diary, Inspector's Dairy/Daily Report: The Resident or Pile Driving Inspector will keep notes describing the Contractor's pile driving operations; personnel, equipment, working hours, and which abutment or pier being worked will be recorded.

The Resident will make a note in the Project Diary of the following: approval of the pile driving equipment, approval of driving procedures, approval of driving hammer, inspection and approval of pipe piles before contractor places concrete. Sections 501.03 – Equipment and 501-04 – Driving Procedures and Tolerances of the Standard Specification address, in detail, equipment and driving of piles.

The Resident will document static and dynamic load testing. Static load testing: approval of testing procedures and the results will be recorded in the Project diary. Dynamic load testing: a report of test results will be

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submitted to the resident and placed in the Testing file. Standard Specification, Section 501.07 explains the requirement of load testing.

Pile tips and pile splicing procedures must be approved by the Resident. Notes will be made in the project diary. Reference is made to Subsection 501.09 of the Standard Specifications.

The Resident or the Pile Driving Inspector will complete the following records and make them part of the Final Quantity computations Book:

Pile Layout Diagram The layout diagram is a sketch of the outline of the foundation and the batter, identification, and location of each pile by number.

Pile Driving Report This report identifies each pile driven by number, location, driving length, pay length, and cut-off length. It also gives the type of hammer and other data pertinent to the operation. This report must be kept current with the work and must be signed by the Inspector.

Report of Record Pile This report is a driving log of a pile; it is an indication of the energy required and the resistance encountered during the driving operation. Two record piles are required for each foundation unit. This report must also be signed and dated.

Measurement and Payment

Foundation Piles Payment for piles furnished will be based on quantities ordered in writing by the Resident. Cut-off piles in excess of 3 m [10 ft] for each piece will become property of the Department. A Special Provision in the Contract will designate how the excess will be disposed.

Payment for piles installed will be determined from pay lengths shown on the Pile Driving Report; pay length is the difference between the driving length and the cut-off length figured to the nearest 25mm [1 in]. In the case of pipe piles, there is no payment for concrete in them.

Splices and Tips These will be recorded for payment on the Pile Driving Report as authorized.

Loading Test These tests will be paid per each; reference will be made to appropriate Diary notes and test results for documentation of quantities paid.

Final quantity for payment for pile delivered, piles driven, load tests, splices, and tips will be entered in the Final Quantity Book, signed and dated. Reference will be made to notes in the pile driving reports, to test results, and to entries in the Project Diary that document inspection and final acceptance. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

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STRUCTURAL CONCRETE

502-1 GENERAL

a. References:

(1) Standard Specifications

Section 501 - Foundation Piles

Section 502.03 - Structural Concrete Materials

(2) Supplemental Specifications and Special Provisions

(3) Standard Detail Sheets

(4) Inspection personnel should receive Fall Protection Training prior to engaging in inspection activities on this item.

b. Terms:

The following terms used in this Section are explained below:

Tell-Tale: Wooden strip or weighted wire freely suspended from concrete forms to match marked stakes below to determine movement or settlement of forms while loading.

Initial Set: The initial stiffening, or loss of plasticity, of the mortar.

Bleeding: The tendency of water to flow to the surface of the concrete mass because it has the lowest specific gravity of the materials in concrete.

Seal Concrete: Concrete placed underwater, usually within a sheet pile cofferdam, used to seal the cofferdam so it can be dewatered. The weight of concrete counterbalances the hydrostatic head of the water after dewatering.

Absorption Factor: Water absorbed internally by aggregates to a point of saturation, but the aggregates are still in a surface-dry condition. It is usually expressed as the ratio of the weight of water absorbed by the aggregate sample to the weight of the dry sample.

Wales or Walers: The horizontal, or nearly horizontal, support members of a form system usually placed over the studs as the last part of the form system.

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Studs: The vertical, or nearly vertical, support members of a form system; usually placed against the form boards as the first supporting members of the form system.

Tremie: A system of vertical, or nearly vertical, tubes or pipes designed to permit the placing of concrete beneath the surface of the water. The discharge end of the pipe is temporarily plugged and the system is filled or charged with concrete and placed against the surface to receive the concrete. The plug is then removed and the concrete placed as desired. Concrete, as necessary, is added to the charging hopper and the concrete in the tremie is pushed out at the bottom.

A Special Provision is included in all contracts which will designate under what method each item will be classified: Method A, B, or C. Under Method A and B the Contractor must do Quality Control testing in accordance with the Specifications and the approved Quality Control Plan. If the concrete is not designated Method A, B, or C, then any quantity greater than 10 m³ [13 yd³] will be Method B, and quantities of 10 m³ [13 yd³] or less will be Method C. See Standard Specification 106.6.

Under the Method A part of the specification, an incentive is paid or a disincentive is charged, depending on the results of the Acceptance tests done by the Department. In general, Method A is used for larger volumes and/or at more critical locations.

Under Method B, there is no incentive or disincentive and QA tests are done to verify acceptability. Method B is intended for use with noncritical concrete and /or smaller volumes.

Under Method C, the verification testing for acceptability is done by the Department. This method is used when the costs outweigh the benefits for a contractor-provided Quality Control Plan. Examples are repair work, fencing, steps and very small volumes.

502-2 LAYOUT & CONTROL

MDOT will provide a point on the baseline (normally the centerline of construction) for the station of the centerline of the substructure unit. It will be the responsibility of the Contractor to turn the angle to establish the centerline of the substructure unit on the ground.

Blocking elevations will be taken by the contractor on top of the girders at the spacings shown on the plans. These elevations are taken to the nearest mm [0.01 in], and compared to the plan elevations to compute a markup grade to be used for setting the deck forms.

For distance checks, which are difficult to measure, such as over a river, a survey crew is available. They must be contacted in advance through the Division Survey Coordinator.

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502-3 TESTING REQUIREMENTS

a. For testing requirements, consult the minimum testing requirements, the quality assurance subsection of Section 502 Structural Concrete.

For Method C concrete, an air test should be done on the first load, and then every third load. Notes should be made for mix temperatures, arrival time, unload time, volume of water added at the site, and mix revolutions. For non-superplasticized concrete, a slump test should be done.

b. Cement: One (1) Certified Mill Test to be obtained by the Resident from the Contractor. For Methods A and B, the Mill Test should be part of the QC Plan.

c. Aggregates: Aggregate samples (fine and coarse) for quality tests are taken from stockpiles at concrete plant locations. It is the Resident's responsibility to notify an Acceptance Testing Supervisor as soon as possible, but no less than two weeks prior to the first scheduled use of the concrete. The Acceptance Testing Supervisor will schedule a plant inspection. As part of the inspection, cement, admixtures containing chlorides, and aggregates will be sampled.

The Resident shall request from Acceptance Testing Personnel a copy of the applicable plant inspection, transit mixer inspection, and quality test results.

When sources of aggregates are changed during the progress of the work, quality determinations must be completed prior to use. The Resident should give advance notification to Acceptance Testing Personnel to expedite proper testing.

d. Gradation of Fine and Coarse Aggregates: Gradation tests must be made on fine and coarse aggregates as specified in the Minimum Testing Requirements and the Quality Assurance section of the Specifications.

502-4 INSPECTION

a. Review the Special Provision Section 502, Structural Concrete and the Contractors Quality Control Plan. Assure that the Contractor is in conformance with these requirements. Forms should be visually inspected for conformity to plan dimensions, cleanliness, and for integrity. Where the edges of the concrete are to be exposed, a chamfer strip needs to be installed. The elevation of the earth below footings should be assured. If the placement is located on ledge, elevations should be recorded, as necessary, for use to compute quantities.

b. Falsework for slabs should be inspected the same as forms. The bottom of slab elevations should be assured. When the concrete deck surface is finished by a screed machine, it is necessary

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to assure the setup with a dry run. The screed rail should be visually sighted for any obvious irregularities, along with assuring a constant dimension above bottom of slab.

c. During concrete placements, the Inspector should confirm that adequate vibration is being done. The grade and finish of the concrete should be visually checked for irregularities. Bridge deck placements need to be watched closely for grade and quality. Random deck checks are needed to assure the machine is on grade and working properly. The areas where the placement starts and ends are the most critical since the screed machine usually misses the ends. A 3 m [10 ft] straight-edge should be used to check the grade in these areas. As soon as possible after finishing, wet-curing mats should be placed.

d. Water curing should be checked each working day. Weekend checks are necessary for concrete less than 48 hours old, bridge decks and random checks.

e. Concrete temperatures need to be checked daily during cold weather periods. Air temperatures should also be noted.

f. When forms and falsework are removed, the surface of the concrete should be visually checked for irregularities, which should be corrected as soon as possible.

502-5 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This subsection describes the recordkeeping necessary to document and measure concrete for major and minor structures.

- a. Field Documentation: Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's pre-placement and placement activities, such as: excavation and preparation for erection of forms and installation of reinforcing steel. Equipment, personnel, weather, temperatures, and location of work site will be recorded also.

It is the policy of the department that the Inspector document in writing the inspection and approval of forms and reinforcing steel before a concrete placement. The Contractor is also required to do a "dry run" with the screed machine before the deck placement. The Inspector will note their observations during the dry run and also measure and record thickness of the deck slab as the concrete is placed. Notes can be entered in the Project Diary or Inspector's Diary or directly in the Final Quantity Book.

Concrete for sign bases, light bases traffic signal bases, and other minor structures will be documented by Inspector's statement verifying that placement of forms, steel cages or mesh, anchor rods, and conduit have been checked and accepted.

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b. Measurement and Payment: Final quantity for payment will be lump sum or by the m³ [yd³] computed in-place as specified in the Schedule of Items in the Contract book.

Lump Sum: This method of payment is specified in the bid schedule if the dimensions of the structure, be it abutment, pier, or deck, are clearly defined and not subject to change in the field. Final quantity for payment will be entered in the Final Quantity Book as "Lump Sum" and reference will be made to inspection and approval of forms, dry run of screed machine, check of slab thickness, as appropriate.

Cubic Meter [yd]: Concrete paid by the unit is usually specified when the dimensions of the structure are not clearly identified as when the footing is on ledge or when the work consists of extending an existing abutment or placing a new footing on dry laid granite. In this situation, concrete is measured by delivery slip. The Inspector will sign the slip when the concrete is delivered to the site and he/she will also note amount wasted if any. The note will say, for example: "wasted ¼ m³". Delivery slip daily totals will be entered in the Final Quantity Book. The concrete may also be measured in-place providing a sufficient number of field measurements are taken; measurements will be entered in the Construction Book. All delivery slip totals and field measurements will be signed and dated.

Occasionally the Schedule of Items will specify concrete to be paid by the cubic meter as opposed to lump sum even though the dimensions of the substructure are clearly shown on the plans and will not change in the field. In this situation the concrete can be paid plan quantity providing the estimated amount is figured to the same degree of accuracy as it would be for final payment. The Resident will check the calculations and so note in the Final Quantity Book.

Where a footing is founded on ledge, concrete placed more than 300 mm [1 ft] below the designated bottom elevation of the footing will not be included in the pay quantity of concrete figured in-place. Likewise, if the concrete is figured by load count, quantity below the 300 mm [1 ft] line will be figured in-place and deducted from the total delivery slip quantity.

Since final ledge cross-sections will have already been taken to figure structural rock excavation, these same cross-sections will be used to compute quantity of concrete for payment or to figure quantity for deduction.

If the item "concrete fill" is added to the contract by work order, the lateral pay limits of the fill must be specified in the work order and the final quantity must reflect a deduction or non-payment for concrete placed beyond pay limits.

As for hot mix asphalts, contract specifications stipulate that quality of concrete will be controlled by following the "QC/QA" requirements of Sections 502 and 106 of the Standard Specifications. The Contractor will propose his/her quality control procedures by submitting a Quality Control

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Plan to the Department for approval. The Contractor will do quality control testing and the Resident will do quality assurance testing.

There are basically three levels of QC/QA: Method A, Method B, and "Non-QC/QA"; Special Provisions will specify the method for each item. Method A provides for incentives and disincentives; Method B provides for disincentives only. The Non-QC/QA method is used when the concrete in question must only meet the minimum quality standards in the Standard Specifications, for example: armored joint repairs, surface repairs to wingwalls, bridge decks, abutments, piers, and box culverts, and also modifications to concrete endposts. Cylinder breaks below what is allowed in the Standard Specifications will be reason for either rejection of the concrete or negotiation of a price credit. Quality control and quality assurance are explained in detail in Sections 106 and 502 of the Standard Specifications.

Final quantity for payment will be entered in the Final Quantity Book; references will be made to source documentation, such as: Final Quantity Computations Book, delivery slips, form checks and reinforcing steel checks. Delivery slip quantities and also form checks and re-steel checks will be entered in the Construction Book or directly in the Final Quantity Book.

Quality control records, quality assurance records, and pay factor computations will be filed in the Testing File for each day's placement. Incentive and disincentive computations and cost figures will be entered in the Final Quantity Book with digits 01 and descriptions added to the pertinent pay item number, for example: 502.2101 Incentive-Str Conc Abuts & Ret Walls.

All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries.

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Example A

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Cont Status SpellCheck Print

Add IDR (IDR: 05/29/2002, Orvis J. Tripp) (Contract: 007951.00)

General Contractors Postings Sketches View

Date/Time Entered: 05/29/2002 Entered By: Orvis J. Tripp Revised By:
Sequence Number: Entered By: Orvis J. Tripp Revision Date:
Generated: No Revision Number:

IDR Date: 05/29/2002
Inspector: OJT Orvis J. Tripp
Weather: Sunny
Low Temperature: 15° C 59° F
High Temperature: 25° C 77° F

Comments: Contractor placed 50 m³ Class "A" Concrete on DS half of deck. Inspected forms, cover and reinforcing steel and found to be within allowable tolerances. Rejected one load for high air content. See postings this day for payment.

Rows 1 to 6 of 6

Example B

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Item Doc Cont Status SpellCheck Print

Add IDR (IDR: 05/29/2002, Orvis J. Tripp) (Contract: 007951.00)

General Contractors Postings Sketches View

Item: 502.25, STR CONC SUPERSTR SLAB
Prop. Ln: 0090 Unit: LS Catg. Auth. Qty: 1.000 Catg. Auth. Amt: \$12,000.00
Type: ORIGINAL ITEM Unit Price: \$12,000.000 Catg. Qty. Placed: 0.500
Catg. Pending Chgs: 0.000 Catg. Qty. Paid: 1.000

Item Posting

Project: 007951.00 FRANKFORT
Category: 0001 BRIDGE ITEMS
Quantity: 0.500 LS Attention:
Station From: Breakdown:
Station To: Remarks: All concrete and reinforcing steel placed as per plans and specs. Test run performed with Bidwell. Testing on file for this days placement.
Location: DS deck

Materials OK Add More Cancel Add Materials Add Breakdowns

Ready

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REINFORCING STEEL

503-1 GENERAL

References:

- (1) Standard Specifications, Section 503.02
- (2) Special Provisions & Supplemental Specifications
- (3) Standard & Special Detail Sheets
- (4) Shop Drawings
- (5) Project Plans
- (6) Construction Safety Rules and Regulations-Department of Labor and Industry.
(D.L.I. Bulletin No. 25-9)

The manuals from C.R.S.I. and A.C.I. referred to in Section 503.05 of the Specifications are available from the Area Bridge Construction Engineer.

This work consists of furnishing and placing reinforcement, either plain or epoxy-coated, in conformance with the Plans, Supplemental Specifications and Special Provisions.

503-2 LAYOUT AND CONTROL

The layout of the reinforcing steel is the responsibility of the Contractor, and should be checked by the Inspector. Any necessary centerlines, bearing lines, etc., required to accurately lay out the reinforcing steel should be furnished by the Contractor, as well as necessary grades. A check should always be made to insure that the vertical steel extends to, but not above, the desired level.

Reinforcing steel should be located by measuring as large a number of bars as possible from a single point in order not to gain or lose distance as may occur when measuring short increments. Remember that the number of bars required within a given space, not the exact spacing, is the critical factor.

Many times the Contractor chooses to prefabricate a portion of reinforcing steel assemblies outside of the forms, such as a pier cap reinforcing steel cage. This must be carefully laid out according to the plans, checking to be sure that any steel to be matched on the preassembled cage will fit correctly. Since this prefabricated portion must be moved as a unit, all ties must be secure and some protection

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against twisting should be included (possibly X-bracing). Welding of reinforcing steel is not normally allowed. Welding of reinforcing steel reduces the strength of the bar by 30% and should only be done by personnel specifically qualified to weld reinforcing steel. Welding may be done in zero stress areas, typically the last 150 mm [6 in] of a bar.

503-3 SAMPLING AND TESTING

Bars and Steel Wire Mesh: Certification - Refer to Standard Specifications, Section 700

Random Sample: When called for on the “Estimated Minimum Testing Requirements”.

503-4 CONSTRUCTION

The Inspector should realize that the designer of the structure has carefully calculated the location of the reinforcement and has designed the member accordingly. The reinforcement should be placed as nearly as practicable to the locations shown on the plans. The importance of concrete cover (distance from surface of concrete to near edge of reinforcement) cannot be overstressed. It is normally 50 mm [2 in] unless otherwise noted on the plans. Some exceptions are bridge slabs and footings. This cover protects the steel from water and de-icing chemicals, which would cause rust. The rusting effectively increases the diameter of the steel, causing spalling of the concrete. Section 503.06 allows approved precast portland cement mortar blocks, metal or plastic chairs to be used to obtain the specified cover.

There are several types of manufactured metal or plastic chairs. They must be checked to be sure they provide the correct nominal height. The nominal height of the bar support shall be taken as the distance from the bottom of the leg, and plate or wire runner to the bottom of the reinforcement. These bar supports are intended to support the steel reinforcement and the normal construction loads. Bar supports are not intended to, and shall not be used to, support runways for concrete buggies or similar loads.

Several methods are acceptable to maintain required spacing between layers of bars. The most common are precast portland cement mortar blocks, which have been cast to fit, or high metal chairs. As stated in the Standard Specifications, Section 503.06, the use of pebbles, pieces of broken stone or bricks, metal pipe or wooden blocks will not be permitted. Tack welding shall be strictly in accordance with the Supplemental Specifications. Tack welding extra short bars on or near the top of shear connector studs is an effective method of supporting slab steel when no welding is allowed on the stringers. Whichever method is used, the Inspector should be sure that the proper clearance is maintained at all times.

Splicing (lapping) of the reinforcement should be closely checked by the Inspector. Standard Specifications, Section 503.07, calls for the spliced bars to be placed in contact with each other and securely wired together. The spliced lengths vary with the size and location of the bars, so the Plans should be checked in each case.

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Reinforcement which is accidentally bent during construction may be straightened to its intended shape before being used in the work. This must be done without heating. Excessive field bending may cause failure of the bar; therefore it should be done with caution.

Field bending or cutting of epoxy-coated reinforcing bars will not be allowed, unless otherwise indicated on the plans or permitted by the Resident. All damaged coating areas that result from permitted bending or cutting shall be repaired in accordance with the patching requirements.

During cold weather construction, all frost must be removed from the steel before concrete placement.

503-5 INSPECTION

Equipment necessary for proper inspection of reinforcing steel should include a copy of the plans and a rule. A block of wood cut to the clearance required is sometimes helpful to check bars where it is inconvenient to read a rule, such as the bottom mat in a bridge deck.

All reinforcement must be as specified in the Standard Specifications, Section 709.01.

Reinforcement should be stored on skids or other supports above the ground and protected at all times from damage and surface contamination. Generally, reinforcing steel can be stored on supports above ground, without protective covering, for periods of up to 3 or 4 months with seasonal weather condition taken into consideration. For extended periods of storage, it should be protected from the weather with adequate covering, allowing air to circulate to the steel from beneath. Tight, thin rust, which remains on the steel when rubbed with burlap, is not considered detrimental. Reinforcement which is rust pitted enough to alter its cross-sectional area is not acceptable.

Epoxy-coated bars shall be stored at the construction site a minimum of 300 mm [12 in] above the ground surface and above any vegetation growth. The storage supports shall be racks or platforms constructed of wood or other materials with padded facings on the contact areas. Bundles of bars shall be stored on racks or platforms in a single layer. Each bundle shall be placed on the rack or platform, out of contact with adjacent bundles. If it is expected that epoxy-coated bars will be stored outdoors for a period in excess of three months, they shall be stored or covered in such a way as to protect them from ultraviolet radiation.

When a shipment of reinforcing steel is received on the project, an inspection of the bar dimensions should be made. Bending tolerances should be in conformance to that established in the latest edition of the "Manual of Standard Practice of the Concrete Reinforcing Steel Institute" and the "Detailing Manual of the American Concrete Institute". All bars shall be checked for their distinguishing set of marks, which are legibly rolled into the surface of one side of the bar. These marks denote the producer's mill, size of the bar and type of steel. Bars shall be Grade 420 [Grade 60] unless otherwise specified on the plans. High-strength bars must also show the minimum yield

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strength. This is done by numbers or by lines. A list of the producing mills and their corresponding bar marks is available from the Area Bridge Construction Engineer.

Several observations to be made during the inspection of the reinforcing steel are:

- (1) Be sure the length of splices are according to plans.
- (2) The spacing number and size of each bar and cover should be carefully checked.

Placing tolerances, in general, may be used as follows:

(a) Height of bottom bars above forms (slabs, etc.): minus 3 mm [$\frac{1}{8}$ in] or plus 6 mm [$\frac{1}{4}$ in].

(b) Cover of top bars (slabs, etc.): minus 3 mm [$\frac{1}{8}$ in] or plus 6 mm [$\frac{1}{4}$ in].

(c) Spacing bars in walls and solid slabs: It is much more important that in any given length or panel of slab or wall there be as many bars as are called for on the plans rather than having each individual bar at its exact spacing. This allows a bar to be moved 25 mm or 50 mm [1 to 2 in] to avoid an insert (deck drain, anchor bolts, etc.) without having to cut the bar, which reduces the strength.

(3) In any location where anchor bolts are to be placed (curbs, bridge seats, etc.) a check should be made to insure that the reinforcing steel and bolts would clear each other.

(4) Except when grouting is called for, all reinforcing steel dowels should normally be tied in place prior to the placement of the concrete around them in accordance with the Standard Specifications, Section 503.06, so as to obtain maximum bond.

(5) Vertical steel splicing to dowels must be checked for correct splice length and proper elevation of the top of the bar.

(6) The Inspector should make certain that the bars are accurately placed in the positions shown on the plans and shall be firmly held there during the placing and setting of the concrete. Immediately before placing concrete, steel reinforcement shall be free from all foreign material, which could decrease the bond between the steel and concrete. Such foreign material shall include but not be limited to dirt, loose mill scale, excessive rust, paint, oil, bitumen and dry concrete mortar.

(7) Check that bars shall be fastened together at all intersections except where spacing is less than 300 mm [1 ft] in either direction, in which case, fastening at alternate intersections of each bar with other bars will be permitted, providing this will hold all the bars securely in position.

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This fastening may be tightly twisted wire or by tack welding when permitted by the Resident. Tack welding for fastening or supporting reinforcing steel will not be permitted. The contractor may supply additional bars and weld those. Welding on epoxy-coated reinforcing steel will not be permitted under any condition. In general, no welding will be permitted on the reinforcing steel of superstructure slabs.

(8) The Inspector will check the placing of the steel in each unit and note it in the diary.

(9) The in-place reinforcement should not be walked or traveled on without using planks or platforms to distribute the weight.

(10) While concrete is being placed, the Inspector should check to be sure that the reinforcing steel remains in the proper position.

(a) Check measurements on bridge deck will be made prior to placing concrete.

(b) When machine finishers are utilized in striking off the complete surface of the bridge deck, adequate check measurements should be made and recorded during the dry run to insure that there is proper clearance over the entire cross-section of the deck.

503-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will keep notes describing the Contractor's progress on this item: also to be noted are crew, equipment, weather, and location work is taking place, i.e. abutment, footing, pier, deck, or sign base. Computations may be done using an excel spreadsheet (ref. example B) or standard computation sheets.

When the steel is delivered, the resident/Inspector will inspect the material for condition and proper storage, He/she will record inspection and acceptance in the Project Dairy or Directly in the Final Quantity Book. Delivery invoices will be kept as part of he project records.

When the Contractor places the re-steel, the Resident/Inspector will inspect for bar size, length, splice assembly, and proper positioning within the forms. He/she will document acceptance of reinforcing steel and splices by notes entered in the Project Diary or directly in the Final Quantity Book. Inspection will also be noted in the project records for re-steel placed in minor structures, such as traffic signal bases, sign bases, or concrete sidewalks.

Quantity for payment of reinforcing steel delivered and place will be the quantity shown on the Steel Schedule in the contract plans, checked and corrected as necessary.

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Final quantities of re-steel will be entered in the Final Quantity Book, signed and dated. Reference will be made to the Steel Schedule, computations in the Final Quantity Computations Book, and to statements of inspection and acceptance in the Project Diary or other project records.

Final quantity of splices will be entered in the Final Quantity Book. Reference will be made to the plans for the number paid; additional splices requested by the Contractor and approved by the Resident will not be measured for payment. References will also be made to Project Diary entries for documentation of splices installed and accepted.

Steel mesh placed in sidewalks, sign bases and traffic signal bases will not be measured for payment but is included in the bid price per unit. **All calculations and data entries must be signed, dated, and checked; the checker and date his/her entries.**

Example A

The screenshot shows the FieldManager software interface. The title bar reads: "FieldManager (Contract: 007951.00) - [Change IDR (IDR: 4/19/2002, Orvis J. Tripp, 1) (Contract: 007951.00)]". The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Cont Status, SpellCheck, and Print. The main window has tabs for General, Contractors, Postings, Sketches, and View. The General tab is active, displaying the following information:

- Date/Time Entered: 04/19/2002
- Revised By: Wendell W Harriman
- Entered By: Orvis J. Tripp
- Revision Date: 05/15/2002
- Sequence Number: 1
- Revision Number: 1
- Generated: No

Below the horizontal line, the following fields are visible:

- IDR Date: 04/19/2002
- Inspector: OJT Orvis J. Tripp
- Weather: Sunny
- Low Temperature: 13 °C 55° F
- High Temperature: 23 °C 73° F

The Comments field contains the text: "Contractor erected reinforcing steel in DS portion of breast wall Abut#1. Checked layout, spacing and cover on all surfaces, as well as elevation of dowels and splice lengths, and found to be as per plans and specs. See Posting this Date and F.Q.C.B. Item 503 Reinforcing Steel for Meas. and Comps."

The status bar at the bottom of the window displays "Ready".

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Example B

The screenshot shows a Microsoft Excel spreadsheet with the following data:

Bar ID	# of Bar	Size of Bar	Length	Ttl of ID(kg)	
16A01	16	16	3930	97.590	Ttl Plcd = 1008.662
16A02	16	16	4070	101.066	
16A03	16	16	4460	110.751	
16A45	16	16	3930	97.590	
22A04	12	22	3455	126.121	
22A06	2	22	3010	18.313	
22A07	2	22	2115	12.868	
16A08	2	16	2695	8.365	
16A09	16	16	1695	42.090	
22A10	8	22	3905	95.032	

Example C

The screenshot shows the FieldManager software interface with the following details:

- Contract: 007951.00
- Item: 503.13, REINF STEEL, PLACING
- Prop. Ln: 0490 Unit: KG Catg. Auth. Qty: 0.000 Catg. Auth. Amt: \$0.00
- Type: SUPPLEMENTAL AGREEMENT Unit Price: \$1.500 Catg. Qty. Placed: 1,008.662
- Catg. Pending Chgs: 100,000.000 Catg. Qty. Paid: 0.000
- Item Posting: Project: 007951.00 FRANKFORT, Category: 0001 BRIDGE ITEMS, Quantity: 1008.662 KG, Attention:
- Station From: [] Breakdown: []
- Station To: [] Remarks: Ref. F.Q.C.B. Sheet 4
- Location: DS Abut#1
- Buttons: Materials, OK, Add More, Cancel

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STRUCTURAL STEEL

504-1 GENERAL

a. References:

(1) Standard Specifications

Section 504

Materials Section 713.01 thru 713.06

(2) Special Provisions and Supplemental Specifications

(3) Standard Detail Sheets

(4) Project Plans

(5) Approved Shop Drawings

(6) Construction Safety Rules and Regulations - Department of Labor and Industry. Inspection personnel should receive Fall Protection Training prior to engaging in inspection activities on this item.

The term "Engineer" in the Standard Specifications for this Section is intended to mean the "Resident" unless otherwise stated in this Manual Section.

Working drawings and shop drawings are prepared by the Contractor and submitted to the Resident for approval in accordance with Section 105.7 of the Standard Specifications.

Design drawings and plans for structural steel are usually prepared by the Design Section of the Bridge Program. Welding symbols used are in accordance with the American Welding Society Standard Welding Symbols. The Fabrication Engineer is a resource for interpretation of welding symbols and procedures.

In general, any testing or inspection of welded fabricated steel members will be done in the shop by the Bridge Program, Structural Steel Section, or an authorized testing agency.

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When a Testing Agency is authorized to perform Shop & Mill Inspection by the Bridge Program, the Testing Agency will forward copies of their inspection reports to the Fabrication Engineer.

When the Bridge Program file copy is complete and all the Testing Agency invoices have been checked and paid, it will be indexed and given to the Resident to incorporate into the Project Testing File.

b. Safety on Steel:

The Inspector should always be safety minded. They should be aware of the safety equipment and devices required when working on structural steel. A review of Administrative Policy #410 should be made to insure compliance. Safety Equipment may be obtained thru the Bridge Program office if needed.

504-2 LAYOUT AND CONTROL

The Contractor will do layout of structural steel. The Resident may want to check the layout of the centerline of bearings, working lines and also span distances at this time. Survey crews should be contacted for this check.

504-3 SAMPLING AND TESTING

- a. Steel: (1) Certified Mill Test Reports covering major carrying members.
(2) Certification - Refer to Division 700, Materials & Tests.
- b. Welding: (1) Letter of Compliance for Shop Welders.
(2) Welder's certification must be verified prior to any field welding.
(3) Certified test reports on all electrodes used, both field and shop if not on MDOT approved list.
- c. Bolts: (1) Test Reports; Standard Specifications, Section 713.02

504-4 CONSTRUCTION

a. FIELD ERECTION

Each piece of the structural steel, which has been fabricated in the shop, has been match-marked as shown on the field erection plan of the working drawings furnished by the Contractor. If correctly fabricated and erected, the steel should fit together with very little strain or distortion.

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The Contractor shall, as per 504.41 of the Standard Specifications, inform the Resident of his proposed method of erection for approval, well in advance of the scheduled delivery and/or erection date. This information should be fully detailed, if verbal only, in an Inspectors Daily Report or the bound Project Diary as it is obtained. If the Resident is uncertain about approving a procedure, the Project Manager and or Construction Engineer should be contacted.

In contracts where the erection is expected to be more difficult than usual, the Special Provisions may include a detailed procedure. If this is the case, a careful check should be made that all these requirements are met.

Detailed diary entries should be made of the actual erection procedure as erection progresses.

Items that the Resident must be sure are covered in the Contractor's order of erection:

(1) Proper sequence of erection: If a definite sequence is not shown on the plans, it is then left up to the Contractor. The procedure must be checked to assure that the steel is held securely. Erection should start from a fixed bearing, or adequate measures should be provided at expansion bearings so the steel cannot shift position. The steel should also be erected in such a manner that there is not a long overhang (major portion of a beam unsupported) beyond a pier.

(2) Hoisting Equipment: Hoisting equipment should be discussed with the Contractor to ascertain that lifting capacities are not exceeded. Also, hoisting devices and capacities should be discussed and approved.

(3) Maintenance of Traffic: Particular attention should be given to the erection procedure to assure that traffic is properly maintained. This may require one-way traffic at times, and, if so, flaggers, traffic control devices, and additional signs will be required. This may be required if lifting equipment/personnel has to occupy part of roadway, or to insure traffic is not exposed to overhead work. If the Contractor makes a proposal to close the roadway, the following info should be provided for review: detour route, times the detour will be in use, and signs and flaggers proposes for use. Traffic cannot be routed over town ways without the approval of the municipalities involved. The Construction Engineer or Traffic Engineer may be contacted for review/suggestions for approval.

Steel erected over roadway or pedestrian traffic require a temporary sub floor or netting to protect the public from falling objects. Also, flaggers may be required during steel erection.

Bearing areas also will be required to be laid out by the Contractor at this time, and are required to be marked out 25mm [1 in] larger than base plate dimensions. Elevations should be taken by the Contractor at corners and center of the base plate for "dressing" if required. These areas should be checked if "dressing" is required, to insure a smooth and level surface is provided at the correct elevation. Also, a

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25mm [1 in] width trough should be bushed/ground to provide an outlet for water that may collect in the depression. If elevations determine that the bearing areas are low, then galvanized filler plates will be required. Usually, filler plates are required for areas in excess of 6mm low [$\frac{1}{4}$ in]. Once bearing areas are “dressed”, anchor bolt holes can be located and drilled to depths shown on shop drawings for the bearings. The anchor bolts can then be grouted in place with an approved non-shrink grout. The grout used shall be selected from the MDOT approved list of anchor bolt grouting materials. The Contractor should obtain, from the supplier, fact sheets on the proper procedures for mixing, temperature control and curing of the selected product. The Inspector should review the “cut sheets” to insure required procedures have been used in the placement of the grout. Once anchor bolts have been installed, filler plates, if required, and bearings can be set and steel erection can proceed.

Many times when setting armored joints and expansion dams, the two sections are tacked together with tab bars and threaded rod for temperature adjustment. They should be removed soon after placing the concrete against the second side, so that strains will not be induced in the concrete, resulting in undesirable cracking.

The proper installation of the expansion dams and armored joints is a very important phase of structural steel erection. Normally they are placed at finished grade. Usual practice is to set and embed in concrete the section attached to the end of the bridge deck. Then, the abutment half of the dam can be set to exactly match the deck half and give the best possible “ride”.

Due to fabrication tolerances and inaccuracies in laying out the bearing locations, it is sometimes necessary to make slight adjustments in the position of the bearings, after the erection is complete, to allow the proper clearance between units or at the abutments and to provide the correct opening at expansion devices. If the expansion bearings are of the rocker type, the rockers are adjusted according to the prevailing temperature so as to be vertical at the standard temperature as shown on the plans (Usually 7°C [45°F]). Shop Drawings normally will show or indicate adjustments for temperature. Fixed bearings may be welded to structural steel once erection and tightening is complete. Expansion bearings are not welded up until the dead loads have been applied to the structural steel.

b. CONNECTIONS:

Contact surfaces of metal must be free of rust, loose mill scale, oil, grease and paint.

Prior to bolting a field splice, the splice shall be “drifted” with tapered pins. Enough pins shall be used to insure that all the holes are lined up properly prior to placing the bolts. It is normal that a few bolts may need to be “tapped” into place, but none should need to be “driven”. This would damage the threads and could cause false torque readings. Field connections of structural joints on modern steel bridge structures are now made with high strength carbon steel bolts tightened to a specified tension. The term “high strength bolts and nuts” as used here concerns only those bolts and nuts conforming to the ASTM

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designation A325. These connections are commonly called “A325 bolts, nuts and washers” by project personnel.

Precautions should be taken by the inspector to insure that A325 nuts and bolts are being used at all times by the Contractor. The dimensions of these fasteners can be found under Section 713.02 of the Standard Specifications. Identifying markings can be found as shown in Structural Steel manual. MDOT Quality Assurance and should be contacted so that the bolts can be randomly checked. If required, samples of each size and length should be provided by the Contractor, three weeks prior to use, for testing.

A490 bolts are not allowed as a substitute for A325 bolts even though the A490 bolt has a higher ultimate strength. These bolts have the physical characteristic of being more brittle than the A325.

The usual type of A325 bolts used in bridge construction is the plain bolt without ribs or interference projections. These plain bolts have a diameter that is usually 1.5 mm [$1/16$ in] smaller than the hole in the structural member. A high strength bolt is tightened by tension applied to the bolt and operates by clamping the members or plates together. Forces are transferred by friction between the surfaces so clamped, so the transfer of bearing and shear forces are not theoretically dependent on any shear or bearing between the members and the bolts. It is therefore imperative that the specified minimum bolt tension value is obtained.

Prior to the use or tightening of any bolts and nuts, the Contractor is required to perform a Rotational Capacity test on two randomly selected fastener assemblies from each shipping lot. (Refer to 504.44 and 713.02 of the Standard Specifications)

The specifications allow the Contractor three methods of tightening bolts. (1) The calibrated wrench method, (2) turn-of-nut method and (3) Direct Tension Indicators (DTI's).

(1) Calibrated Wrench Method:

In the Calibrated Wrench Method, Section 504.52(1), the Contractor shall provide a tension measuring device, Skidmore-Wilhelm calibrator or approved equal, which has been calibrated by an approved testing agency not more than 12 months prior to use, for calibrating the Contractor's air or torque wrenches. Three random samples of bolts, washers and nuts are selected daily and tightened in the Skidmore, to obtain an average of the three bolts, for a tension of not less than 5% nor more than 10% in excess of the Required Minimum Bolt Tension specified in the Standard Specifications, Section 504.48, Table 1. Air wrenches, if used, are required to perform the required tension of each bolt in approximately 10 seconds from a “snug-tight” condition.

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(2) Turn of Nut Method:

In the Turn-of-Nut Method, Section 504.52(2), and Table 6, all bolts in a joint must be installed and brought to a “snug tight” condition, representing approximately 10% of the minimum required tension, before final tightening procedures begin.

The air wrench “chuck” or socket should be marked at 90° intervals so the operator can easily determine the required amount of turn.

A check must be made and recorded by a random sample of three nuts and bolts, selected from those being used in the connections. These bolts are to be inserted in a Skidmore tensioning device and brought to a “snug tight” condition. The bolts are then tightened, to obtain an average of the three bolts, for a tension of not less than 5% or more than 10% in excess of the Required Bolt Tension specified in Section 504.48, Table 1, of the Standard Specifications. The nut rotation, as specified in Table 6, shall be observed from the “snug tight” condition to the required turn specified to insure the minimum tension required is obtained. The required turn may result in a tension value higher than as specified, but should not be cause of concern as the snug tight condition plus the required turn is expected to tighten well into the inelastic range of A325 bolts.

(3) Direct Tension Indicators:

In the use of DTI’S (at the option of the Contractor), no calibration of the tightening procedure is required. The Contractor is required however, to prove, by actual demonstration, that the personnel assigned the task of tightening have the skill to produce fastened assemblies meeting the requirements of this specification. The Contractor is also required during the Rotational Capacity Test to perform a DTI verification test, as specified in Section 713.02, using 3 randomly selected fastener assemblies. DTI’s are required to be installed in accordance with manufacturer’s installation instructions, which the Contractor will be required to provide to the Resident/Inspector. DTI’s are required at all times to be installed under the stationary part of the bolt-nut-washer assembly. Gap requirements are specified after “snug-tight” conditions as well as final tightening conditions. Section 504.52(3) and Table 7 specify the required gap at these conditions. The Contractor is required to supply all feeler gauges and labor for performing the required testing of the DTI’S. In addition, a Technical Representative from the DTI Manufacturer shall be present during initial testing and installation of the DTI’s.

c. WELDING

Welding on steel structures, when allowed, shall conform to Specifications for Welded Highway and Railway Bridges of the American Welding Society, as modified by Supplemental Specifications and Special Provisions. Generally, where field welding is provided for in the erection of a structure, it is limited to welding of secondary members (diaphragms, braces, etc.). Any field welding on structural members or steel incorporated in the final work will require the welder to be certified as required in Section 504.55.

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Due to possible undesirable effects set up in the steel where welding is performed, and the tendency to reduce the fatigue strength of the steel, unspecified welding will not be permitted in the tension area of beams or other main stress members. Unspecified welding is welding not called for on the plans or in the specifications or requested by the Contractor for his convenience in performing construction activities. Any welding requested by the Contractor on structural members to facilitate their construction operations requires approval by the Resident, which may require consulting the Project Manager and/or Fabrication Engineer for approval.

The MDOT publishes a semi-annual List of Approved Electrodes. The Contractor is required to select and use electrodes from this list for any welding required on structural steel, or any steel incorporated into permanent work for the project. If the Resident/ Inspector has any uncertainties or questions regarding welding procedures, types, electrodes, etc, the Bridge Fabrication Engineer and Shop Fabrication Inspectors can and should be contacted for assistance.

504-5 INSPECTION

Inspection of the structural steel should start as soon as it arrives at the project site. Items to consider are possible shipping damage, steel markings for erection, etc. Approved Shop Drawings should be in hand when inspection of steel delivery begins, as well as the Contractor's erection plan to insure that the required equipment, workforce and materials are present for erection.

The bearings are the first structural steel unit delivered and erected. Most bearings are included with the structural steel but in some instances is a separate pay item. Bearing areas, bearings, anchor bolt layout and grouting should be checked by the Inspector to insure correct procedures and locations have been used for steel erection. Each steel stringer (girder) should set properly onto the bearings. Examine each one to see that the flanges make full contact with the top of the bearing.

In making up splices, the Inspector and Contractor should check splice areas and plates to insure all foreign matter (oil, paint, dirt, loose rust, etc.) has been removed. The strength of the splice depends on the friction between the plates, so positive contact must be made. The match marks should be closely watched to be sure that each piece is correctly located. When all the steel has been erected, the back wall and end clearances should be checked before anchoring it in its final position.

The Inspector should be sure that the Contractor has used enough "drift pins", tapered pins, to properly align the bolt holes. Improper alignment will cause forcing the bolts into place, which will damage the threads. If the steel does not fit accurately, then the Contractor and Inspector should review shop drawings to insure steel parts have been erected as shown on the erection plan. If fit-up problems still exist, the Contractor should make contact with his Fabrication Shop, and the Resident should contact the Fabrication Engineer or Inspector

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for their input into fit-up problems. Any corrective actions should involve the Project Manager and the Area Construction Engineer or Support Manager.

Bolts used in connections shall be A325 and can be identified by several markings (See the Structural Steel Manual). Bolt lengths normally are shown on the erection plan of the shop drawings or, at times, listed on a separate sheet. A rule of thumb, when installing bolts, is that at least two full threads should show beyond the nut after tightening. A check of the nuts should be made either before using or as installing to insure no signs of "cracks" are present. Cracks may be due to the tightening process, or may have occurred during fabrication of the nuts. If it appears there are numerous nuts with "cracks", the Fabrication Engineer/Inspector should be contacted to determine if the shipment should be rejected.

On exterior girders, the bolts will be installed with the heads on the exterior side of the web splices. On any one connection, the bolts will be installed with all the heads on the same side of the connection. On flange connections, the bolts will be installed with the heads on the bottom side of flanges. The inspector should monitor the Contractor's selected bolting procedure to assure that it is being used in a proper manner.

The Inspector is required to check the torque of 10% of the bolts, but not less than two bolts, selected at random in each connection. Prior to performing the required torque check, at least once each day, the required torque shall be determined for each length and diameter of bolt used that day. Five bolts are required to be installed in the Skid-more tension device and the high and low values rejected, and the three remaining values averaged for a torque to be used for inspection. Section 504.52 can be reviewed for compliance and procedures required when the required torque is not attained.

Turn of the nut inspection will require the Inspector to be present during tightening to insure the required rotation is accomplished.

For joints using DTI's, inspection will consist of verifying that the installation of the fastener assemblies conforms to the installation of the fastener assemblies as tested in the DTI verification test(s), that a 0.4 mm feeler gauge is refused in not less than the number of spaces listed in Section 504.49 table 4, and that a 0.1mm [0.004 in] feeler gauge can be inserted in at least one space of the DTI.

The Contractor shall provide all necessary torque wrenches, calibration equipment, feeler gauges and labor required to perform the required inspection testing.

Field welding required on expansion devices, drains, bearings and structural steel, if required, as shown on plans shall be in accordance to the specifications of the American Welding Society. Also, welders are to be certified as required in Section 504.55. In addition, welding electrodes are to be selected from the MDOT List of Approved Electrodes. Welding gauges are available from the Bridge Program. Assistance in welding procedures, inspection of welds and other welding issues may be obtained from the Bridge Program Fabrication Engineer or Shop Fabrication Inspectors.

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Extreme care should be taken during the installation and inspection of expansion dams and/or armored joints. Since these become a portion of the travelway, an improper grade or slope can create a noticeable “bump” or “dip” in the rideability of the roadway.

The deck portion of each set is usually installed first. A block out area is required on slab ends, as shown in Standard Details, for bridges with expansion devices. After the slab is placed, the expansion device can be set in the block out area and back wall. With the use of a straight edge or string, grade can be established using the slab that is in place. Once the device is set to grade, anchored in place and adjusted for temperature, the tabs or temperature adjustment device holding the two sections together can be removed for placement of concrete.

504-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will record, on a daily basis, the contractor's progress in the erection of structural steel. They will keep notes regarding, but not limited to: the installation of beams, splices, diaphragms, and bearing assemblies. Crew, equipment, weather, and location, i.e., which span, girder, or abutment worked on and lot numbers of materials are noted.

Documentation for payment will be as follows:

Fabrication and Delivery. When the steel is brought on the job, the Resident/Inspector will identify and record which girders, braces, bearing assemblies, and other hardware are delivered, and he/she will inspect for fabricating and shipping defects. Items to consider are:

1. Full bearing of bearing stiffeners.
2. Web buckles in welded girders within tolerances.
3. Welds in proper locations
4. Burrs and roughness removed.
5. No loose or scaly rust in splice area.

Notes will be made in Project diary or directly in the Final quantity book, signed and dated.

The Department will perform, through the services of a private Testing Agency, ship and mill inspection of structural steel fabrication. The Fabrication Engineer will forward a cop of the Inspection Report to the Resident. In addition, the Inspector should become familiar with the many other details of inspection explained in 504.

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Erection. The following tests will be done and documented in the project records at the time steel is erected:

Rotational Capacity Test. Standard Specification, Sections 504.28 and 713.02 require that a “rotational capacity” be done on two sets of nuts, bolts, and washers in every lot delivered to the project. This test determines the compatibility of the components. The results will be noted in the Project diary or directly in the Final Quantity Book.

Bolt Tension Test. Standard Specifications require the contractor to install and test bolt tension in girder splice connections and diaphragm/cross-brace connections using the following method

1. Calibrated Wrench Method.
2. Turn of the Nut Method.
3. DTI Method

Refer to Section 504-4 Construction, part (b) connections for further explanation of bolt tension tests.

Department policy requires that the Inspector verify bolt tension in girder splices and cross-brace and diaphragm connections. Any of the above methods will be used and the results will be recorded in the Project Diary, Construction Book, or in the Final Quantity Book. On a multi-span structure, a splice layout diagram is suggested to keep account, on a daily basis, of which splices have been checked and accepted; notes will be made directly on the diagram. This sheet will become part of the project records. An overview of the structural steel layout, such as the one found in the contract plans may be used.

Final quantity for payment will be entered in the Final Quantity Book. References will be made to field inspections, rotational capacity tests, bolt tension tests and other notes of inspection. **All calculations and data entries must be signed, dated and checked. The checker must sign and date his/her entries.**

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SHEAR CONNECTORS

505-1 GENERAL

References:

- (1) Construction Plans
- (2) Standard Detail
- (3) MDOT Pre-Approved List (If Available)
- (4) Standard Specifications

Section 505

Materials Section 711.06

- (5) Construction Safety Rules and Regulations-Department of Labor and Industry.
Inspection personnel should receive Fall Protection Training prior to engaging in inspection activities on this item.

Shear Connectors are designed to transmit horizontal shear forces from the slab into the steel beam making both the beam and slab act as a unit. Also, they provide anchorage for the slab.

Although seldom done, due to safety reasons, the Contractor has the option of having studs installed at the shop. If the Contractor so elects, than the MDOT Fabrication Engineer should be consulted to insure required testing and documentation is completed. When shear connectors are shop welded, the Contractor must provide adequate walkways and hand railings in accordance with safety regulations.

505-2 LAYOUT AND CONTROL

Shear connector layout is the responsibility of the Contractor as per contract plans. The Inspector/Resident should randomly check this activity insure the layout has been done as per plan.

Shear connector studs should protrude above the bottom layer of reinforcing steel in the concrete deck. The blocking mark-up grades will determine if this will happen. If the studs are too short the Contractor may elect

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to install longer studs if they are installed in the field. If they were installed in the shop, it will be necessary to weld stud extensions on top of the studs.

505-3 SAMPLING AND TESTING

Section 711.06 requires the Contractor, prior to use, to provide to the Resident the name of the manufacturer of the studs proposed to be used. The Resident can check the MDOT approval list for stud approval if it is available. If not, the Contractor is required to provide the manufacturer's in-plant quality control tests for each length of stud to be used. Tests are to have been performed within 6 months of delivery of the studs. Also required prior to use, is the manufacturer's certification that the studs delivered conform to the applicable requirements of AWS D1.1 paragraphs 4.22 and 4.23.

505-4 CONSTRUCTION

Surface conditions of the flanges are a concern for proper installation of the studs. Removal of any rust, scale, or oil and grease on existing steel will normally be required by the Contractor just prior to installing studs. This is normally done by grinding areas where studs are to be installed. Attention to air and metal temperatures should be paid when they approach 0°C [32°F] and also, -18°C [0°F]. Inclement weather can also be a factor in whether studs can be installed. Sections 505.05 and 505.051 should be reviewed if these conditions exist.

Pre-qualification of the operator and their procedures are required prior to beginning production studs. This requires 2 studs to be installed and bent to an angle of 45° from its original axis. If no failure occurs, then the operator and their procedure are approved for that beam or girder. This test is required for each beam or girder. If failures occur in this test, then an additional 2 studs and bending are required. Section 505.05 should be reviewed for qualification of operator, procedures and retesting procedures if required.

505-5 INSPECTION

Once production begins, the Inspector is required to make a visual inspection of the studs for a complete 360° collar of weld. The Contractor will be required to remove the porcelain shields to allow for this inspection. Studs that appear not to have full collar of weld should be bent 45° in a direction away from the area that appears not to have weld. If failure occurs, then the stud will be required to be replaced. An additional test that the Inspector may elect to do is to sharply strike a stud with a nail hammer. If the weld is sound, there will be a ringing sound. If the weld is defective, there will be a dull thud. Bending these studs 45° will usually break the stud off. The Inspector also, when temperature drops below 0°C [32°F], is required to bend to 45° one stud per 100 installed. This would be in addition to any studs bent for insufficient weld. If studs have to be replaced,

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Section 505 Shear Connectors -- 3 Pages

attention should be made as to areas of flanges that are in tension. Section 505.05 should be reviewed for corrective procedures in these areas.

The Contractor may at times want to install additional studs for use in supporting screed rails etc. Although these studs are not for payment, the requirement of the Standard Specifications, Section 505 still apply.

All shear connectors, once installed and accepted, as well as well as the top of flanges, must be kept free of grease, oil, paint, or any substance with which might affect the bond with the concrete. Total count of studs installed per beam should be made and checked against the plan quantity shown on the stud layout plan sheet. The Inspector should include daily notes in the Inspectors Daily Report or in a bound book on qualification/procedures, testing of studs, any corrective procedures and total studs installed.

505-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Filed Documentation:

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes documenting the Contractor's progress on this item; crew, equipment, and location of work, i.e., which span and which girder, will be noted. Field welding will be done by a prequalified welder, as required in Section 504.49 of the Standard Specifications.

Measurement and Payment:

Quantity for payment, lump sum, will be recorded in the Final Quantity Book, signed and dated. Reference will be made to statements of inspection and acceptance in the Project records. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

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RAILINGS

507-1 GENERAL

References:

- (1) Standard Specifications, Section 507.02
- (2) Special Provisions and Supplemental Specifications
- (3) Standard and Special Detail Sheets
- (4) Working Drawings
- (5) Project Plans

Bridge railings are of several types and materials. The railing provided for a structure will conform to the material requirements and details of construction shown on the plans for the type of railing designated in the contract. Working drawings must be submitted before fabrication in accordance with the Standard Specifications, Section 105.7.

507-2 LAYOUT AND CONTROL

Field layout for the anchor bolts is the responsibility of the Contractor, and in accordance with approved working drawings. The inspector should check the bolt layout prior to placing the concrete on which the rail is to set. If proper clearance between anchor bolts and a construction joint is not obtained, the joint can be moved slightly to help correct the situation.

Common errors are as follows: (1) Layout error of 300mm [1 ft] between bolt clusters, (2) Reversing the bolt cluster layout from that shown on the plans; this should be double-checked on final bolts placement.

507-3 SAMPLING AND TESTING

Refer to the project specific "MINIMUM TESTING REQUIREMENTS" for this item; the minimums will specify the number and type of tests required.

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507-4 CONSTRUCTION

a. General

The MDOT uses bridge rail systems that have been crash tested. Do not approve any changes to details without consulting with the Design team member, Project Manager or Construction Engineer.

If anchor bolts are to be cast into the concrete, the re-bar stirrups must not be cut if they are in the way. The stirrup can be slightly bent or the plate can be notched around the bar. The concrete around anchor bolts should be carefully finished to assure a smooth, solid surface on which to support the rail post. If templates are used to hold the bolts when placing the concrete, extra care must be taken to get the concrete up to grade under the entire template.

If excess concrete is inadvertently left, the area should be dressed prior to setting the posts. The posts, unless otherwise called for on the plans, should be set plumb and in true alignment. In many cases, posts are set normal to the grade.

End clearances will be shown on the plans. If the final bridge length varies slightly from the plan length, these variations should be adjusted at the site in accordance with the project conditions, i.e.: if sections are long they may have to be cut, if spacing cannot be adjusted enough to avoid adequate expansion. If sections are short, the shortage can be distributed over the rail sections.

The expansion openings must be kept to the opening shown on the working drawings. Many types of rail allow a rail bar length to be shortened to adjust the final rail length. Care must be taken to assure adjustments for slopes if plan dimensions are horizontal.

The bolts must project above the concrete at least the amount shown on the plans for proper installation of the posts. It is beneficial to protect/cover anchor bolt projections through the templates prior to placing concrete; this step should minimize the need to clean the bolt threads prior to the installation of the rail posts.

b. Aluminum

When setting aluminum rail posts, the aluminum shall not come in direct contact with any other metal or the concrete. Preformed pads are generally called for on the plans or in the Special Provisions. Extra pads are also supplied to adjust post heights.

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c. Steel

Steel bridge railing is erected in a similar manner as aluminum. When required to be painted, the steel shall be cleaned and painted in accordance with Section 506 of the Standard Specifications.

d. Concrete

Forms, concrete, and other details regarding bridge rails shall be in accordance with Section 502 of the Standard Specifications, this Manual, and any related Special Provisions.

507-5 INSPECTION.

The Inspector should see that the concrete areas beneath the bases are smooth and true and the anchor bolts and threads are clean and in working order.

When the rail is assembled, the required openings should be checked to be sure that the minimum openings are obtained. The posts should be plumb and in good alignment; rail bars shall be cleaned, painted, and coated as specified.

Final alignment of railings should be made by sighting the rail to obtain a line that is pleasing to the eye. All anchor bolt nuts and rail bolt nuts must be checked for tightness. Note that the correct nut must be used in the proper location.

507-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT.

Field Documentation.

Project Diary, Inspector's Diary/Daly Report: The Resident or Inspector will keep notes documenting the Contractor's progress on this item. Crew, equipment, and location of work noted, for example,; which span if a multi-span structure, and which side, left or right, will be recorded.

Measurement and Payment

If the item is paid lump sum, notes of inspection and acceptance will be made in the Project Diary or directly in the Final Quantity Book. If the item is paid plan quantity, the Resident will check the accuracy of the computations and will refigure the quantity from the plans if necessary. He/she will also make entries in the project Diary or Final Quantity Book relative to inspection and acceptance. If the item is paid by the unit, field measurements will be entered in the Construction Book or the Final Quantity Book, signed and dated. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Final Quantity Book sample entry with (comments):

507.0831 Steel Bridge Railing 4 Bar	Est. = 61 M
<p>Refer to Bk. 2, pgs. 30, 32, 35, 39 (for inspection/documentation), and Testing File Sections 502 and 507 (for all testing requirements).</p> <p><u>FINAL PAY QUANTITY: 61.5 M</u> (pay to nearest 0.10 M)</p> <p>Entered by: <u>Signature/Date</u></p> <p>Checked by: <u>Signature/Date</u></p> <p>(Note: All comps should have check marks indicating that each individual computation has been checked, including the final pay quantity. Underline/highlight the FINAL PAY QUANTITY line)</p>	<p>Quantities field measured as follows:</p> <p>Sta. 10+015 lt. - Sta. 10+046 lt: 30.62 M Field Meas./Doc by: JA 9/17/02</p> <p>Sta. 10+012 rt. - Sta. 10+043 rt: 30.86 M Field Meas./Doc by: JA 9/18/02</p> <p>Total = 61.48 M Comp by: JA 9/21/02</p> <p>Checked by: <u>Signature/date</u></p>

Inspector's Diary sample entry with (comments):

Monday 9/9/02 Fair, 70s	<p><u>507.0831 STEEL BR. RAIL. - 4 BAR</u></p> <p>INSTALLED BRIDGE RAIL, STA. 10+015 LT. - STA. 10+046 LT. ALL WORK DONE IN REASONABLE COMPLIANCE WITH PROJECT PLANS AND SPECIFICATIONS.</p> <p>(Note: When the bridge rail item is done and completed, it has to be noted in a diary that the work on that specific item has been completed, inspected, and accepted by the Inspector or the Resident. It is good practice to underline/highlight the final acceptance of any item. This will help locate the item during any future review of the project documents. A common way to highlight items is to underline/with red ink, final inspection/acceptance)</p>
<p>M.D.O.T: (list project personnel)</p> <p>(General Contractor Here) (Working Hours) 6:30AM - 5:00PM</p> <p>(List GC men and equipment on site) 1 SUPT, 5 MEN, 1 LG. EX., 1 DOZER, 1 GRADER, 1 F.E. LDR, 2 DUMP TRUCKS, 1 LG. VIB. ROLLER, 1 P-UP TRUCK, MISC HAND TOOLS)</p> <p>(Description of work on project by GC) HAULING/PLACING ASC GRAVEL, STA. 9+050 TO ABUT 1, FULL WIDTH @ WELL COMPACTED LIFTS. (Typically, the bridge rail will be installed by a subcontractor - list subcontractor name w/brief description of crew) (List work done by subcontractor on specific item)</p>	

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Section 508 Membrane Waterproofing -- 3 Pages

MEMBRANE WATERPROOFING

508-1 GENERAL

References:

- (1) Standard Specifications Section 508.02 - Materials
- (2) Special Provisions & Supplemental Specifications
- (3) Standard and Special Detail Sheets
- (4) Project Plans

Membrane waterproofing is intended as a surface sealer for concrete bridge decks when the wearing surface is bituminous concrete. Since bituminous concrete is porous, the underlying concrete must be protected from winter de-icing agents and water. A water tight seal over the entire deck must be obtained if the membrane is to be effective.

Particular attention should be paid to the Special Provisions regarding this item as Supplemental Specifications providing new materials and methods to be used are covered therein.

508-2 LAYOUT AND CONTROL

Covered area will be defined on the plans. Basically it will be the entire surface of the bridge deck.

508-3 SAMPLING AND TESTING

Glass Fabric: Certification- Refer to Division 700, Materials & Tests.

Bituminous Material: These are shipped in drums usually identified by seals listed on the test report that accompanies each shipment.

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508-4 CONSTRUCTION

The surface of the concrete must be smooth, clean, dry and at least 1°C [35°F]. All operations shall start at the low point or points and proceed up grade.

The required process for laying the membrane is adequately explained in the Specifications and must be rigidly followed.

When sealing around drain pipes that have weep holes cut into their side, or around weep holes cast into the deck, the membrane must not cover these holes. They must be cleaned of all bituminous or other material which will restrict moisture from draining through them, since they are designed to remove the moisture which penetrates through the wearing surface and runs along on top of the membrane.

When placing the fabric, extra care must be taken to prevent bubbles from forming. Should this occur, the fabric must be flattened tightly against the surface. Note also that the edges are turned up and tightly cemented.

Note that the Specifications (Section 508.07) require two separate applications of flashing cement; one applied after application of the primer and one before the final mop coat.

Areas adjacent to the sealed surface (curbs, rails, etc.) must be adequately protected against discoloration from the bituminous material. The Contractor must take corrective action to remove such stains if the material is splashed onto these areas.

During the construction a check should be made frequently of the temperature of the heated bituminous material. (Section 508.04 of the Specifications.)

508-5 INSPECTION

The Inspector should check the test reports of the bituminous materials against seal tags that are on each unit to see that they agree. The checked seal numbers should be recorded in the Inspector's Diary (back portion), but the seals need not be saved.

A final inspection of the completed membrane should include checking the proper sealing of all the edges, proper covering of the fabric with the bituminous material, and that all weep or drain holes are free and clear.

Inspectors should also make checks and record the rates of application of bituminous Materials used.

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508-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Field Documentation

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's preparation and installation of membrane waterproofing on bridge decks. Crew, equipment, weather conditions, and temperature will be noted. Manufacturers' names of primer, membrane, and mastic will be recorded and verified with the Department's Prequalified List before approval for use. Acceptance of the item after work is completed will be recorded in the Project Diary or Final Quantity Book.

Measurement and Payment

Final quantity for payment will be lump sum entered in the Final Quantity Book. Reference will be made to notes of inspection and final acceptance. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

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Section 509 Pipe Arches -- 2 Pages

STRUCTURAL PLATE PIPES, PIPE ARCHES, ARCHES, AND METAL BOX CULVERTS

509-1 GENERAL

References:

1. Standard Specifications: Section 105.6 Construction Survey
Section 105.7 Working Drawings
Section 509.02 Materials
Section 206 Structural Excavation
Section 511 Cofferdams
2. Special Provisions and Supplemental Specifications
3. Shop Drawings
4. Project Plans

The purpose of this specification is to assure that structural plate drainage structures are fabricated and installed to quality standards as per the plans and specifications. Inspection begins at the shop drawing stage and carries through to the final installation of the product.

509-2 SHOP DRAWINGS

Timely handling of submittals: assure that the submittal is complete.

Review the submittal from the supplier to assure that:

1. The span and rise or diameter of the structure conforms to the plans.
2. The material conforms to the specification.
3. The geometry conforms to the plan.
4. Forward the submittal to the Fabrication Engineer for formal approval

509-3 STRUCTURE ERECTION

Upon delivery, check for fabrication and shipping damage. Assure that material is properly stored. When possible, check contractor's grade and alignment.

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For Arch units, check footing span. For arch units, assure that the unbalanced channel is filled with asphalt material meeting the specifications after the bolts are tightened.

Structure must be assembled as shown on the shop drawings.

Assure that the proper bolt lengths and type are used. Assure the bolts are tightened to the proper torque by spot-checking with a torque wrench and a visual inspection.

During the back filling, assure that proper compaction is obtained and fill is brought up evenly on both sides of the structure.

509-4 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This subsection describes the recordkeeping required to document and measure the assembly and installation of structural plate pipes and pipes arches.

Field Documentation

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's progress of the installation of the structural plate pipe. Notes will be made regarding, but not limited to: assembly in the dry or in the trench, excavation, bedding, torque checks, stream diversion, cofferdams, and backfilling. Crew, equipment, and weather will also be noted.

To document payment for item, the Resident/Inspector will inspect and note acceptance of bedding and will check the tension in 10% of the bolts using a calibrated torque wrench. Bolts are to be torqued 135 to 400 Nm [100-300 ft-lbs]. The wrench should be available from the Contractor.

Measurement and Payment

Final quantity for payment will be lump sum and be entered in the Final Quantity Book, signed and dated. Reference will be made to notes in the Project Diary that document and acceptance of bedding and the checking of bolt tension. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

There is no separate payment for excavation. Standard Specification, Sections 206.01(a) and 206.04(a), state that payment for excavation is incidental to the price bid for the structure. Quantity of granular borrow for payment will be shown on the plans; reference is made to Section 203.18, second paragraph, of the Standard Specifications.

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Section 510 Special Detour -- 2 Page

SPECIAL DETOUR

510-1 DESCRIPTION

A Special Detour generally consists of a structure and the necessary roadway to carry traffic, both vehicular and pedestrian, while an existing bridge is being replaced or repaired. The Special Detour is designed for each particular project, by a Professional Engineer working for the Contractor, and can vary greatly from job to job. The Contractor normally supplies all of the materials for the temporary bridge.

Occasionally there is a Special Provision in a contract allowing the contractor to use MDOT's MABEY (no this is not misspelled, it is a brand name) bridge.

510-2 INSPECTION

1. Review the requirements of the Standard Specifications, Section 105.4.5 and Section 510.
2. Ensure the design was done and stamped by a Professional Engineer, and reviewed by the Department.
3. Review project permits for special requirements.
4. Ensure that all signs pertaining to the detour are in place before opening to traffic and that all signs are covered or removed when traffic is taken off the detour.
5. Pay particular attention to the erosion control requirements for the detour.
6. When the MDOT's MABEY bridge is used, a representative of MABEY bridge is required to observe the installation and removal of the bridge.

510-3 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This subsection describes the recordkeeping required to document and measure for payment the installation of a detour on the project.

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Section 510 Special Detour -- 2 Page

Field Documentation.

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's progress of in the construction of the detour. The Inspector must be familiar with the contract specifications; Section 510, to assure that the detour has been designed and constructed according to plan. Acceptance, maintenance, satisfactory removal, and clean-up of the site and notes relative to compliance with design and environmental requirements should be made and noted. Crew, equipment, and weather conditions will be recorded.

Measurement and Payment.

Final quantity for payment will be lump sum and be entered in the Final Quantity Book, signed and dated. Reference will be made to notes in the Project Diary that document and acceptance, and disposal recorded in the project records. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

Departmental policy is: if, during removal of the detour, the Contractor uses some of the excavation as permanent fill and if the use of this excavation does not cause a waste of usable excavation elsewhere on the project, the material in question will be measured and paid as common borrow.

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Section 511 Cofferdams -- 4 Pages

COFFERDAMS

511-1 GENERAL

References:

- (1) Standard Specifications
- (2) Special Provisions including Environmental Permits
- (3) Supplemental Specifications and Supplemental Standard Details
- (4) Standard Details
- (5) Best Management Practices for Erosion & Sediment Control
- (6) Project Plans

Cofferdams are used to enable the construction of structural foundations below the water level. Some cofferdams involve underwater concrete seals in which the cofferdam is used as the outside form. When forms are to be constructed for concrete to be placed in the dry, the cofferdam is designed large enough to enable the forms to be built and to provide for necessary pumping from outside of the forms.

511-2 LAYOUT AND CONTROL

All layout is the responsibility of the Contractor. MDOT will provide reference lines or points for the control of the work from which the Contractor may determine boundaries, limits, or other necessary locations in order to establish and construct the required cofferdams. The Inspector should verify that the location of the cofferdams will not cause interference with the work, or in the case of seal cofferdams, the accuracy is within the tolerance allowed for the seal concrete.

511-4 CONSTRUCTION

Cofferdam construction is, to a large extent, governed by the environmental permits included in the contract documents. The permits may refer to the Best Practices Manual, or it may include specific requirements regarding cofferdams. The permit will also specify the in-stream work window. See the Supplemental Specifications for the definition of in-stream work. Certain types of cofferdams, such as sandbags, may be constructed outside of an in-stream work window, whereas other types, such as sheet piles, may not be constructed except during an in-stream work window. Once constructed, work may

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take place behind a cofferdam outside of the work window. The Best Management Practices Manual requires that construction of cofferdams include such factors as the effects of erosion and sedimentation, movement of stream flow around the dam, provisions for sediment basins, pumping from inside the cofferdam, monitoring and maintenance, and provisions for proper removal to minimize pollution. Details are also included in the Standard Details and Supplemental Standard Details. In addition, a Soil Erosion and Water Pollution Control Plan be submitted for the project, which must include any proposed cofferdams and sedimentation basins.

When sizing the cofferdam, the flow that will be expected for the duration of the work shall be taken into consideration. If more elaborate or detailed cofferdams are required, Section 511.02 does require the Contractor, if requested, to submit plans showing material to be used and method of construction. These plans are handled the same as for shop and working drawings (Section 105.7).

Although Standard Specifications, Section 511.03 specifies construction requirements to be followed, most of these requirements are also included in the Best Management Practices Manual. In case of discrepancy, follow first the Contract Permits, and second, the Best Management Practices Manual. If sandbags are to be used, they must conform to the materials required by the Manual, and an impervious membrane must be placed below the sandbags to facilitate removal. The bottom to be built upon should be sound material, not loose boulders, or logs that will let water rush through uncontrolled. For sandbag construction, the width of the dam shall be enough to withstand the pressures due to the depth of water being withheld, and the height shall be sufficient to withhold all expected water from running through the area while concrete is being placed.

Regardless of the method of cofferdam construction, the cofferdam must be constructed such that when it is dewatered, there will not be running water through the work area.

After the cofferdams have been constructed and sealed, the pumping operation usually follows when the concrete footing is to be placed in the dry. There should be room in the cofferdam to allow pumping outside of the footing forms for the concrete. Section 511.04 explains the required process.

All pumping from inside a cofferdam must be into a sediment basin. If pumping around, or providing for flow around a cofferdam, the flow may be required to be discharged into a pool to reduce the downstream velocity, as shown in the Standard Details and Best Management Practices Manual.

The cofferdam must be inspected regularly, and maintained if necessary to clean out the accumulation of sediments, and to repair any areas of leakage or deterioration.

Removal of the cofferdams shall leave the area in a neat appearance and condition. All sediments shall be removed first, and cofferdam removal should proceed starting at the downstream end, or with the downstream cofferdam. Nothing shall be left in the streambed that will impede the flow, cause eddying of currents, or obstructions to marine traffic.

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511-5 INSPECTION.

The Inspector should review the permits and the SEWPCP submitted by the Contractor to determine what the Contractor is required to provide. The initial, periodic, and final inspections will then consist of determining that all the requirements of the permits and plans are being met.

In addition, cofferdams should be checked for adequate construction and elevations, proper type of materials, large enough area remaining in the channel to carry the expected water, and area inside the cofferdam of sufficient size to accommodate forms and proper pumping procedures. The Inspector should ensure that no part of the cofferdam, including shoring or bracing, is within the work area. A cofferdam that is constructed for the placement of "seal concrete" requires additional inspection since it essentially becomes incorporated in the final work. The Inspector therefore needs to check the cofferdam the same as required for inspecting concrete formwork.

The pumping operations should be watched to assure that, during pumping, currents are not set up in the formed area where concrete is being placed. Standard Specifications, Section 511.04 limits the pumping in seal areas. The Inspector also needs to periodically inspect the cofferdams for sediment accumulation and condition, and assure that they are properly cleaned out and maintained.

511-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

This Subsection describes the recordkeeping required to document and measure the installation, maintenance, and removal of cofferdams...

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's progress on this item. Type of cofferdam, whether sheet piling or sand bags, stream diversion if allowed, and dewatering, maintaining, and removing will be noted.

Final quantity for payment will be lump sum and be entered in the Final Quantity Book, signed and dated. Reference will be made to notes in the Project Diary that document and acceptance of the item. Measurement of each cofferdam is by the Lump Sum, regardless of how much or how little work is done. The item will be considered as complete, provided there is work done which adequately accomplishes the purpose of a cofferdam and thereby allows construction of the intended work. Note that all work pertinent to the cofferdam item including the sediment basin and clean-up, and all pumping required, is included in the cofferdam item. Upon completion, the Inspector should include the quantity for payment along with a statement that either the work or removal has been satisfactorily completed and accepted. This should include all removal and clean-up of sediment basins, pumps, etc. The item is not accepted until the cofferdam has been disposed in a manner satisfactory to the Resident. Payment is made regardless of the extent of work required to build the cofferdam. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

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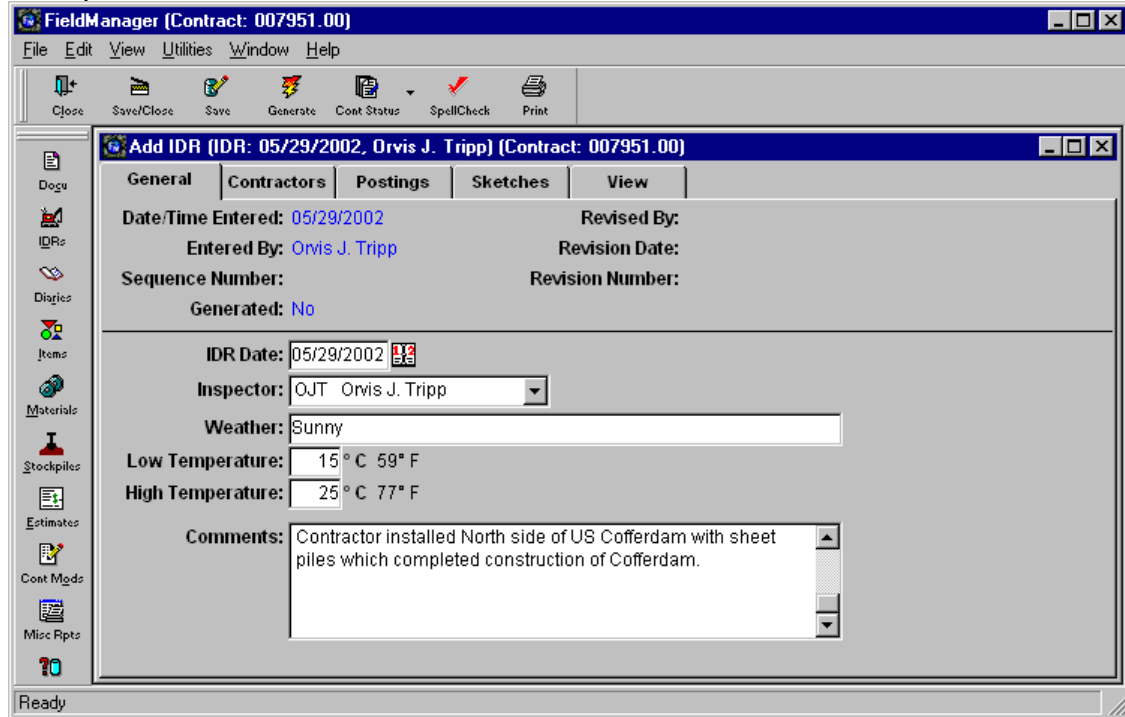
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Example A



FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Cont Status SpellCheck Print

Add IDR (IDR: 05/29/2002, Orvis J. Tripp) (Contract: 007951.00)

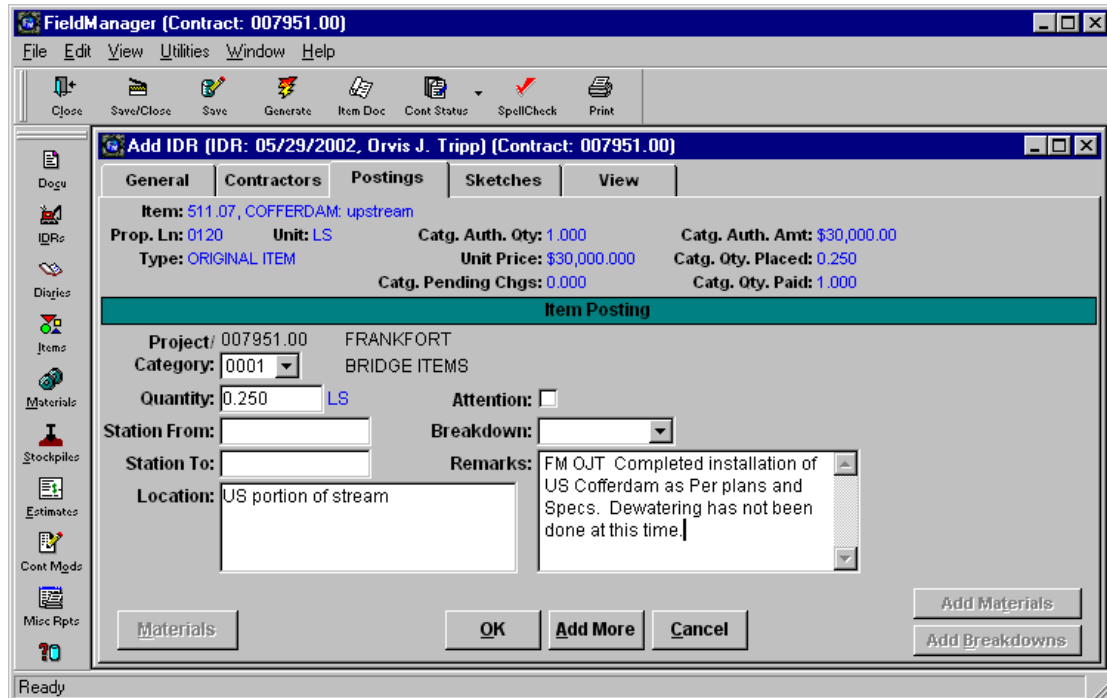
General Contractors Postings Sketches View

Date/Time Entered: 05/29/2002 Revised By:
Entered By: Orvis J. Tripp Revision Date:
Sequence Number: Revision Number:
Generated: No

IDR Date: 05/29/2002
Inspector: OJT Orvis J. Tripp
Weather: Sunny
Low Temperature: 15° C 59° F
High Temperature: 25° C 77° F
Comments: Contractor installed North side of US Cofferdam with sheet piles which completed construction of Cofferdam.

Ready

Example B



FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Item Doc Cont Status SpellCheck Print

Add IDR (IDR: 05/29/2002, Orvis J. Tripp) (Contract: 007951.00)

General Contractors Postings Sketches View

Item: 511.07, COFFERDAM, upstream
Prop. Ln: 0120 Unit: LS Catg. Auth. Qty: 1.000 Catg. Auth. Amt: \$30,000.00
Type: ORIGINAL ITEM Unit Price: \$30,000.00 Catg. Qty. Placed: 0.250
Catg. Pending Chgs: 0.000 Catg. Qty. Paid: 1.000

Item Posting

Project: 007951.00 FRANKFORT
Category: 0001 BRIDGE ITEMS
Quantity: 0.250 LS Attention:
Station From: Breakdown:
Station To: Remarks: FM OJT Completed installation of US Cofferdam as Per plans and Specs. Dewatering has not been done at this time.
Location: US portion of stream

Materials OK Add More Cancel Add Materials Add Breakdowns

Ready

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Section 512 French Drains -- 3 Pages

FRENCH DRAINS

512-1 GENERAL

References:

- (1) Standard Specifications Section 512.02 - Materials
- (2) Special Provisions & Supplemental Specifications
- (3) Standard & Special Detail Sheets
- (4) Project Plans

A French Drain is a free draining filter consisting of a graded gravel cover over a layer of graded stone placed against retaining walls, abutments, etc., to allow water to flow through holes placed in the walls to equalize water pressure.

512-2 LAYOUT AND CONTROL

Layout shall be as called for on the plans. The drain pipes through the walls should be at an elevation just above the normal low water elevation or as low as practical. The stone for French Drains should start at the invert of these pipes and extend for a height of 600 mm [2 ft].

512-3 SAMPLING AND TESTING

Gradation: One (1) for each project - Aggregate Subbase (Gravel) portion
One (1) for each project - Stone - Resident's Option

512-4 CONSTRUCTION

French Drains are usually placed at the same time as the rest of the backfill for the structure. Normal earth backfill, as called for on the plans, shall be placed 600 mm [2 ft] below the invert of the drainpipes in the walls.

The French Drain stone starts at this elevation and shall form a box section, 600 mm [2 ft] wide and 600 mm [2 ft] high for the entire length of the structure.

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The gravel shall be placed to form a box section around the stones, to the limits of 600 mm [2 ft] above the stones, 600 mm [2 ft] behind the stones and 600 mm [2 ft] below the stones, but not to be placed below the top of the footing.

Gravel for the French Drains shall be compacted in the same general manner and to the same extent as the adjacent embankment.

512-5 INSPECTION

The plans must be checked for the areas where French Drains are to be built. The Inspector, for the purpose of documentation, will make notes in the Inspectors Daily Report (See Following Examples) or bound diary to indicate that the material was placed to the limits shown on the plans. Several entries may be necessary if the placement of this item continues over a period of time.

512-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

This subsection describes the recordkeeping required to document French Drain for payment.

Project Diary, Inspector's Diary/Daily Report; The Resident or Inspector will record the Contractor's progress of work. He/she will assure that material is placed to the dimensions and elevations shown on the bridge detail plans. A statement of inspection and acceptance for final payment will be entered in the project records.

Final Quantity Book: Final quantity for payment, lump sum, will be entered in the Final Quantity Book, signed and dated. Reference will be made to notes of acceptance; these notes will be made in the Project Diary or directly in the Final Quantity Book. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Examples

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Cont Status SpellCheck Print

Add IDR (IDR: 04/19/2002, Orvis J. Tripp) (Contract: 007951.00)

General Contractors Postings Sketches View

Date/Time Entered: 04/19/2002 Revised By:
Entered By: Orvis J. Tripp Revision Date:
Sequence Number: Revision Number:
Generated: No

IDR Date: 04/19/2002
Inspector: OJT Orvis J. Tripp
Weather: Sunny
Low Temperature: 13 °C 55° F
High Temperature: 23 °C 73° F

Comments: Contractor constructed French Drains Abut 1, entire width of structure. Visually inspected Stone and Granular Borrow from Smith Pit placed within close conformity as per plans and specs. See Posting this date for payment.

Ready

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Item Doc Cont Status SpellCheck Print

Change IDR (IDR: 4/17/2002, Orvis J. Tripp, 1) (Contract: 007951.00)

General Contractors Postings Sketches View

Item: 512.081, FRENCH DRAINS
Prop. Ln: 0130 Unit: LS Catg. Auth. Qty: 1.000 Catg. Auth. Amt: \$2,500.00
Type: ORIGINAL ITEM Unit Price: \$2,500.000 Catg. Qty. Placed: 1.500
Catg. Pending Chgs: 0.000 Catg. Qty. Paid: 1.000

Item Posting

Project/ 007951.00 FRANKFORT
Category: 0001 BRIDGE ITEMS
Quantity: 0.500 LS Attention:
Station From: Breakdown:
Station To: Remarks: FM OJT
Location: Abut #1

Materials OK Add More Cancel Add Materials Add Breakdowns

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Section 513 Slope Protection -- 3 Pages

SLOPE PROTECTION

513-1 GENERAL

References:

- (1) Standard Specifications Section 513.02 - Materials
- (2) Special Provisions and Supplemental Specifications
- (3) Standard and Special Detail Sheets
- (4) Project Plans

Slope protection as described in this section is a stabilized blanket placed on the exposed slope in front of an abutment. It is constructed of either portland cement concrete or crushed stone, whichever is shown on the plans.

Occasionally a special type of slope protection is called for. In such cases, details will be in the Special Provisions and/or on the Project Plans.

513-2 LAYOUT AND CONTROL

Protected slope areas will be shown on the project plans, with all required construction details. Construction layout is the responsibility of the Contractor. Refer to the Standard Specifications, Section 105.6 for clarification of layout responsibilities.

513-3 SAMPLING AND TESTING

Refer to the project specific "MINIMUM TESTING REQUIREMENTS" for this item; the minimums will specify the number and type of tests required. Look for: concrete cylinder/% air/sublot (QC/QA) and material gradation requirements. For concrete, refer to section 502 of the Standard Specifications or Special Provisions.

513-4 CONSTRUCTION

Portland Cement Concrete: Standard Specifications, Section 513.03 covers the subject of concrete slope paving. Vibratory plate compactors should be used to fully compact the area. It must be placed on frost-free and well-compacted material, which has been dampened just prior to placing the concrete. The Plans and Special Provisions should be checked to determine the class of concrete required.

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To assure that the welded wire reinforcement is positioned in its proper location within the concrete slab section, the following placement procedure is recommended: (1) place/consolidate concrete slab depth below the wire mesh. (2) place wire mesh on top of the lower layer. (3) place/consolidate the remaining depth of concrete to plan design thickness/top of forms. When placing slabs on grade, it is good practice to have a supply of an evaporation retarder (CONFILM) on hand; its use is to prevent evaporation of water from the concrete mix, and not for concrete finishing purposes. The Contractor will ultimately determine the procedure to construct the slope protection; use these recommendations as reference only.

The curing method must provide continuous curing for the 5 days required in the Specifications.

513-5 INSPECTION, MEASUREMENT AND DOCUMENTATION

a. Portland Cement Concrete- The following is a guideline for inspection and documentation:

Location/Description	Forms insp/accept. by/date	Wire mesh insp/acc. by/date	Concrete placement date	Comments
Abut. 1 - 1 st course	JA 6/10/02	JA 6/10/02	6/11/02	Curing - 2 layers of wet burlap. Placement in compliance w/plans and specs.

Notes/Recommendations:

1. Keep all documentation (Inspection and Acceptance) in one place, either the Inspector's Daily Reports (Field Manager software) or a bound field book, preferably the Miscellaneous Construction Book. Keep cross-referencing of books to a minimum.
2. Check form dimensions with a measuring tape and string; refer to project plans.
3. Take all necessary tests - refer to Minimum Testing Requirements.
4. Document day-to-day curing, with curing completion date.

b. Crushed Stone Slope Protection: The following is a guideline/example for inspection and documentation:

Abutment No. 1 Granular base insp./accept. by: JA 7/15/02

Abutment No. 1 Crushed stone depths checked at numerous locations on slope, and found to be in compliance with plan dimensions. Insp/accept. by: JA 7/18/02 Item now 50% complete.

Notes/Recommendations:

1. Keep all documentation (Inspection and Acceptance) in one place, either the Inspector's Daily Reports or a bound field book, preferably the Miscellaneous Construction Book. Keep cross-

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referencing of books to a minimum. Note day to day work in Inspector's Diary, i.e. - "Installing granular borrow @ Abut. #1 in well compacted lifts for slope protection base," or "Installing Abut 1 slope protection - depth checks @ most locations good - directed contractor to increase stone depths at 3 locations to meet depth requirement."

2. Note location, inspection and acceptance of slope protection base before placement of crushed stone.
3. Assure that all necessary tests are done - refer to Minimum Testing Requirements.
4. Look for a smooth and uniform completed stone surface.

513-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's progress on this item. Preparation for placing concrete or crushed stone as called for on the plans, i.e. setting grades, excavating as necessary, compacting the slope, as well as crew, equipment and weather will be recorded.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book and referenced to field measurement or plan dimensions. Field measurements and calculations will be entered in the Construction Book, signed and dated, **All calculations and data entries must signed, dated and checked; the checker must sign and date his/her work.**

Sample Final Quantity Book entry (with comments):

513.09 Slope Protection - Portland Cement Concrete		Est. = 415 M2
Refer to Bk. 3, pgs. 24 - 30 (for inspection/documentation), and Testing File Section 513 (for all testing requirements).	Field measured quantity as follows:	
	Abut. #1 - $18.33\text{M} \times 12.20\text{M} = 223.63 \text{ M}^2$	
	Field meas. /comp. by: JA 10/3/02	
<u>FINAL PAY QUANTITY: 400.10 M2</u> (pay to nearest 0.10 M2)	Abut. #2 - $15.24\text{M} \times 11.58\text{M} = 176.48 \text{ M}^2$	
Entered by: <u>Signature/Date</u>	Field meas. /comp. by: JA 10/15/02	
Checked by: <u>Signature/Date</u>	Total = 400.11 M2	
	Comp. by: JA 12/19/02	
	Comps checked by: <u>Signature/Date</u>	
(Note: All comps should have check marks indicating that each individual computation has been checked, including the final pay quantity)		

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Section 514 Curing Box -- 2 Pages

CURING BOX FOR CONCRETE CYLINDERS

514-1 GENERAL

Reference Standard Specifications.

514-2 CONSTRUCTION

Reference Standard Specifications.

514-3 INSPECTION

The Inspector shall check the water level and temperature in the curing box. The curing box shall be checked for level and placed in an area where it will not be disturbed.

Quantities will be documented for payment by general notes in Inspectors Daily Report (Field Manager software) (See Examples) or the bound Inspector's Diary. The Inspector will state:

- a. When the box is installed and operating properly.
- b. When the concrete is about 1/3 completed.
- c. When the concrete is about 2/3 completed.
- d. When the concrete is completed and the box is no longer necessary.

514-4 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

Project Diary, Inspector's diary/Diary Report: The Resident or Inspector will note in the Project Diary or directly into the Final Quantity Book, inspection and acceptance of the curing box. He/She will also periodically inspect the curing box to assure the Contractor is adequately maintaining it. Subsection 514.03 of the Standard Specification describes, in detail, the requirement for an acceptable and properly maintained curing box.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book, signed, dated, and referenced to notes of inspection and acceptance in the project records. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

Twenty-five percent (25%) is paid when box is installed and operating properly. Fifty per cent (50%) of the bid price is paid when concrete is 1/3 completed. Seventy-five percent (75%) of the bid price is paid when the concrete is 2/3 completed. One-hundred percent (100%) of the bid price is paid when the concrete is completed and box is no longer necessary.

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Section 514 Curing Box -- 2 Pages

Example A

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File Edit View Utilities Window Help

Close Save/Close Save Generate Cont Status SpellCheck Print

Change IDR (IDR: 4/19/2002, Orvis J. Tripp, 1) (Contract: 007951.00)

General Contractors Postings Sketches View

Date/Time Entered: 04/19/2002 Revised By: Wendell W Harriman
Entered By: Orvis J. Tripp Revision Date: 05/15/2002
Sequence Number: 1 Revision Number: 1
Generated: No

IDR Date: 04/19/2002
Inspector: OJT Orvis J. Tripp
Weather: Sunny
Low Temperature: 13° C 55° F
High Temperature: 23° C 73° F

Comments: Contractor installed, leveled and add water to Curing Box this day. Heater energized and proper temperature maintained as per plans and specs. See posting for payment.

Ready

Example B

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Item Doc Cont Status SpellCheck Print

Change IDR (IDR: 4/19/2002, Orvis J. Tripp, 1) (Contract: 007951.00)

General Contractors Postings Sketches View

Item: 514.06, CURING BOX FOR CONC CYL
Prop. Ln: 0140 Unit: EA Catg. Auth. Qty: 1.000 Catg. Auth. Amt: \$900.00
Type: ORIGINAL ITEM Unit Price: \$900.000 Catg. Qty. Placed: 0.250
Catg. Pending Chgs: 0.000 Catg. Qty. Paid: 0.000

Item Posting

Project: 007951.00 FRANKFORT
Category: 0001 BRIDGE ITEMS
Quantity: 0.250 EA Attention:
Station From: Station To: Breakdown:
Location: Outside Contractors Field Office Remarks: Installed and working properly as per specs.

Materials OK Add More Cancel

Ready

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Section 515 Protective Coating -- 3 Pages

PROTECTIVE COATING FOR CONCRETE SURFACES

515-1 GENERAL

References:

- (1) Standard Specifications Section 515.02 - Materials
- (2) Special Provisions & Supplemental Specifications
- (3) Standard & Special Detail Sheets
- (4) Project Plans

This work shall consist of furnishing and applying a protective coating on concrete surfaces as called for on the plans, or as designated by the Resident in accordance with the Specifications.

Protective coating for concrete surfaces is utilized to reduce the intrusion of chlorides from de-icing salts in concrete. This reduces the potential for corrosion of the reinforcing steel. Corrosion of the reinforcing steel is a major factor in the degradation of concrete quality over time.

515-2 LAYOUT AND CONTROL

Location for applying protective coating for concrete surfaces shall be noted on the Plans.

515-3 SAMPLING AND TESTING

Certification- Refer to Standard Specifications, Section 700, and Section 711.05.

515-4 CONSTRUCTION

a. Surface Preparation

On surfaces to be treated, all voids shall be filled with mortar, and the entire surface shall be dressed by rubbing to remove form marks and blemishes to present a neat appearance. The concrete shall remain dry for at least 48 hours before treatment and shall be free of laitance, oil, grease, dirt and rust. All traces of dust shall be removed immediately before applying the linseed oil mixture.

The treatment shall not be done until at least 14 days after casting the concrete and completed at least 24 hours before the treated portion is opened to traffic.

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b. Application

Enough material shall be used to coat the surfaces thoroughly. Two coatings shall be applied 24 hours or more apart. The minimum rates of application shall be 0.10 L/m² [0.025 gal/yd²] for the first coat and 0.07 L/m² [0.015 gal/yd²] for the second coat.

The method of application may be dependent on available equipment and the area involved. Hand spray methods or pressure distributors may be used, and application by rollers or brushes may be desirable under some conditions. Care shall be taken to prevent discoloration of areas and parts not requiring treatment. Twenty-four hours after application, excess coating materials, if any, must be removed.

When practical, treatment of the concrete surfaces shall be completed before exposure to deicing salts. The temperature of the concrete shall be above 4°C [40°F].

515-5 INSPECTION

The Quality Assurance function is to verify that the coating materials used meet the Specification and are placed on properly prepared surfaces in conformity with Plans and Specifications.

1. Determine concrete to be coated has cured for the appropriate time.
2. Determine concrete to be coated is clean and dry.
3. Determine that the Contractor's method of assuring proper application rate is appropriate and followed.
4. Determine that the proper wait time is observed between coats.

515-5 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will record the Contractor's work activities on this item. They will note application rate of each coat and final acceptance. Crew, equipment, and weather conditions will be documented also.

Final Quantity Book: Final quantity for payment will be by the square meter or lump sum. Total units will be computed from field measurements or from dimensions scaled from the plans. Measurements, dimension, and calculations will be entered in the Construction Book and total transferred to the Final Quantity Book. Lump sum will be entered directly in the Final Quantity Book,

Final quantity for payment will be signed and dated. References will be made to measurements, calculation, and notes of final acceptance. **All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work.**

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Section 515 Protective Coating -- 3 Pages

Example A

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Cont Status SpellCheck Print

Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: 007951.00)

General Contractors Postings Sketches View

Date/Time Entered: 05/20/2002 Revised By:
Entered By: Orvis J. Tripp Revision Date:
Sequence Number: Revision Number:
Generated: No

IDR Date: 05/20/2002
Inspector: OJT Orvis J. Tripp
Weather: Sunny
Low Temperature: 2 °C 36° F
High Temperature: 20 °C 68° F

Comments: Contractor applied second coating of Protective Coating to all surfaces of bridge as per plans. First coating applied 3 days previous and 20 days following casting to clean dry surfaces. Application rate as per specs. See posting this day for

Rows 1 to 6 of 6

Example B

FieldManager (Contract: 007951.00)

File Edit View Utilities Window Help

Close Save/Close Save Generate Item Doc Cont Status SpellCheck Print

Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: 007951.00)

General Contractors Postings Sketches View

Item: 515.20, PROT COAT FOR CONC SURFACES
Prop. Ln: 0150 Unit: M2 Catg. Auth. Qty: 32.000 Catg. Auth. Amt: \$208.00
Type: ORIGINAL ITEM Unit Price: \$6.500 Catg. Qty. Placed: 57.517
Catg. Pending Chgs: 0.000 Catg. Qty. Paid: 28.217

Item Posting

Project: 007951.00 FRANKFORT
Category: 0001 BRIDGE ITEMS
Quantity: 29.300 M2 Attention:
Station From: Breakdown:
Station To: Remarks: FM Fascia DS=0.75x12.0=9.0m^2
US=0.75x12.4=9.3m^2
Abut 1&2 US&DS Wings
4x(2.5 x 1.1) = 11.0m^2
Total = 29.3 m^2
Location: US & DS Fascia and Wings

Materials OK Add More Cancel Add Materials Add Breakdowns

Ready

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Section 517 Shotcrete -- 6 Pages

SHOTCRETE

517-1 GENERAL

a. References

- (1) Construction Plans
- (2) Construction Manual Section 502 - Structural Concrete
- (3) Standard Specifications Section 502 - Structural Concrete
Materials Section 701 - Structural Concrete Related Materials
- (4) Special Provisions Section 517 - Shotcrete
- (5) "Guide to Shotcrete" - ACI 506R-90

b. Terms

Following is an explanation of some of the terms unique to shotcrete used in this Section (many other terms are described in the "Guide to Shotcrete" - ACI 506R-90):

Depth gages: Small metal or plastic markers attached to or installed perpendicularly in the substrate or backup material at convenient intervals and heights, and positioned just below the finish coat of shotcrete.

Depth Probes: Small bars, usually 12 to 14 gage steel, marked with the specified shotcrete thickness, inserted into the shotcrete where desired to indicate thickness.

Dry-mix shotcrete: Shotcrete in which most of the mixing water is added at the nozzle.

Flash finish: A thin shotcrete coat applied from a distance greater than normal for use as a final coat or for finishing; also called Flashing.

Ground wire: Small gage, high strength steel wire used to establish line and grade for shotcrete work; also called alignment wire, screed wire, or shooting wire.

Nozzleman: Worker on shotcrete crew who manipulates the nozzle, controls consistency with the dry process, and controls final disposition of the material.

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Overspray: Shotcrete material deposited away from intended receiving surface.

Rebound: Shotcrete material leaner than the original mixture, which ricochets off the receiving surface and falls to the ground.

Shotcrete: Portland cement mortar or concrete mix pneumatically projected under pressure at a high velocity onto a surface.

Test panels: A piece of heavy plywood or steel plate, simulating actual job and reinforcing conditions, usually 200 cm² [30 in²], which is filled with shotcrete for compressive strength testing.

Wet-mix shotcrete: Shotcrete in which all of the ingredients, including water, are mixed before introduction into the delivery hose. Compressed air is introduced to the material flow at the nozzle. If accelerator is used, it is normally added at the nozzle.

517-2 LAYOUT AND CONTROL

The Contractor will be responsible for establishing the limits of the work and ensuring the thickness, in accordance with the Plans and approved changes.

517-3 TESTING REQUIREMENTS

a. General Refer to the Minimum Testing Requirements to determine the tests and/or certifications required. Refer to the Standard Specifications or the Special Provisions, Section 700 for requirements of materials certifications.

b. Mix Design The Special Provisions will determine basic design requirements of the concrete mix that will be required for the project, and should be contained in Special Provision section 502, Non QC/QA. The Special Provisions for Shotcrete will contain any modifications required to the basic design requirements, including the aggregate gradation requirements.

c. Materials The requirements for all materials and admixtures to be used in the concrete mix will be contained in the Special Provisions. The Contractor should also submit the material sources he intends to use for approval by the Department prior to use. The sequence of construction should also be submitted for approval. Aggregate submittals should include description of stockpiles, original source, bulk specific gravity, absorption, colorimetric, gradations including any blended gradations, and Fineness Modulus, as applicable.

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d. Qualifications The qualifications of the Foreman and Nozzleman are required to be submitted a minimum of 21 days prior to starting the work. The minimum qualifications are: Foreman - 5 years of experience in shotcreting of which 2 years are as a nozzleman; Nozzleman - 2 years experience as a nozzleman. Evidence of performing similar work elsewhere is required for documentation of experience.

e. Tests If test panels are required, they should be made in either the horizontal, vertical, or overhead positions, but should generally conform to the anticipated shooting position.

517-4 CONSTRUCTION

a. Sequence Determine that the construction sequence is in accordance with the approved submittal.

b. Equipment The Contractor must provide equipment of the size and type specified. The equipment should be in good condition, capable of providing continuous operation during the shotcreting operation. Particular attention should be given to condition and cleaning of hoses and nozzles, as well as other shotcrete delivery apparatus, to ensure the quality of the mix placed. Pumps and pressure systems must also be well maintained to ensure quality of the shotcrete.

c. Surface Preparation A clean and sound surface is required on which to place shotcrete. Therefore, sandblasting of all areas should be done prior to shotcreting. Any areas that are too deteriorated to be sandblasted should have all loose and unsound material removed without damaging the substrate. Where a satisfactory surface is non-existent, or where removal of loose and unsound material results in extreme voids, a preliminary placement of either concrete, or application of shotcrete may be necessary to provide an acceptable surface.

d. Anchors and Reinforcement Depending on the surface, it will be necessary to install dowels or welded studs. Dowels or anchors are necessary for attaching the reinforcing bars, and alignment and depth control. The dowels or welded studs will be specified on the plans or in the Special Provisions.

e. Alignment Control Control of the thickness should be accomplished by using ground wires, guide strips, or depth gages, or a combination of these. The number and spacing should be sufficient to establish and maintain the required thickness or grades during shotcreting. Abrupt changes in thickness and feathered edges should be avoided. A spacing of 600 mm [2 ft] to 900 mm [3 ft] apart, or less, is recommended.

f. Delivery and Application The delivery and application of the mix to the surface is the most critical part of a shotcreting operation, and must be done properly to ensure the quality of the work. The rebound must be kept out of the mix being placed, and removed from the work area and disposed. Proper application will minimize both rebound and overspray, and both must be removed before hardening. Some of the

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factors that affect proper application are distance of the nozzle from the surface, orientation to the surface, adjustment of the water content at the nozzle, and thickness of the layer being placed. Sagging and sloughing of freshly applied shotcrete are indications of problems with the equipment delivering the mix, or with the application of the mix. If the shotcrete is deposited in multiple layers, previous layers should be allowed to harden slightly and should be damp, before proceeding with a new layer.

g. Defective Shotcrete Where problems have developed with either the delivery or application procedures, which have caused the shotcrete to either sag or slough, or there is segregation, voids or laminations, the shotcreting should be immediately suspended and the defective shotcrete removed. Where there are voids behind reinforcing bars, or when workmanship has resulted in lack of bonding, the shotcrete must be removed and the defective work corrected.

h. Finish A natural finish is a gunned finish with the shotcrete brought to approximate line and grade, which is the best for dry-mix shotcrete. A smoother finish may be obtained by placing a fraction beyond grade, allowing to stiffen, then screeded and trimmed to grade. Ground wires and other guide strips are removed, and impressions are floated. The surface may be broomed to obtain a natural finish.

A flash finish is where a finer finish is desired, and consists of a thin surface coat up to 6 mm [$\frac{1}{4}$ in] using fine No. 1 gradation sand (portion passing a No. 4 sieve).

The finish coats may be finished with a wood float, rubber float, brush finish, or steel trowel.

i. Weather Limitations Shotcrete applications should generally follow the same weather and temperature requirements as Structural Concrete -- Standard Specifications, Section 502. Cold weather protection is required until a minimum strength of at least 5.2 Mpa [750 psi] is attained. Shotcrete must not be placed on frozen surfaces.

j. Curing The finished shotcrete should be covered with burlap or absorptive mats and kept wet for 7 days, similar to structural concrete slabs. A curing compound may be used after 48 hours. Rapid drying should be prevented. Flushing with water may be allowed after a minimum of 48 hours has elapsed after finishing.

k. Safety Requirements All appropriate safety precautions for working around fresh concrete should be taken, including eye, dust, and skin protection; adequate ventilation, and protective clothing. All applicable safety laws and regulations should be followed.

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517-5 INSPECTION

Depending on the requirements of the Special Provisions, the following provides a checkpoint list of checking and spot-checking as a guide for the Inspector to follow:

- a. Prior to starting work, spot check the Contractors materials, storage and handling procedures to ensure the correct materials are being used according to the approved submittals, and materials are being stored and processed properly.
- b. Check to see that all submittal requirements are satisfied and changes approved before allowing work to begin.
- c. When all surface preparation is complete, check to see that all loose and deleterious material has been removed, and that all other preparation requirements, such as sandblasting or filling of voids, has been completed.
- d. After reinforcement installation, check all details for correct amount and that it has been properly installed and secured in place. Also check all alignment and minimum thickness control.
- e. Inspect the area surrounding the shotcrete placement to ensure that other requirements will be complied with, such as: protection of adjacent water or streams from pollution, stream diversions, pumps and sediment basins as necessary, delivery of materials, traffic control, and provisions for lighting and ventilation if necessary. Review any Special Provisions for these requirements. If checking the Ph is required for flushing, such as in metal culverts, it will be necessary to obtain the initial Ph prior to starting the work for comparison after flushing.
- f. Just before shotcreting begins, check that all proper equipment and materials are in-place or will be available when required, and that the crew and personnel are in conformance with the submitted requirements. Make all necessary preparations for any testing required. Review with the Contractor all final details for finishing and curing, and the corrective measures to be taken should defective materials or shotcrete develop. Review temperature and weather limitations, and ensure that proper protection measures will be taken. Check that proper safety requirements are in place.
- g. After the shotcreting has begun, watch for equipment problems, proper delivery of material to the nozzleman, and correct application procedures. Indicators of equipment or delivery problems or incorrect procedures are frequent starting and stopping, excessive rebound or rebound which becomes incorporated into the mix, sagging or sloughing of the shotcrete, excessive build-up on the ground wires or reinforcing steel, ridges and/or depressions at the reinforcing steel, and inability to meet the required grade.

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- h. During the shotcreting, check to see that rebound is being removed, and that minimum depths are maintained using depth probes if necessary. Ensure that test panels, if required, have been made, or that other testing is completed as required by the Minimum Testing Requirements. Check for proper surface finishing and application of curing protection.
- j. After the shotcrete has sufficiently set, any questionable areas may be sounded with a hammer to determine acceptability.

517-6 MEASUREMENT AND DOCUMENTATION

- a. Check to determine if unit or Lump Sum measurements apply.
- b. For unit measurements, measure the areas to which shotcrete has been applied, or document the limits according to the Plans or approved changes. Measure the depths for computation of quantities or to document minimum thickness.
- c. For Lump Sum measurements, document that the shotcrete has been placed to the limits as shown on the plans or approved changes. Also, check depths to document minimum thickness.
- d. Measurements will be entered into a bound field book or directly into the Final Quantity Book. Quantities that are entered into a bound field book will be computed and totals transferred to the Inspector's Daily Report, or entered into the Final Quantity Book. **All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work.**

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REHABILITATION OF STRUCTURAL CONCRETE

518-1 GENERAL

References:

(1) Standard Specifications

Section 508

Section 518

(2) Contract Drawings

(3) Special Provisions

Section 502

Section 508

Section 518

(4) General Conditions, Supplemental Specifications, and Supplemental Standard Details

Section 502

Section 508

518-2 TESTING REQUIREMENTS

References:

(1) Supplemental Specifications And Supplemental Standard Details Section 502

(2) MDOT Project Development Minimum Testing Requirements

(3) Manufacturer's Recommendations

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518-3 CONSTRUCTION

The rehabilitation of structural concrete bridge decks consists of the removal of any existing deteriorated concrete from the areas designated on the plans, such as slab, curbs or sidewalks, and the replacement of that concrete to rehabilitate and strengthen the structure.

a. Removal of Existing Deteriorated Concrete

1. Membrane removal should be sufficient to sound the deck if the existing membrane is compatible with the new waterproofing membrane. Membrane should be completely removed if the membranes are not compatible.
2. After removal of the membrane, sound the concrete with a chain drag or hammer. Delaminated concrete sounds hollow. Visually examine the concrete. Delineate the area of concrete to be removed by marking with paint.
3. Check that concrete is being removed by either a:
 - a. Scarifying machine which has been approved by the Resident
 - b. Chipping hammer - maximum 16 kg [35 lb]
 - c. Pavement breaker - maximum 16 kg [35 lb]
4. Assure that all unsound concrete is removed. After the designated concrete has been removed, check for additional unsound concrete (i.e.: additional depth, rusty reinforcing, additional perimeter delamination).
5. Assure that the perimeter of the cavity is saw cut to a minimum depth of 13 mm [$\frac{1}{2}$ in]. Saw cuts should not extend beyond the perimeter of the patch.
6. If any portion of a reinforcing steel bar is exposed, then the concrete in that area must be removed to a depth of 25 mm [1 in] below/behind the reinforcing steel.

b. Cleaning and Preparation of Surfaces to Receive New Concrete

1. Assure that the surfaces to receive the new concrete or patching material are free of oil, solvent, grease, dirt, dust, bitumen, loose particles, and any foreign matter.

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2. Check that the area of the deck to receive the new concrete has been cleaned within 24 hours preceding the placement of concrete and recleaned if contaminated.
3. Assure that deck cleaning is performed by dry sand blasting or another approved method.
4. Assure that all debris from the cleaning operation is removed by compressed dry air from the cleaned surfaces and adjacent areas.
5. Assure that the compressor air lines are equipped with effective oil traps.

c. Assure that the placement of materials is in accordance with the following:

Depth of Placement	Material to be Used	Bonding Material
greater than or equal to 25 mm [1 in]	Class AA Concrete	bonding grout (518.07)
25 mm [1 in] to 50 mm [2 in]	May use patching material with aggregate if approved by M.D.O.T.	Same as below
less than 25 mm [1 in]	material listed on the MDOT's list of Prequalified Patching Materials	scrub coat of patching material according to manufacturers directions

An approved water based, multi component, epoxy resin, Portland cement based bonding agent may be used when the bonding material would dry prior to placement of the concrete or patching material (i.e.: form and pour).

The prequalified list of patching materials and the list of approved bonding agents are available on the network p:\cons0\apprlist, or from the Project Resident.

Be present during placement and mixing of concrete or patching and bonding materials.

d. Structural Concrete Slab

1. If concrete removal is required to below the top of the main reinforcing steel, assure that the concrete is removed to a minimum depth of 25mm [1 in] below the bottom of the main reinforcing steel.

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2. When a new structural concrete wearing surface is to be placed on the existing deck, assure that the placement of the concrete is as detailed in the following table:

Existing structural concrete removed to:	New concrete to be placed:
Reinforcing steel	monolithic with specified new structural concrete wearing surface
Below reinforcing steel, or to full depth	to the level of the deck surface and properly cured to placement of new wearing surface

For concrete curbs and sidewalks, assure that all inclined surfaces are removed to a minimum depth of 25 mm [1 in] behind the nearest plane of reinforcing steel. An inclined surface is one which is greater than 30 degrees from the horizontal.

e. Reinforcing Steel

1. Assure that all existing reinforcing steel that is exposed by the concrete removal and will remain in the bridge is cleaned of all loose rust by sand blasting, wire brushing, or machine wire brushing.
2. Assure that all existing reinforcing steel which is broken or has lost 25 percent or more of the original cross-sectional area is supplemented with new reinforcing steel of the same diameter as the original.
3. Assure that all supplemental reinforcing steel is lapped 30 bar diameters and wired to the existing steel or, when approved by the Resident, the existing reinforcing steel is cut out and the supplemental steel spliced in with tension couplers.

f. Mixing of Bonding Grout

1. Assure that the bonding grout is made with portland cement and fine aggregate, proportioned 1 to 1 by volume.
2. Assure that the fine aggregate is from the same source as that used in the concrete. This can be done by checking that the color of the aggregate used in the grout is the same as that used in the concrete. Notify the Resident if the source of the aggregate cannot be determined.
3. Assure that the grout is mixed in a mechanical mortar mixer that has been approved by the Engineer.

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4. Assure that the fine aggregate is deposited in the mechanical mortar mixer prior to adding the cement.
5. If water is required in the manufacturer's directions, assure that only enough water is added to produce a grout with a workable consistency. Workable consistency is defined as the minimum amount of water necessary to allow flow of the grout without segregation of the grout ingredients. Check that the consistency of the grout is "pasty." Assure that no more water is added to the grout mixture at any time.
6. Assure that the grout does not separate prior to placement.
7. Assure that the grout is placed within 30 minutes after the water is added to the cement.

g. Placement of Bonding Grout

1. Assure that the supporting slab is free of excess moisture prior to placement of the bonding grout. Excess moisture is defined as any standing water.
2. Assure that the coating of grout does not exceed 3 mm [$\frac{1}{8}$ in] in thickness.
3. Assure that the grout has not become dry prior to being covered with new concrete. The grout should be soft, moist and pliable to the touch. Drying is also indicated by a lightening of color.
4. If the surface of the grout indicates any drying, assure that additional grout is brushed onto the area.
5. If the grout becomes thoroughly dry, assure that the grout is removed by sand blasting, or by other means acceptable to the Resident, and replaced.

518-4 INSPECTION, MEASUREMENT AND DOCUMENTATION

Inspection is also included above under construction.

Even if the Contractor sounds the surface, all surfaces shall be sounded by the MDOT Inspector. All patched areas shall be resounded by the MDOT Inspector as soon as the patches have set up. Unsound surfaces, existing remaining wearing surface, and existing incompatible membrane shall be outlined with spray paint by the MDOT inspector for removal.

All divots and pits on bridge decks shall be corrected to the tolerance allowed by the membrane manufacturer.

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Ensure that Contractor cleans spilled patching material or other foreign material from concrete surfaces. Damage done to the concrete surface by the Contractor shall be repaired at no cost to the MDOT.

Document what was done and where and when it was done.

Curing time may be extended, if membrane waterproofing is used.

Obtain manufacturers specification sheets for patching material and bonding agents that are used on the project.

518-5 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT.

Project Diary, Inspector's/daily Report: The Resident or Inspector will keep notes describing the Contractor's activities on this item; crew, equipment, weather conditions, location of work, i.e. which lane and which span if appropriate, will be recorded. Also documented are: name brand of patching material and bonding grout.

Final Quantity Book: Final quantity for payment will be determined from field measurements recorded in the Construction Book, signed and dated. Rehabilitation of Structural Concrete can involve one or a combination of items. If these items overlap in area, the item involving the largest surface area should be measured first and should be all encompassing, i.e. include the other items. These other items should then be measured after and deducted from the largest area. This method of measurement will avoid confusion and result in the greatest accuracy.

The final quantity will be entered in the Final Quantity Book and referred to field measurements in the Construction Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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EXPANSION DEVICES (NON-MODULAR)

520-1 GENERAL

References:

- (1) Construction Manual, Section 504 - Structural Steel
- (2) Standard Specifications
- (3) Project Plans
- (4) Special Provisions and Supplemental Specifications
- (5) Standard Details
- (6) Supplemental Standard Details
- (7) Approved Shop Drawings

Expansion Devices - Non-Modular will consist of the seals, anchorage system, and curb and sidewalk expansion dams as applicable. There are two types of seals, either a gland seal or a compression seal.

520-2 LAYOUT AND CONTROL

The MDOT will provide reference lines or points for the control of the work. From these references, it is the Contractor's responsibility to lay out the centerline of bearing, centerline of construction, or other reference line for "setting" of the steel shapes. The Contractor is to make use of all the above referenced resources in accomplishing this layout to ensure the proper location of the unit. A 3 m [10 ft] straightedge, or a string line, set at the finished grade by blocking can be used to establish the grade of the steel shape. The Inspector should check the Contractor's layout, by an independent means, if possible, to determine that the layout is correct.

520-3 TESTING REQUIREMENTS

If a gland seal is specified, the proposed gland seal must be listed on the MDOT list of prequalified gland seals. Refer to the Minimum Testing Requirements to determine any tests and/or certifications required. Refer to the Standard Specifications or the Special Provisions, Section 700 for requirements of materials certifications.

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520-4 CONSTRUCTION

The proper installation of joints and dams, adjusting to grade, and installation of seals is the responsibility of the Contractor; the Inspector should review the specifications, plans, and details, and work with the Contractor to ensure the work is done correctly.

Expansion devices will usually be delivered to the project as an assembled unit ready for installation, including the curb and sidewalk expansion dams. In some cases, such as stage construction, either the expansion dams or the expansion joints may be in separate sections, which are then field-welded together when installed. The units will include adjustment devices for temperature; these must not be removed until after final setting of the unit. All concrete on both sides of the joint, except for the required block-outs, is to be placed prior to setting the expansion unit in place. The unit is then set to the correct horizontal alignment, and the adjustment device supports are then welded to the structural steel (or the backwall reinforcing steel) according to the details.

The joint gap is to be adjusted by means of the joint adjustment devices at the time the unit is installed, just prior to setting to grade and welding in place. For purposes of calculating the joint adjustment for gland seals in accordance with the plans and standard details, measure the length "L" along the centerline from the fixed bearings to the joint. Obtain the temperature of the structure "T" by attaching a temperature gauge to the steel or concrete superstructure in a shaded area. Note that this is the adjustment dimension measured along the centerline, and will be different from the gap dimension for skewed joints. For compression seals, obtain the seal type, size, and brand as specified, or as proposed by the Contractor, and obtain the manufacturer's data, which is usually included with the proposed seal, from which the width of the seal and the movement rating (MR) can be obtained. The "MR" can also be obtained from the MDOT list of approved products when it is known which seal the Contractor will be using. The final adjustment to the joint gap is then made with the measurement perpendicular to the joint.

The grade is to be established using a string-line or straightedge set across the joint with block-ups to the actual finish surface grades; this should ensure that the final surface across the joint will be smooth. The actual joint grade is set slightly lower, $3 \pm$ mm [$\frac{1}{8}$ in], than the finish concrete grade for snowplow protection. Also, ensure that the trailing edge of the joint is not higher than the leading edge, to prevent damage to snowplows catching on the trailing edge. After the expansion device has been thus set to the proper line and grade using the slab and backwall adjustment devices, the unit is welded in place by welding together the slab adjustment plates, and tack welding the backwall adjustment plates to the backwall reinforcing steel. After final welding, the grades and joint width should be re-checked to ensure correctness, than the joint adjustment devices are cut off and removed. The final concrete can then be placed in the block-outs.

The seal is to be one continuous unit and is to be installed as such, although fabricated splices may be allowed in accordance with the Specifications. Be sure the joint is clean and dry before starting installation. Installing compression seals during the cooler part of the day, usually early morning (or on a colder day), may be helpful to take advantage of the increased gap. Perform the installation in accordance with the manufacturer's

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recommendations, using the proper lubricants, tools, and equipment. Avoid twisting or distorting the seal to install it. Do not cut the seal except as permitted by the Specifications (at abrupt angular changes in vertical alignment for compression seals).

520-5 INSPECTION

Determine if the fabricated assemblies are required to be shop inspected. When the fabricated assemblies are delivered to the jobsite, they should be inspected for shipping damages. If the assemblies are not shop inspected, then, as a minimum, the Inspector should check for fabrication deficiencies by comparing the units with the approved shop drawings. Also, compare the dimensions of the assembly curb-to-curb and curb/sidewalk dams to the same dimensions of the structure to ensure that they conform. Check the gap dimension to determine if properly set prior to delivery and check the seal for proper size.

The installation of the joint is critical to obtaining good rideability. The Inspector should check the layout and installation, and if he has any questions regarding the correctness of the work he should bring them to the Contractor's attention, as corrections can only be made by removing the concrete and resetting the joint if the concrete has been placed and the work is found to be defective. Some typical questions at this stage which should be asked of the Contractor are: 1) Is the horizontal location correct (is the crown-break in the correct location), this is especially critical on skewed joints; 2) Have the grades been set correctly to match the finished concrete surface with the proper precautions so as not to damage snowplows; and 3) Has the gap been adjusted properly (in the right direction and measured correctly). Check the stud anchors to ensure that they extend into the reinforcing steel area, and that the reinforcing steel is properly placed behind the joints (reference Standard Details). Ensure that all field welds required (but only those welds shown on the drawings and details or as directed) are properly completed. After the temperature adjustment devices have been removed, recheck the joint width. When the concrete is placed in the block-outs, inspect the grade to ensure the proper finish relative to the joint.

The Contractor is responsible for the proper installation of the seal in accordance with all Specifications and details. The Inspector may, prior to installing the seal, inspect the joint to ensure that it is clean and dry and free from all foreign material. Inspection of the installation of the seal may consist of obtaining and reviewing the manufacturer's recommendations, and observing that the Contractor follows the recommended procedure. A final inspection should be done to ensure that the seal is seated properly and meets the requirements of the Plans, Specifications, and details. Any deviations may be cause for rejection of the work.

The Inspector should document the work in either a bound field book or Inspector's Daily Report with a statement of inspection and acceptance as follows: 1) when the unit has been delivered to the site and properly stored; 2) when the unit has been set in place and is ready for placing concrete; 3) when the concrete has been placed in the block-outs; and 4) after final installation of the seal. Steps 3 and 4 may be combined at final acceptance of the work.

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520-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will make notes regarding: type of sealant used, whether gland or compression, manufacturer's name, preparation of surface area prior to installation, name of lubricant or sealant, and other specification requirements. When the unit is delivered, a portion may be paid, based on receipted bills. Crew, equipment, weather conditions and temperatures will also be recorded.

Final Quantity Book: Final quantity for payment will be entered in the Final quantity Book by the unit. References will be made to appropriate Dairy entries that document inspection and acceptance. **All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work.**

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Section 521 Finger Joint & Fabric Trough -- 3 Pages

FINGER JOINT AND FABRIC TROUGH

521-1 GENERAL

References:

- (1) Construction Manual, Section 504 - Structural Steel
- (2) Standard Specifications
- (3) Project Plans
- (4) Special Provisions and Supplemental Specifications
- (5) Standard Details
- (6) Supplemental Standard Details
- (7) Approved Shop Drawings

Finger joints and fabric trough will consist of the finger joint expansion devices, anchorage system, fabric troughs and any appurtenances when required, and curb and sidewalk expansion dams as applicable.

521-2 LAYOUT AND CONTROL

The MDOT will provide reference lines or points for the control of the work. From these references, it is the Contractor's responsibility to lay out the centerline of bearing, centerline of construction, or other reference line for "setting" of the steel shapes. The Contractor is to make use of all the above-referenced resources in accomplishing this layout to ensure the proper location of the unit. A three-meter straightedge, or a string line, set at the finished grade by blocking can be used to establish the grade of the steel shape. The Inspector should check the Contractor's layout, by an independent means, if possible, to determine that the layout is correct.

521-3 TESTING REQUIREMENTS

Refer to the Minimum Testing Requirements for any tests or certifications required. Determine that the sample of fabric for the trough, if required, has been submitted the required 30 days prior to installation.

521-4 CONSTRUCTION

The proper installation of the finger joints and dams, adjusting to grade, and installation of the fabric trough and any appurtenances is the responsibility of the Contractor. The Inspector should review the specifications, plans, and details, and work with the Contractor to ensure the work is done correctly.

Finger joint expansion devices will be delivered to the project as an assembled unit ready for installation, including the curb and sidewalk expansion dams. In some cases, such as stage construction, either the expansion dams or the expansion joints may be in separate sections, which are then field welded together when

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installed. The units will include adjustment devices for temperature; these must not be removed until after final setting of the unit. All concrete on both sides of the joint, except for the required block-outs, is to be placed prior to setting the expansion unit in place. The unit is then set to the correct horizontal alignment, and the adjustment device supports are then welded to the structural steel or to the bearing plate inserts in the backwall.

The joint opening, "J" is to be adjusted by means of the joint adjustment devices at the time the unit is installed, and just prior to setting to grade and welding in place. For purposes of calculating the joint adjustment in accordance with the plans and standard details, measure the length "L" along the centerline from the fixed bearings to the joint. Obtain the temperature of the structure "T" by attaching a temperature gauge to the steel or concrete superstructure in a shaded area. Note that this is the adjustment dimension measured along the centerline, and will be different from the opening dimension perpendicular to the joint for skewed joints. The final adjustment to the joint opening is then made with the appropriate measurement either along the centerline, or as calculated perpendicular to the joint.

The grade is to be established using a string-line or straightedge set across the joint with block-ups to the actual finish surface grades; this should ensure that the final surface across the joint will be smooth. The actual joint grade is set slightly lower, $3 \pm \text{ mm}$ [$? \text{ in}$], than the finish concrete grade for snowplow protection. After the expansion device has been thus set to the proper line and grade using the slab and backwall adjustment devices, the unit placed by welding together the slab and backwall adjustment plates. After final welding, grade and joint width should be re-checked to ensure correctness. Then, the joint adjustment devices are cut off and removed. The final concrete is then placed in the block-outs.

The shop drawings are to be consulted to determine the correct sequence, methods and equipment to be used to install the fabric trough. The trough is normally designed to be replaced, therefore, the support structure will normally allow the trough to be installed after the joint has been installed and cast in place; this should also be evident on the Plans. The difficulties that arise in installing the fabric trough are usually due to the space restrictions, both in the attaching and completely securing of the trough to the support structure, and for access in the opening beneath the joint. If the Contractor elects to install the fabric trough prior to installing the joint, then the above should be taken into consideration to ensure that the trough can be removed later.

521-5 INSPECTION

Determine if the fabricated assemblies are required to be shop inspected. When the fabricated assemblies are delivered to the jobsite, they should be inspected for shipping damages. If the assemblies are not shop inspected, then as a minimum, the Inspector should check for fabrication deficiencies by comparing the units with the approved shop drawings. Also, compare the dimensions of the assembly curb-to-curb and curb/sidewalk dams to the same dimensions of the structure to ensure that they conform. Check the gap dimension to determine if it was properly set prior to delivery.

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The installation of the joint is critical to obtaining rideability. The Inspector should check the layout and installation, and if he has any questions regarding the correctness of the work he should bring them to the Contractor's attention, as corrections can only be made by removing the concrete and resetting the joint if the concrete has been placed and the work is found to be defective. Some typical questions at this stage which should be asked of the Contractor are: 1) Is the horizontal location correct (is the crown-break in the correct location), this is especially critical on skewed joints; 2) Have the grades been set correctly to match the finished concrete surface with the proper precautions so as not to damage snowplows; and 3) Has the gap been adjusted properly (in the right direction and measured correctly). Check the stud anchors to ensure that they extend into the reinforcing steel area, and that the reinforcing steel is properly placed behind the joints (reference Standard Details). Ensure that all field welds required (but only those welds shown on the drawings and details or as directed) are properly completed. After the temperature adjustment devices have been removed, recheck the joint width. When the concrete is placed in the block-outs, inspect the grade to ensure the proper finish relative to the joint.

The Contractor is responsible for the proper installation of the fabric trough and appurtenances in accordance with all specifications and details. The Inspector may, before installing the trough, inspect the joint and connections to ensure that they are clean, dry and free from all foreign material. Inspect the installation of the trough to ensure that it has been installed properly in conformance with the plans and details, such that, regardless of the Contractor's procedure, the correctness of the installation is not compromised, and that it will function as intended. Ensure that at any planned splices in the upper section is on the inside of the lower section for drainage; also ensure that any other drainage structures are installed to perform properly and drain away from structural units. Any deviations may be cause for rejection of the work. A final inspection should be done to ensure that the trough is clean and functioning properly.

The Inspector should document the work in either a bound field book or Inspector's Daily Report with a statement of inspection and acceptance as follows: 1) When the unit has been delivered to the site and properly stored; 2) When the unit has been set in place and is ready for placing concrete; 3) When the concrete has been placed in the block-outs; and 4) After installing the fabric trough and appurtenances. Steps 3 and 4 may be combined at final acceptance of the work.

521-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will record the manufacturer's name, and lot number. A copy of shop drawing approved by the fabrication engineer will be kept on file. The Resident will also inspect by materials for general condition, cleanliness, and conformity to plan dimensions.

Final Quantity Book: Final quantity for payment by "each", will be entered in the final Quantity book, signed and dated. References will be made to Project diary entries for inspection and acceptance. **All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work.**

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Section 522 Expansion Devices - Modular -- 3 Pages

EXPANSION DEVICES - MODULAR

522-1 GENERAL

References:

- (1) Construction Manual, Section 504 - Structural Steel
- (2) Standard Specifications
- (3) Project Plans
- (4) Special Provisions and Supplemental Specifications
- (5) Approved Shop Drawings

Expansion Devices - Modular will consist of the seals, fabricated steel shapes, anchorage system and supports, and curb and sidewalk expansion dams as applicable.

522-2 LAYOUT AND CONTROL

The MDOT will provide reference lines or points for the control of the work. From these references, it is the Contractor's responsibility to lay out the centerline of bearing, centerline of construction, or other reference line for "setting" of the steel shapes. The Contractor is to make use of all the above referenced resources in accomplishing this layout to ensure the proper location of the unit. A 3 m [10 ft] straightedge, or a string line, set at the finished grade by blocking can be used to establish the grade of the steel shape. The Inspector should check the Contractor's layout, by an independent means, if possible, to determine that the layout is correct.

522-3 TESTING REQUIREMENTS

Refer to the Minimum Testing Requirements to determine any tests or certifications required. Refer to the Standard Specifications or the Special Provisions, Section 700 for requirements of materials certifications.

522-4 CONSTRUCTION

The proper installation of joints and dams, and adjusting to grade is the responsibility of the Contractor; the Inspector should review the specifications, plans, and details, and work with the Contractor to ensure the work is done correctly.

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Expansion devices will be delivered to the project as an assembled unit unless otherwise specified on the shop drawings, which are to be followed if any field splicing is required. The seal elements within the modular expansion device are to be continuous units and field splices are not allowed. The unit is to be carefully stored and protected from the elements until ready to be installed. The units will include adjustment devices for temperature; these must not be removed until after final setting of the unit. All concrete on both sides of the joint, except for the required block-outs, is to be placed prior to setting the expansion unit in place. The unit is then set to the correct horizontal alignment, and the adjustment device supports are then welded to the structural steel (or the backwall reinforcing steel) according to the details.

The joint gap is to be adjusted by means of the joint adjustment devices at the time the unit is installed, and just prior to setting to grade and welding in place. The Plans and details will specify the methods for calculating the adjustment of the joint opening. Care should be exercised to ensure the adjustment is measured properly relative to the skew of the joint. The final adjustment to the joint gap is then made.

The grade is to be established using a string-line or straightedge set across the joint with block-ups to the actual finish surface grades; this should ensure that the final surface across the joint will be smooth. The actual joint grade is set slightly lower, $3 \pm \text{ mm}$ [$\frac{1}{8} \text{ in}$], than the finish concrete grade for snowplow protection. After the expansion device has been thus set to the proper line and grade using the slab and backwall adjustment devices, the unit is welded in place by welding together the adjustment devices as shown on the drawings. After final welding, the grades and joint width should be re-checked to ensure correctness, and then the joint adjustment devices are cut off and removed. The final concrete can then be placed in the block-outs. Care must be exercised to ensure that concrete does not enter the expansion device.

522-5 INSPECTION

Check that the required shop inspection of the fabricated assemblies was done. When the fabricated assemblies are delivered to the jobsite, they should be inspected for shipping damage. Storage at the job site should be inspected to ensure the units are protected from harm prior to installation. Field check dimensions of the unit curb-to-curb and curb/sidewalk dams to compare with the same dimensions of the structure to ensure that they conform. Check the gap dimension to determine if properly set prior to delivery to the dimensions shown on the plans and/or shop drawings.

The installation of the joint is critical to obtaining good rideability. The Inspector should check the layout and installation, and bring any questions regarding the correctness of the work to the Contractor's attention, as corrections can only be made by removing the concrete and resetting the joint if the concrete has been placed and the work is found to be defective. Some typical questions at this stage which should be asked of the Contractor are: 1) Is the horizontal location correct (is the crown-break in the correct location), this is especially critical on skewed joints; 2) Have the grades been set correctly to match the finished concrete surface with the proper precautions so as not to damage snowplows; and 3) Has the gap been adjusted properly (in the right direction and measured correctly). Check the stud anchors to ensure that they extend into the reinforcing steel

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area, and that the reinforcing steel is properly placed behind the joints. Ensure that all field welds required (but only those welds shown on the drawings or as directed) are properly completed. After the temperature adjustment devices have been removed, recheck the joint width. When the concrete is placed in the block-outs, inspect the grade to ensure the proper finish relative to the joint. Also, during the concrete placement inspect for concrete entering the joint, and if it occurs, have it removed immediately.

The Contractor has the final responsibility for the proper installation of the expansion device in accordance with all Specifications and details. A final inspection should be done to ensure that the device has been installed properly and meets all of the requirements of the plans and specifications. Any deviations may be cause for rejection of the work.

The Inspector should document the work in either a bound field book or Inspector's Daily Report with a statement of inspection and acceptance as follows: 1) When the unit has been delivered to the site and properly stored; 2) When the unit has been set in place and is ready for placing concrete; and 3) When the concrete has been placed in the block-outs.

522-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Field Documentation:

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will make notes regarding the type of seal used, preparation of surface areas prior to installation, and other specification requirements. Crew, equipment, and weather conditions should also be noted.

Measurement and Payment:

Final Quantity Book: Final quantity will be entered in the Final Quantity Book by the unit. Reference will be made to appropriate Diary entries that document inspection and acceptance. **All calculations and measurements must be signed, dated and checked; the checker must sign and date their entries.**

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BEARINGS

523-1 GENERAL

References:

- (1) Construction Manual, Section 504 - Structural Steel
- (2) Standard Specifications
- (3) Project Plans
- (4) Special Provisions and Supplemental Specifications
- (5) Approved Shop Drawings

523-2 LAYOUT AND CONTROL

The MDOT will provide reference lines or points for the control of the work. From these references, it is the Contractor's responsibility to lay out the centerline of bearing, centerline of construction, or other reference line for "setting" of the anchor bolts, plates, and bearings. The Contractor is to make use of all the above referenced resources in accomplishing this layout to ensure the proper location of the bearings. When doing the layout, be sure to check the actual constructed dimensions between bearing centerlines, to avoid errors. The layout should begin when installing the reinforcing steel in the bridge seats. By laying out the anchor bolts at this time, the reinforcing steel spacing can be adjusted to avoid interference with the drilling of the holes after the concrete has been placed. Careful control should be maintained to ensure that this initial layout can be accurately replicated when preparing to drill the holes for the anchor bolts. The Inspector should check the Contractor's layout, by an independent means, if possible, to determine that the layout is correct.

523-3 TESTING REQUIREMENTS

Anchor bolts may be required to be tested; refer to the plans and Special Provisions, also Standard Specifications, Section 504.45. Refer to the MDOT list of prequalified materials for approved anchoring materials. At a minimum, mill tests will be required for masonry plates and other structural steel items, and certifications will be required for preformed pads and other materials. Review the above references to determine if any further testing is required. Two of the completed bearings at random are to be tested by the

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manufacturer prior to delivery. Check to ensure that these test results are on file and are satisfactory according to the Standard Specifications and any Special Provisions before proceeding with the installation. Refer to the Minimum Testing Requirements to determine any other tests or certifications required. Refer to the Standard Specifications or the Special Provisions, Section 700 for requirements of materials certifications.

523-4 CONSTRUCTION

The proper installation of anchor bolts, plates and bearings is the responsibility of the Contractor; the Inspector should review the specifications, plans, and details, and work with the Contractor to ensure the work is done correctly.

Installation of the bearings begins with the preparation of the bridge seat. The specifications require the concrete bearing area to be dressed or, alternatively, for the area to be a grout pad. The bearing area is to be level, and drainage away from the area must be provided (by channeling if lower than the surrounding area). Anchor bolt holes are to be drilled and anchor bolts grouted, to receive a preformed pad and masonry plate. To determine the size of the required bolt holes, consult the technical data sheet for the selected anchoring material.

Bearings delivered to the project are required to be wrapped and/or enclosed in moisture-proof and dust-proof covers. They are to be carefully stored and protected from the elements in the original coverings until ready to be installed. When installed, they shall be adjusted for temperature. The bearings are specified to be shipped pre-marked with a neutral axis at 7°C [45°F]. Temperature measurements are to be taken at the surface of the steel for purposes of adjusting the bearing for temperature, and dead load deflections are to be considered for purposes of calculating the adjustment. For calculating the adjustment in millimeters, use the following formula: $.012 \times T \times L$, where "T" is the temperature difference from 7° C, and "L" is the length in meters. The length "L" is measured along the centerline from the fixed bearings to the joint. For concrete structures, use half the temperature range. The bearing sole plates are not to be welded to the girders until after the superstructure concrete has been placed. After the superstructure concrete has been placed, check the bearings for temperature and readjust if necessary. After all adjustments are complete, the sole plates are welded to the girders where shown on the drawings. Only welded connections shown on the drawings are to be made; no other welding to the structural steel is allowed. All welded connections are to be performed by certified welders.

523-5 INSPECTION

Pot bearings are required to be shop inspected. Shop testing of the bearings is to be carried out under the direction of the Fabrication Engineer and observed by the Inspector at the plant.

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When the bearings are delivered to the jobsite, they should be inspected for shipping damages and for any damage to the wrapping or containers. If the covering or wrapping has been damaged, check to see if any remedial action is required or if the bearing must be rejected. Inspect the storage of the bearings to determine that they are stored in a clean dry area with wrapping and containers intact.

The Inspector should check the layout and installation, and any questions regarding the correctness of the work he should be brought to the Contractor's attention. Some of the items which may be inspected are: 1) preparation of the concrete bearing surface to ensure that it is level and even and that drainage is provided, and 2) drilling of the bolt holes and grouting of the anchor bolts to ensure proper embedment depth, correct hole size, and proper grouting is done. When the bearing is set, inspect the temperature adjustment to determine that it has been adjusted properly (in the right direction and measured correctly). After placing the superstructure concrete and readjusting the bearings for temperature if necessary, ensure that all field welds required (but only those welds shown on the drawings and details or as directed) are properly completed.

The Contractor has the final responsible for the proper installation of the bearings in accordance with all specifications and details. A final inspection should be done to ensure that they have been installed properly and meet all of the requirements of the plans and specifications. Any deviations may be cause for rejection of the work.

523-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will inspect and note approval of : 1) when the bearings have been delivered to the site and properly stored; 2) when the bearing area has been prepared; 3) when the holes are drilled and the anchor bolts grouted in place; 3) when the preformed pads, plates, and bearings are set; and 4) when the temperature adjustments have been made and the sole plates are welded to the girders. Any or all of these steps may be combined along with a final acceptance of the work.

Approved shop drawings, shop inspection reports and test results will be forwarded to the Resident by the Fabrication Engineer in advance of delivery of the bearing assemblies to the site.

Final Quantity Book: Final quantity for payment bid and measured by the unit for each assembly will be entered the Final Quantity Book. Reference will be made to notes of inspection and acceptance of seating areas and test results. **All calculations and data entries must be signed, dated, and checked; the checker and date his/her entries.**

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TEMPORARY STRUCTURAL SUPPORT

524-1 GENERAL

References:

- (1) Standard Specifications Section 524.02 - Materials
- (2) Special Provisions & Supplemental Specifications
- (3) Standard & Special Detail Sheets
- (4) Project Plans

This work consists of designing, fabricating, erecting, maintaining, and dismantling temporary structural supports as detailed on the project Plans, Specifications and Special Provisions. Temporary structural supports proposed by the Contractor to facilitate the work shall also conform to these specifications.

524-2 LAYOUT AND CONTROL

The location of the temporary structural supports will normally be shown on the plans. The Contractor will normally do layout. The Resident may designate the location of the temporary structural supports.

524-3 SAMPLING AND TESTING

The temporary structural support system shall be designed and stamped by a Professional Engineer registered in the State of Maine; refer to Standard Specifications, Section 524.03, for design parameters.

Submit all working drawings and computations to the MDOT Resident for distribution to the Project Manager for review and approval. The Resident should review the proposed support system for constructability and possible project scheduling conflicts. Allow ten days for design review and approval.

524-4 CONSTRUCTION

The erection of temporary supports shall be in strict conformance with the approved design and details, and the Contractor shall use only the materials approved for use. No loads shall be placed on the temporary supports without prior approval of the Engineer.

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No loads shall be placed on temporary supports which are adjacent to traveled ways or which support structures carrying traffic, unless the Professional Engineer responsible for the design has certified to the MDOT that the system was erected in conformance with the approved plans and design details.

The approval by the MDOT of all or part of temporary supports shall not be construed as in any way relieving the Contractor of his responsibility, and the work shall be entirely at the Contractor's risk.

Upon completion, the work requiring the use of the temporary structural supports shall be removed and the area under and around the temporary structural supports shall be restored to its original condition.

524-5 INSPECTION, MEASUREMENT, AND DOCUMENTATION

The Resident/Inspector has full authority to inspect all aspects of the temporary support construction for compliance with the working drawings, and report any deficiencies to the Contractor and the Engineer responsible for the design. To assure compliance with the working drawings and associated design computations, the Resident/Inspector shall receive written certification from the structural support Design Engineer that the temporary structural support system was erected in conformance with the approved plans and design details.

Temporary structural supports shall be measured as the number of units called for on the plan. Refer to the Standard Specifications, Section 524.28 for additional information.

In general, once the supports have been designed and erected, a partial payment of 50% of the contract bid price per unit should be made to the Contractor. 75% payment can be made based on 75% completion of the work associated with the support system. Once the support system is dismantled, and all incidental work resulting from the erection and maintenance of the support system is complete, 100% payment can be made to the Contractor.

The Resident/Inspector shall maintain submittal dates and points of contact for all correspondence relating to the design approval process; the Inspectors Daily Reports, (See Following Examples) or the Project Correspondence File and Project Diary should contain this information.

The Resident/Inspector shall maintain daily diary entries covering the erection of the temporary structural support; this information can be placed in the Inspector's Diary or Project Diary. The completion date and removal date of the temporary structural support system can be entered directly into the Final Quantity Book, along with a statement indicated inspection and acceptance by the temporary structural support system Design Engineer. A typical entry into the Final Quantity Book is as follows:

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524.30 Temporary Structural Support					2EA
Description	Design Completed	Erection Completed	Structure Dismantled	Entered By	*Design Engineer/Date
Pier #1 Support	4/11/96	4/26/96	6/26/96	MEB	DESIGN ENG-DATE
Pier #2 Support	4/11/96	6/19/96	8/30/96	MEB	DESIGN ENG-DATE

* This is to certify that the Temporary Structural Support structure was inspected on the indicated date and was found to be in conformance with the approved plans and design details:

_____ Design Engineer

In lieu of signing the Final Quantity Book, the Design Engineer can submit a letter of certification for each project visit summarizing the above certification statement; each letter should be filed in the Project Correspondence File with the appropriate reference in the Final Quantity Book. It is advised that the Resident/Inspector document the name and date of the Design Engineer for each project visit in the last column above.

Final Pay Quantity: 2 EA

Entered By: _____
Date: _____

Checked By: _____
Date: _____

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Example A

The screenshot shows the 'FieldManager' application window with the title bar 'FieldManager (Contract: 007951.00)'. The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Cont Status, SpellCheck, and Print. The main window displays the 'Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: 007951.00)' dialog box. The dialog has tabs for General, Contractors, Postings, Sketches, and View. The 'General' tab is active, showing fields for Date/Time Entered (05/20/2002), Entered By (Orvis J. Tripp), Sequence Number, Generated (No), Revised By, Revision Date, and Revision Number. Below these are fields for IDR Date (05/20/2002), Inspector (OJT Orvis J. Tripp), Weather (Sunny), Low Temperature (2 °C 36° F), and High Temperature (20 °C 68° F). A large text area for Comments contains the text: 'Received Certification this day from Mike E. Betts P.E that the Temporary Structural Support Pier 1 & 2 was erected in conformance with the approved plans and design details. Certification contains all applicable Information and put on file.' The status bar at the bottom shows 'Ready'.

Example B

The screenshot shows the 'FieldManager' application window with the title bar 'FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: 007951.0...'. The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Item Doc, Cont Status, SpellCheck, and Print. The main window displays the 'Item Posting' dialog box. The dialog has tabs for General, Contractors, Postings, Sketches, and View. The 'General' tab is active, showing fields for Item (524.30, TEMPORARY STRUCTURAL SUPPORT), Prop. Ln (0495), Unit (EA), Catg. Auth. Qty (0.000), Catg. Auth. Amt (\$0.00), Type (SUPPLEMENTAL AGREEMENT), Unit Price (\$100,000.000), Catg. Qty. Placed (0.750), Catg. Pending Chgs (1.000), and Catg. Qty. Paid (0.000). Below these are fields for Project (007951.00 FRANKFORT), Category (0001 BRIDGE ITEMS), Quantity (0.750 EA), Attention (checkbox), Station From, Station To, Location (DS Structure), Breakdown, and Remarks (Structure erected and applicable documentation on file.). The status bar at the bottom shows 'Ready'.

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Section 526 Concrete Barrier -- 5 Pages

CONCRETE BARRIER

526-1 GENERAL

References:

- (1) Standard Specifications Section 526.02 - Materials
- (2) Special Provisions & Supplemental Specifications
- (3) Standard & Special Detail Sheets
- (4) Project Plans

Concrete Barriers are used two ways: temporary and permanent. The work for temporary concrete barrier shall consist of the setting, resetting, and removing the barriers, when the work is completed. The work for permanent concrete barrier shall consist of furnishing or constructing the barriers and elements in a permanent location in accordance with the Specifications, and in reasonably close conformity with the lines and grades shown on the plans or established by the Resident.

Temporary Concrete Barrier, Type I, shall consist of a double-faced barrier of a shape designated on the plans with attachments that allow sections to be connected into a continuous barrier. The connections shall be of a type that allows disassembly, moving and reassembly of the barrier. Provisions shall be made in the casting of the barrier for attaching the barrier to the roadway and to the bridge decks, when such attachment is specified on the plans.

Several types of Permanent Concrete Barrier are designated:

Type II: double face barrier of a shape shown on the plans.

Type IIIa: Single face barrier 825 mm [32 in] high of a shape shown on the plans.

Type IIIb: Single face barrier 1075 mm [42 in] high of a shape shown on the plans.

Transition barrier of various heights joining steel bridge rail to steel guardrail.

526-2 LAYOUT AND CONTROL

The location of Temporary and Permanent Concrete Barrier will normally be shown on the plans. The Contractor will normally do the layout. The Resident may designate the location of the Temporary Concrete Barrier.

526-3 SAMPLING AND TESTING

For Temporary Concrete Barriers, the State reserves the right to take core samples from the barriers in accordance with ASTM C42. Average compressive test strengths below 17 Mpa [2,500 psi] will result in rejection of the barriers. For Permanent Concrete Barriers, test as per Special Provisions 502 included with Class "LP".

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526-4 CONSTRUCTION

Temporary Concrete Barrier shall be placed, relocated and removed as shown on the plans or as directed.

Temporary Concrete Barriers which have been damaged, by other than the traveling public while in use or show signs of deterioration shall be replaced, as directed, at no additional cost to the State.

The Permanent Concrete Barrier shall be constructed or placed as shown on the plans. The Permanent Concrete Barriers differ from normal Structural Concrete in the following areas:

1. Concrete Barrier may be formed cast-in-place or by precasting and/or prestressing methods or slip-forming methods.
2. Finish for Concrete Barrier shall be equal to a steel form finish.
3. Liquid forming compounds used for curing concrete barriers shall not contain fugitive dye or other agents, which will discolor the concrete.
4. In addition to the foregoing methods of curing concrete, barrier may be cured by an accelerated curing method using low-pressure steam or radiant heat in a moist atmosphere. Other methods of curing may be used if approved by the Resident.
5. When slip-forming is used, a dissipating curing compound shall be used during placement, and wet burlap shall be placed on the barrier. The material shall be kept wet for the next seven days. If called for, permanent concrete protective coating shall be applied a minimum of 28 days later.

526-5 INSPECTION

The Resident/Inspector should make sure that the Temporary Concrete Barriers are located where shown on the Plans or as directed. The Temporary Concrete Barriers shall be generally be free of fins and porous areas, and shall present a neat and uniform appearance. The run of barriers should be properly secured to each other, and both ends of the run should be tapered at a rate specified in the MUTCD, or dead-ended to the railing or to the outside edge of shoulder, as directed.

The Resident/ Inspector should make sure that the Permanent Concrete Barriers are located where shown on the plans. Inspection should be done according to Section 502, Structural Concrete.

Policy concerning the inspection and rejection criteria for temporary concrete barrier is currently being developed. Contact your manager to determine if this is available.

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526-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT.

If the Temporary Concrete Barrier is measured and paid by the meter (linear foot), measure the total length acceptable and enter directly in the Inspectors Daily Report (See Examples A & B) or the bound Final Quantity Book. If the item is measured and paid Lump Sum, enter the "Lump Sum" in the Final Quantity Book.

Permanent Concrete Barrier Type II, IIIa, and IIIb will be measured for payment by Lump Sum complete in place and entered directly in the Inspectors Daily Report or the Final Quantity Book.

Permanent Transition Concrete Barrier will be measured by each barrier connecting bridge rail to guardrail complete in place and entered directly in the Inspectors Daily Report (See Examples C & D) or the Final Quantity Book.

Regardless of how measured, refer to Diary notes that document inspection and acceptance of forms and re-steel. Sometimes this item is pre-cast. In this situation, refer to inspection reports written by the Inspector at the plant at the time the barriers were pre-cast. **All calculations and data entries must be signed, dated, and checked; the checker and date his/her entries.**

Example A

The screenshot shows the FieldManager software interface. The title bar reads "FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract:...]". The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Cont Status, SpellCheck, and Print. The main window has tabs for General, Contractors, Postings, Sketches, and View. The General tab is active, displaying the following information:

Date/Time Entered:	05/20/2002	Revised By:	
Entered By:	Orvis J. Tripp	Revision Date:	
Sequence Number:		Revision Number:	
Generated:	No		

Below this, there are input fields for:

- IDR Date: 05/20/2002
- Inspector: OJT Orvis J. Tripp
- Weather: Sunny
- Low Temperature: 2 °C 36° F
- High Temperature: 20 °C 68° F

A comments box contains the text: "Contractor installed Temporary Concrete Barriers for lane closure through bridge area. All work done as per Traffic Control Plan, M.U.T.C.D., plans and specs".

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Example B

FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: ...]

File Edit View Utilities Window Help

Close Save/Close Save Generate Item Doc Cont Status SpellCheck Print

General Contractors Postings Sketches View

Item: 526.301, TEMPORARY CONC BARRIER TYPE I
Prop. Ln: 0160 Unit: LS Catg. Auth. Qty: 1.000 Catg. Auth. Amt: \$2,400.00
Type: ORIGINAL ITEM Unit Price: \$2,400.000 Catg. Qty. Placed: 0.500
Catg. Pending Chgs: 0.000 Catg. Qty. Paid: 1.000

Item Posting

Project: 007951.00 FRANKFORT
Category: 0001 BRIDGE ITEMS
Quantity: 0.500 LS Attention:
Station From: Breakdown:
Station To: Remarks: FM OJT Placed Temporary Barriers in long tapers from 15 Ft to 3 Ft Right of centerline on each end as per plans and Specs. All connections secured with pins.
Location: Station 2+12.5, 15 Ft Rt to 7+50, 15 Rt

Materials OK Add More Cancel Add Materials Add Breakdowns

Ready

Example C

FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: 0...]

File Edit View Utilities Window Help

Close Save/Close Save Generate Cont Status SpellCheck Print

General Contractors Postings Sketches View

Date/Time Entered: 05/20/2002 Revised By:
Entered By: Orvis J. Tripp Revision Date:
Sequence Number: Revision Number:
Generated: No

IDR Date: 05/20/2002
Inspector: OJT Orvis J. Tripp
Weather: Sunny
Low Temperature: 2 ° C 36 ° F
High Temperature: 20 ° C 68 ° F
Comments: Contractor Installed Permanent Concrete Transition Barrier NW Corner of bridge. See posting for payment. Also placed concrete for precast of Permanent Concrete Transition Barrier

Ready

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Example D

The screenshot shows the FieldManager software interface. The main window title is "FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract: 0...". The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Item Doc, Cont Status, SpellCheck, and Print. The main area has tabs for General, Contractors, Postings, Sketches, and View. The "Postings" tab is active, showing details for Item: 526.34, PERMANENT CONC TRANSITION BARRIER. The item details include Prop. Ln: 0505, Unit: EA, Catg. Auth. Qty: 0.000, Catg. Auth. Amt: \$0.00, Type: SUPPLEMENTAL AGREEMENT, Unit Price: \$1,625.000, Catg. Qty. Placed: 1.250, Catg. Pending Chgs: 4.000, and Catg. Qty. Paid: 0.000. The "Item Posting" section includes fields for Project (007951.00 FRANKFORT), Category (0001 BRIDGE ITEMS), Quantity (1.000 EA), Attention (checkbox), Station From, Station To, Location (Station 6+50, 15 Ft Rt FM OJT Installed to line and grade as per plans and specs. pay=0.75), and Breakdown (dropdown). The Remarks field contains: "Placed concrete for precast unit as per plans and specs. Found reinforcing steel and cover within allowable tolerances. pay=0.25 Total = 1.0 UN". At the bottom, there are buttons for Materials, OK, Add More, Cancel, Add Materials, and Add Breakdowns. The status bar at the bottom left shows "Rows 1 to 7 of 7".

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Section 527 Energy Absorbing Unit -- 3 Pages

ENERGY ABSORBING UNIT

527-1 GENERAL

References:

- (1) Standard Specifications Section 527.02 - Materials
- (2) Special Provisions & Supplemental Specifications
- (3) Standard & Special Detail Sheets
- (4) Project Plans

This work shall consist of furnishing and installing Work Zone Crash Cushions as specified in Special Provision 652 or as directed by the Resident.

527-2 LAYOUT AND CONTROL

The location of permanent installations will normally be shown on the plans, at a designated location, similar to guardrail. The Contractor will normally do layout. The Resident may designate the location of temporary installations.

527-3 SAMPLING AND TESTING

Submit all working drawings and computations to Resident for review and approval.

527-4 CONSTRUCTION

Work Zone Crash Cushions shall be provided and installed in accordance with the manufacturer's recommendations for the specific application and the posted speed limit.

Work Zone Crash Cushions that are damaged or destroyed shall be repaired or replaced promptly. The Contractor shall have on hand one complete set for replacements.

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527-5 INSPECTIONS, MEASUREMENT, AND DOCUMENTATION

Work Zone Crash Cushions will be measured by the Unit, which price shall be full compensation for furnishing and placing them, including all incidentals and for setting as many times as required. A cluster of Portable Crash Barrels or a cluster of Energite III sand barrels is considered a Unit. Each N-E-A-T or Adiem II is considered a Unit.

The location of the installation should be entered directly into the Inspectors Daily Report (See Following Examples) or bound Final Quantity Book, with a reference to any relevant construction notes in the Project Diary or an Inspector's Diary.

Replacements for the Work Zone Crash Cushions damaged beyond functional ability by collisions will be paid for as new Work Zone Crash Cushions, and the removal of the impacted devices will be considered incidental to the replacement units. Replacement Work Zone Crash Cushions on hand, but unused, will not be paid for directly.

Example A

The screenshot shows the FieldManager software interface. The title bar reads "FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract:...)". The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Cont Status, SpellCheck, and Print. The main window has a tabbed interface with "General" selected. The "General" tab contains the following fields:

Date/Time Entered:	05/20/2002	Revised By:	
Entered By:	Orvis J. Tripp	Revision Date:	
Sequence Number:		Revision Number:	
Generated:	No		
IDR Date:	05/20/2002		
Inspector:	OJT Orvis J. Tripp		
Weather:	Sunny		
Low Temperature:	2 ° C 36 ° F		
High Temperature:	20 ° C 68 ° F		
Comments:	Received approval for shop drawings of crash cushions this day and placed on file. Contractor installed Crash Cushion at South Approach.		

The status bar at the bottom of the window displays "Ready".

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Example B

The screenshot displays the FieldManager software interface. The title bar reads "FieldManager (Contract: 007951.00) - [Add IDR (IDR: 05/20/2002, Orvis J. Tripp) (Contract:...)". The menu bar includes File, Edit, View, Utilities, Window, and Help. The toolbar contains icons for Close, Save/Close, Save, Generate, Item Doc, Cont Status, SpellCheck, and Print. The main window has tabs for General, Contractors, Postings, Sketches, and View. The "Postings" tab is active, showing the following details:

- Item:** 527.34, WORK ZONE CRASH CUSHIONS
- Prop. Ln:** 0500 **Unit:** UN **Catg. Auth. Qty:** 0.000 **Catg. Auth. Amt:** \$0.00
- Type:** SUPPLEMENTAL AGREEMENT **Unit Price:** \$5,200.000 **Catg. Qty. Placed:** 1.000
- Catg. Pending Chgs:** 2.000 **Catg. Qty. Paid:** 0.000

The "Item Posting" section includes:

- Project:** 007951.00 FRANKFORT
- Category:** 0001 BRIDGE ITEMS
- Quantity:** 1.000 UN **Attention:**
- Station From:** [] **Breakdown:** []
- Station To:** [] **Remarks:** FM OJT 1 UN as per plans, specs. and shop drawings.
- Location:** Station 2+12.5, 18.5 Ft Lt

At the bottom, there are buttons for Materials, OK, Add More, Cancel, Add Materials, and Add Breakdowns. The status bar at the bottom left shows "Rows 1 to 3 of 3".

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PRECAST PRESTRESSED CONCRETE SUPERSTRUCTURE

535-1 GENERAL

References:

- (1) Standard Specifications
- (2) Special Provisions and Supplemental Specifications
- (3) Standard and Special Detail Sheets
- (4) Project Plans

Precast prestressed concrete superstructure as described in this section consists of manufacturing, furnishing, and erecting precast/prestressed structural concrete units and other related materials in accordance with project Plans and Specifications. It is important to note that this item is typically a long lead-time item; the working drawing process should be started as soon as possible (once the contract is awarded and "Notice to Proceed" is given) to eliminate any future lost time claims.

Examples of this item are as follows:

Precast/prestressed concrete deck slabs: The deck slabs are used in place of a full depth cast-in-place deck slab section; this application typically reduces construction time by eliminating the need to form and strip the interior bays of a typical bridge deck system. The slabs act as primary stay in place deck forms, and become an integral part of the bridge deck system.

Precast/prestressed concrete box beam: The box beam is the main structural component of the bridge superstructure. Typical finish topping treatments over box beam segments are as follows: (1) the beams are sealed/covered with waterproofing membrane and paved. (2) the beams receive a concrete leveling slab placed to specific design cross sectional geometry, then are sealed/covered with waterproofing membrane and paved; this cover treatment provides added protection for the slabs, and ease of maintenance for future wearing surface replacements.

Precast/prestressed concrete I-Girder: Concrete I girders replace conventional steel girders used in the construction of composite (steel girder/reinforced concrete deck) bridge superstructure systems.

535-2 LAYOUT AND CONTROL

Field layout for all precast/prestressed structural concrete units is the responsibility of the Contractor. Refer to the Standard Specifications, Section 105.6 for clarification of layout responsibilities.

It is recommended that the Contractor complete a full layout of each individual structural unit prior to delivery of any structural unit. Typical layout includes a clearly defined center/working line, centerline of bearings (to establish unit ends in relation to bearing areas) and individual offset lines (with unit

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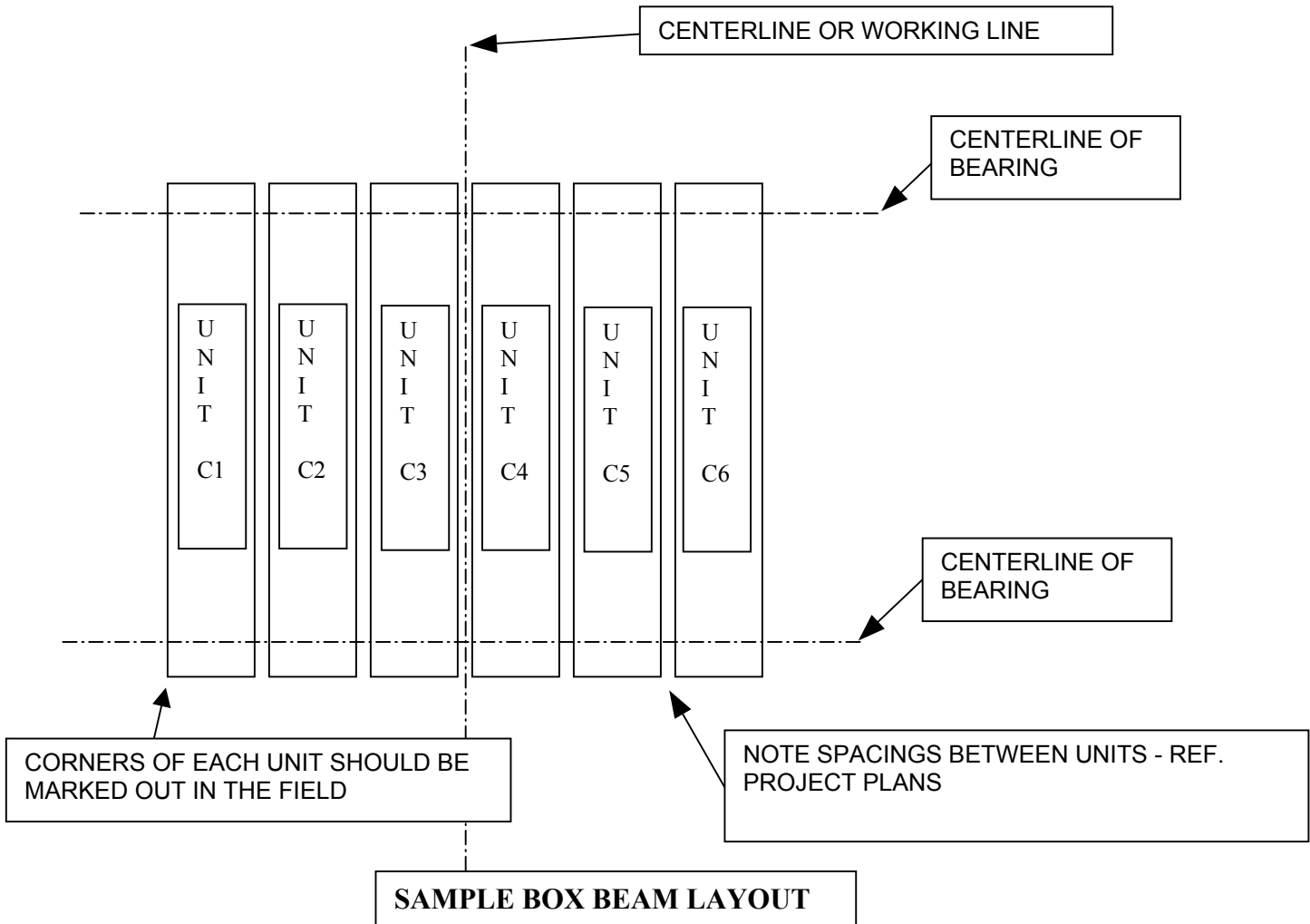
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spacings) for each individual piece (to assure that the total bearing width will support combined unit spacings and widths).



535-3 SAMPLING AND TESTING

Refer to the project specific “Minimum Testing Requirements” for this item; the minimums will specify the number and type of tests required. In most cases, minimum testing requirements will require certification of the product, covering all aspects of the manufacturing process; this certification should be on the manufacturing company letterhead.

During the manufacturing process, a complete Quality Control/Quality Assurance (QC/QA) procedure will be implemented. The QC/QA plan will cover all aspects of production testing, and detail all testing and inspection responsibilities of both the manufacturer and the Department. A “Pre-Production

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Meeting” will be scheduled with the manufacturer prior to the start of work, and after the Fabrication Engineer has approved the working drawings; the Fabrication Engineer will schedule the meeting with the manufacturer, and coordinate all plant inspection activities.

535-4 CONSTRUCTION

The primary focus is on the erection procedure for each type of unit and on incidental procedures required to complete all installation work associated with each respective unit. Once the units are manufactured and accepted through the QC/QA process, the manufacturer will deliver the units to the site. The product delivery schedule shall be organized by the contractor; prior to delivery of the product, the Resident should be assured of the following: (1) All QC/QA testing is complete and that the product has been accepted by the Department personnel at the plant. (2) The contractor has an erection plan for setting each respective unit; in some cases, the contractor will submit a detailed erection plan for setting each unit. Ultimately, it is the contractor’s responsibility to assure that adequate manpower and equipment is available on site for the erection procedure. (3) All layout is complete for the installation of the units. (4) All incidental work that is required to complete the item work is reviewed. This may involve post-tensioning, grinding bearing areas, grouting, or drilling for and setting end anchors/dowels.

Precast/prestressed concrete deck slabs: Precast deck panels shall be erected as shown on the plans. High-density Styrofoam temporary supports shall be attached to the outside edges of the top flanges of the girders, with an adhesive applied in accordance with the manufacturer’s published recommendations. The foam shall be field-cut to adjust the bottom-of-slab/blocking point elevations as required. If threaded jacking devices are cast into the panels, the bottom-of-slab elevations shall be adjusted with the jacks. The blocking points will be detailed on the Superstructure Detail Sheet, showing detailed bottom-of-slab elevations at specific locations on the I-Girder top flange surface.

After the precast deck panels have been erected, adjusted and sealed, the void between the top of the girder flange and the bottom of the panels shall be filled with a non-shrink, flowable, cementitious grout with a design compressive strength of 42 MPa [6000 psi]. The grout shall be one of the products listed on the MDOT’s list of Pre-qualified Grout Materials for Keyways. The grout shall be mixed, placed and cured in accordance with the manufacturer’s published recommendations. Vent holes shall be provided at 1 m [3 ft] intervals to prevent air lock.

Prior to placing cast-in-place concrete on the precast deck panels, the joints shall be caulked to prevent seepage of concrete paste.

Oil, grease and other contaminants that may prevent a bond between the precast deck panels and the cast-in-place concrete shall be removed by abrasive blast cleaning.

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Precast/prestressed concrete box beam: Precast concrete box beams shall be erected as shown on the plans, and in accordance with the following guidelines:

Bearing surfaces: The bearing areas must be properly finished to the required plan elevation. Typically, the unit bearing areas will set on a neoprene pad. The inspector shall assure that the bearing pad covers the entire bearing area of each unit, and that the anchor pin holes of the bearing pad line up with the anchor sleeves located at the box beam ends.

Initial Lateral Post Tensioning: Once the units are in place, and prior to grouting, assure that all post-tensioning strands are installed in the post-tensioning ducts; if the bridge has a large skew angle, the strands may have to be installed during the erection of each individual unit (in this case, the “dead-end/non-tensioning end” of the strand will be located within the keyways between the units). Gaskets of compressible material are required around duct openings within keyways to prevent blocking of the duct with grout; the gaskets are installed during the erection of the units (typically held in place with construction adhesive until the matching box beam unit is set). A seamless polypropylene sheath for the full length of the strand shall cover all strands, except at the anchorage location. An initial tension of 2,224 N [500 lb] per strand shall be applied to lateral post-tensioning strands prior to grouting; this step is required to take out any slack within each individual strand.

Longitudinal keyway grout: Longitudinal keyways between beams shall be filled with a non-shrink, flowable, cementitious grout with a design compressive strength of 42 MPa [6000 psi]. The grout shall be one of the products listed on the Maine Department of Transportation’s list of Pre-qualified Grout Materials for Keyways. The grout shall be mixed, placed and cured in accordance with the manufacturer’s published recommendations. Immediately before filling the keyway, it shall be cleared of debris. The keyway surfaces shall be soaked with water prior to placement of grout. The keyways shall be sealed to prevent material/grout loss; in most instances, round “backer rod” will be used to seal the bottom keyway gap.

Final Lateral Post-Tensioning: A tension of 129,000 N [14.5 ton] per strand shall be applied to lateral post-tensioning strands. The Resident should review the tensioning jack gauge reading to assure that the proper reading corresponds to the required final tension of 129,000 N [14.5 ton]. The tensioning jack must have documentation certifying calibration of the jack within the last 12-month period, and a table/chart detailing gauge readings with corresponding tensioning forces.

After tensioning:

1. The ends of the strands shall be sawn or abrasion cut not less than 32 mm [1¼ in] from the end of the wedge. The tendon tail and the gripping part of the anchorage shall be coated with corrosion-inhibiting grease and then capped with a watertight covering. The entire anchorage shall be watertight.

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Recesses at ends of lateral post-tensioning ducts shall be filled with grout using the same type cement as that in the pre-stressed slabs. Prior to installing the grout, the stressing pockets shall be clean of any dirt, grease, oil, or other material that may prevent bonding. Grouting shall be completed within 10 days of lateral post-tensioning.

2. The box beam end anchors shall be installed as detailed on the project plans. One abutment will have sleeves filled with MDOT approved asphalt filler; this end will act as the expansion end of the bridge. The other abutment will have sleeves filled with an MDOT approved anchoring grout; this end will act as the fixed end of the bridge.

No vehicular traffic, including the Contractor's equipment shall be allowed on the bridge until post-tensioning and end anchoring is complete.

Precast/prestressed concrete I-Girder:

Precast concrete I Girders shall be erected as shown on the plans, and in accordance with the following guidelines:

1. Assure that the contractor has completed all layout and installed all required bearing pads/pedestals as detailed on the project Plans. Field layout is critical in verifying girder lengths and girder end locations. This step should be completed well in advance of delivery.
2. A girder handling and erection plan should be prepared by the contractor and submitted to the Resident for review. This plan should be prepared and stamped by a Professional Engineer registered in the State of Maine. Keep in mind that concrete girders are extremely heavy, and require a great deal of crane power for proper erection. The plan should detail all temporary girder bracing, crane specifications (with lifting charts/comps), and a project site drawing, detailing girder delivery/loading areas and crane positions during the entire erection procedure. It is advisable to have the MDOT Fabrication Engineer review the erection plan to assure that any temporary bracing does not put unacceptable stresses on the individual girders.
3. Do not allow drilling of holes in the girders or the use of power tools on the girders.
4. Temporary bracing shall be provided to stabilize the girders until diaphragms are in place.
5. Review the diaphragm placement procedure with both the contractor and team designer; in most cases, the mid-span diaphragms can be placed prior to placing the reinforced concrete deck. The diaphragms located at the pier locations and abutment locations must be placed with the deck. It is worth noting that the formwork at the abutment and pier diaphragm locations is extremely critical; any form failure at these locations during the deck placement will adversely affect the entire deck placement. It is a very good idea to have Contractor

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personnel inspect these diaphragm sections for the entire placement duration. Keep in mind that this will ultimately be at the Contractor's option, but is worth noting as a good construction practice.

535-5 INSPECTION

Precast/prestressed concrete deck slabs: Prior to erection of the units, the Inspector should verify that all required contractor layout is complete, and that all temporary supports (Styrofoam/screw jacks) are installed as required. Each individual deck slab should be inspected for any damage that may have occurred during the loading and shipping of the unit; the Contractor is ultimately responsible for repairing any product defect. The most convenient time for this inspection is during the erection of the slabs, just prior to setting the slabs to the plan design locations.

Once all units are set in place, the next step is to make sure that all gaps between the bottom of slab and top girder flanges are sealed, and that all seams between the units are sealed. Prior to placing the grout, all debris must be removed from the top flange/bottom of slab cavity.

Check that the proposed grout is on the MDOT Prequalified List, and assure that the grout is mixed, placed, and cured in accordance with the manufacturer's guidelines. Once the grout is cured, the item should be complete, inspected, and accepted.

The following is an example of a complete entry covering construction inspection and acceptance:

Date: 9/9/02

weather: fair, 80's

Deck slabs for bays B1 and B2 delivered to project and erected in accordance with the erection plan; all slabs inspected and found to be free from any defects from shipping (note any defects found, and requests to the contractor for repair procedures; notify Fabrication Engineer and document telephone conversation). Scheduled to set remaining slabs tomorrow.

Date: 9/10/02

weather: fair, 70's

Deck slabs for bays B3 and B4 delivered to project and erected in accordance with the erection plan; all slabs inspected and found to be free from any defects from shipping (note any defects found, and requests to the contractor for repair procedures; notify Fabrication Engineer and document telephone conversation). Scheduled to place grout tomorrow.

Date: 9/11/02

weather: fair, 70's

All joints sealed @ top of girder/bottom of slab void; place Sika grout 212 as required per the project plans/details and in accordance with the manufacturer's guidelines. All exposed grout surface area covered with 2 layers of wet burlap.

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Date: 9/12/02

weather: showers, 70's

Curing good today.

Date: 9/13/02

weather: showers, 70's

Curing complete today. All precast slabs installed as required per project plans and specifications. This item is now complete, inspected, and accepted.

Note: If possible, put entries into an Inspectors Daily Report or the bound Final Quantity Book, and keep cross-referencing of field books to a minimum. Sign and date all entries.

Precast/prestressed concrete box beam: Prior to erection of the units, the Inspector should verify that all required Contractor layout is complete, bearing pads are ready, and that all bearing areas are properly finished. Each individual box beam should be inspected for any damage that may have occurred during the loading and shipping of the unit; the Contractor is ultimately responsible for repairing any product defect. The most convenient time for this inspection is during the erection of the beams, just prior to setting the beams to the plan design locations.

Once all units are set in place, the next step is to make sure that all post-tensioning strands are installed and initially tensioned as required. Once initial tensioning is complete, the bottom keyway gaps should be sealed with round backer rod and the end keyway bulkheads closed; the keyways shall be cleaned, wetted, and filled with an approved non-shrink grout. Once the grout is cured, the beams can be tensioned to the final tensioning force 129,000 N [14.5 ton]. The tensioning strands must be cut as required, and the fascia blackouts filled with grout using the same type cement as that in the pre-stressed slabs. The final step is to drill for and install the anchoring pins located at the beam ends; check with the project plans and make sure that one beam end is fixed (filled with non-shrink grout), and one beam end is expansive (filled with asphalt filler); prior to installing the pins, check the drill hole depths for the pins. Once the anchor pins are installed, the item should be complete, inspected, and accepted.

The following is an example of a complete entry covering construction inspection and acceptance:

Date: 8/1/02

weather: fair, 80's

Beams A1, A2, A3, A4, and A5 delivered to project and erected in accordance with the erection plan; all beams inspected and found to be free from any defects from shipping (note any defects found, and requests to the contractor for repair procedures; notify Fabrication Engineer and document telephone conversation). Tensioning strands installed through units as required. Tensioning gauge certification up to date/tensioning chart with gauge. Initial tension of 2,224 N [500 lb] applied to each strand; corresponding gauge reading of 2.1 equivalent to 2224 N [500 lb]. Bottom of keyways sealed w/backer rod, and keyway bulkheads installed; scheduled for grouting tomorrow.

Date: 8/2/02

weather: fair, 90's

All keyway grouted with Sika Grout 212; grouting procedure completed in reasonable compliance with manufacturer's guidelines. Top of keyways covered with 2 layers of wet burlap.

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Date: 8/5/02

weather: showers, 80's

Beam strands tensioned to 129,000 N [14.5 ton]. as required. Strand ends cut/capped as detailed, and all fascia blackouts cleaned and grouted.

Date: 8/6/02

weather: fair, 90's

Contractor drilled for and installed all anchor pins as per the project plans. Fixed end anchor pin @ abut. #1 filled with grout; expansion end @ abut. #2 filled with asphalt filler. All beams installed as required per project plans and specifications. This item is now complete, inspected, and accepted.

Note: If possible, put entries into the Inspectors Daily Report or the bound Final Quantity Book, and keep cross-referencing of field books to a minimum. Sign and date all entries.

Precast/prestressed concrete I-Girder: Prior to erection of the units, the inspector should verify that all required Contractor layout is complete, bearing pads/pedestals are ready, and that all bearing areas are properly finished. Each individual I-Girder should be inspected for any damage that may have occurred during the loading and shipping of the unit; the Contractor is ultimately responsible for repairing any product defect. If a girder is damaged, consult with the Fabrication Engineer for an approved repair plan (this plan will be required from the Contractor). The most convenient time for this inspection is during the erection of the girders, just prior to setting the girders to the plan design locations.

The critical link in this entire process is the erection plan developed by the Contractor. A well thought-out plan should eliminate any erection problems, and provide a clear procedure to install the girders in their plan design location. It is highly recommended to become familiar with the plan, and have a clear understanding of the entire process as developed by the Contractor. During the erection procedure, it is recommended to take pictures to document all aspects of the operation.

As the girders are installed, temporary supports will be required to support the girders until the diaphragms are formed, placed, and cured. Make sure that the temporary supports are installed as required by the erection plan/procedure. Once all girders are installed and temporarily supported, the item should be complete, inspected, and accepted.

The following is an example of a complete entry covering construction inspection and acceptance:

Date: 1/29/02

weather: fair, 20's

I-girders G1, G2, G3, G4, and G5 delivered to project and erected in accordance with the erection plan; all girders inspected and found to be free from any defects from shipping (note any defects found, and requests to the Contractor for repair procedures; notify Fabrication Engineer and document telephone conversation). Temporary supports installed as required.

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Date: 1/30/02

weather: fair, teens

I-girders G6, G7, G8, G9, and G10 delivered to project and erected in accordance with the erection plan; all girders inspected and found to be free from any defects from shipping. All girders installed as required per project plans and specifications. This item is now complete, inspected, and accepted.

Note: If possible, put entries into the Inspectors Daily Reports or bound Final Quantity Book, and keep cross-referencing of field books to a minimum. Sign and date all entries.

535-6 FIELD DOCUMENTATION, MEASUREMENT AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Inspector or Resident will note progress of work on this item. Notes relative to inspection such as, but not limited to, will be made, for example: detensioning, post-tensioning, and other key points of inspection.

Plant inspection reports will be made part of the project file.

Final Quantity Book: final quantity for payment will be lump sum. The quantity will be entered in the Final Quantity book, signed, dated, and referenced to Dairy entries for inspection and acceptance. **All calculations and data entries must be signed, dated, and checked; the checker and date his/her entries.**

Sample Final Quantity Book entry with (comments):

535.60 Prestressed Structural Concrete Slab		Est. = 1 L.S.
Refer to Bk. 3, pgs. 24 - 30 (for inspection/documentation), and Testing File Section 535 (for all testing requirements).	(Put inspection/acceptance notes here if all documentation is put in the Final Quantity Book; use other pages in this book as required. I.e. continues on page 75).	
<u>FINAL PAY QUANTITY: 1 Lump Sum</u>		
Entered by: <u>Signature/Date</u>		
Checked by: <u>Signature/Date</u>		
(Note: All entries should have check marks indicating that each individual entry has been checked, including the Final Pay Quantity)		

SECTION 600

MISCELLANEOUS
CONSTRUCTION

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Section 601 Gabions and Mattresses -- 1 Page

GABIONS AND MATTRESSES

601-1 GENERAL

Reference

- (1) Standard Specifications: Section 601, Section 711.02 thru 711.08
- (2) Plans and Supplemental Specifications

This work shall consist of furnishing, assembling, filling with stones and lacing hexagonal mesh wire baskets, hereafter called gabions or mattresses, constructed in accordance with these specifications and placed in conformity with the lines, grades and dimensions shown on the plans or established in the field.

601-2 LAYOUT

Layout will be done by the Contractor but should be checked by the Inspector for location and grade.

601-3 CONSTRUCTION

The Inspector should review the reference material and the manufacturers recommendations for installation of the type being used, being aware of any underdrain, geotextiles or special backfill to be used. Assure that the gabions or mattresses will fit as per the plan. Any changes should be approved by the Resident.

Assure that the baskets are laced correctly to the adjoining one, and stretched as per the Standard Specifications. Assure that the contractor is placing the rocks as per the Standard Specifications.

601-4 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Entries should be made in the Inspectors Daily Report or the Diary as the work progresses regarding adherence to manufactures installation procedures and materials specification.

Measurement for payment will be to the neat line dimensions shown on the plans. Entry for final payment should be entered in the Final Quantity Book, Inspector's Daily Report or other bound field book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 602 Flowable Fill -- 2 Pages

FLOWABLE FILL

602-1 GENERAL

References:

(1) Special Provisions and Supplemental Specifications

(2) Construction Manual

Section 206 - Structural Excavation

(3) Standard Specifications

Sections 701.01, 701.02, 701.03, and 703.01

Flowable Fill is used to fill excavations or voids where it is difficult or impractical to place and compact earth or granular material. This fill might be used in culvert cross trenches, under concrete slabs or granite curbing for foundation, in front of granite curb, or in old drainage to be abandoned. Public utility companies and public works districts often use this fill to achieve a trench backfill which will not settle in the future.

602-2 LAYOUT AND CONTROL

Layout will done be by the Contractor or Subcontractor. Care must be taken in providing for maintaining containment while the fill is being placed, as it can flow like water.

602-3 TESTING REQUIREMENTS

Testing requirements will vary, depending on proposed use of Flowable Fill and requirements of Special Provision Section 602 and Project Minimum Testing Requirements. Tests may include Pressure Air Meter, Strength Cylinders, Modified Slump Test, and Temperature.

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602-4 CONSTRUCTION

Measures must be taken to prevent the culvert from floating in pipe trenches. This may be done by driving re-bar each side of the pipe and using wire ties over the pipe. Mixes with 60 kg/M³ [100 lbs/yd³] to 71 kg/M³ [120 lb/yd³] of cement are recommended, as they are easily re-excavated in the future. Mixes with 89 kg/M³ [150 lb/yd³] to 119 kg/M³ [200 lb/yd³] of cement are not easily excavated with ordinary equipment. An air-entraining admixture in the mix makes it flowable. An accelerant admixture may be added when a quicker set is desired. The mix should be placed directly from the truck into the location, with as low a drop as possible. Earth berms, forms or shoring are used to contain the fill until it sets up.

602-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Measures taken for containment and displacement should be inspected for security. Placement of the mix should clear the sides of the hole to prevent erosion and contamination. The Inspector should make a diary entry of the work. Measurements of the void filled may be necessary, depending of the method of measurement. Payment might be by Lump Sum, delivery slip quantity or measured in place, but usually delivery slip quantities are used unless pay limits are designated.

Measurements should be placed in a Construction or Final Quantity Book. Lump Sum payment or delivery slip quantities could be put directly into the Final Quantity Book with reference to the work in the Project Diary. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 603 Culverts and Storm Drains -- 5 Pages

CULVERTS AND STORM DRAINS

603-1 GENERAL

References:

(1) Construction Manual

Section 206 - Structural Excavation
Section 604 - Manholes and Catch Basins
Section 605 - Underdrains
Division 800 - Utilities

(2) Standard Specifications

Section 206 - Structural Excavation
Section 502 - Structural Concrete
Section 509 - Structural Plate Pipes, Pipe Arches and Arches
Section 603 - Pipe Culverts and Storm Drains
Section 705 - Joint Materials
Section 706 - Non-Metallic Pipe
Section 707 - Metal Pipe

(3) Supplemental Specifications and Supplemental Standard Details for Construction

(4) Standard Details, Highways and Bridges

(5) Special Provisions

(6) OSHA Construction Standard for Excavations

The General Notes should be closely reviewed for data applicable to Culverts and Storm Drains.

Most full construction Project Plans incorporate a Drainage Sheet. This should be carefully reviewed and double-checked against the plans and cross-sections for locations, types of installations and special details or requirements. Differences should be resolved, so that the Resident can inform the Contractor in a timely manner of any changes, before the drainage has been ordered.

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It is the responsibility of the Resident to ascertain that the Drainage Inspector has become familiarized with the construction procedure and fully understands the Special Provisions, Specifications, and Plans.

The safety and convenience of public traffic are of primary importance. The Resident and Inspector should be sure flaggers are available when construction operations interfere with traffic, even if the interference is only for a relatively short period of time.

The Contractor should also be advised that two-way traffic must be maintained after working hours. It may be necessary to require the Contractor to work late to install enough culvert to allow two-way traffic, or a portion of excavated trench may need to be temporarily backfilled to achieve the same result. If backfill is placed for a pipe not carrying water, be sure the upstream end of the pipe is blocked off to keep dirt out of the pipe. The Special Provisions may require that water flow be maintained by pumping, in certain pipes. Check the Special Provisions, Section 105 in the Bid book for specific environmental requirements. Traffic control devices and signs, as indicated in the Standard Details and the MUTCD, should be utilized.

603-2 LAYOUT AND CONTROL

Line and grade for culverts and storm drains will be set by the Contractor prior to start of construction. If a change of location is considered necessary, it can be made before beginning installation. The Resident should recommend changing the design and location of culverts if it will be in the best interests of the Department. Additional easements may be necessary.

For most locations, the Contractor's foreman will compute the midpoint grade and sometimes the quarter point grade, depending upon the length of culvert or the width roadway that can be opened up at one time. Some foremen will compute grades for each length of pipe. If this is done, the Inspector should be sure that the grades figured are correct for the lengths of pipe used. If an Inspector does not know how to figure these intermediate grades, the Resident should instruct them. The Inspector should also check any control set by the Contractor's personnel.

Many Contractors are using laser beams for line and grade control of culvert and pipe installations. Inspectors should check pipes placed with laser control as closely as installations made by other conventional methods. Laser equipment must be used in accordance with manufacturer's directions. They can be set up wrong and are often easily upset by temperature changes and other atmospheric conditions.

603-3 TESTING REQUIREMENTS

Certification is required for all culverts, underdrain and gaskets, per Standard Specifications, Section 700

Residents or Inspectors will make a visual inspection prior to installation to detect any damage which may have occurred during shipment, or on the Project.

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603-4 CONSTRUCTION

The Resident should ascertain the status of property where it is necessary to provide unplanned ditches or ditching out of existing drainage ways when they are outside of the normal R/W limits. If culverts are relocated for any reason, the Resident should make sure there are no R/W problems, particularly concerning drainage easements at proposed new locations, or new underground utility problems which have not been considered, such as locations of sewer, water, or gas lines.

Refer to Division 800 of this Manual for information regarding Utility Section policy regarding location of utility lines.

The Resident and Inspector should be aware of possible water pollution and siltation problems that may exist, or be caused by installation of drainage pipes, or by ditching operations. The Contractor's SEWPCP plan will address these issues, usually calling for riprap and other erosion control items shortly after installation completion.

Deviation from the plan design in alignment or grade may affect environmental permits and drainage easements. The Office of Environmental Services and/or Right-of-Way Division may need to be advised of substantial proposed changes.

Trench excavation for drainage pipes is normally done with a backhoe. The Contract will require excavations to be done as per OSHA's "Construction Standard for Excavations"; deeper trenches will require sloping, trench boxes or shoring to protect workers. The Contractor is required to designate a "Competent Person" to identify hazards and take measures to protect workers. Construction personnel should be familiar with this OSHA manual and advise of any worker safety concerns without actually telling the Contractor what measures to take. It is the Contractor's responsibility to notify nearby inhabitants prior to blasting. The proper signs should be in position from the time explosives are brought onto the site until after the charges are detonated.

Poor soil conditions or rock may necessitate undercutting to provide for a solid bed of material under the pipe. The undercut area may be backfilled with suitable excavation, or granular material if necessary, and compacted. The Inspector should decide whether or not undercutting is necessary and what material to use for bedding. Granular material may be required with wet conditions.

In general, material excavated should be used as backfill to have uniformity with the surrounding roadbed, minimizing differential frost heaving. Objectionable material should be separated from usable material and used in slopes or wasted. Care should be taken to compact under the haunches of the pipe and to place backfill in maximum 200mm [8 in] layers. A 900 mm [3 ft] cover must be maintained over the culvert to protect it from traffic loads. This may be a fill of common material or Aggregate Subbase Gravel above subgrade. Longitudinal drainage (parallel to centerline) would not usually require cover as it can usually be barricaded off except at crossovers or side roads.

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603-5 INSPECTION

Upon delivery to the project, all pipes should be given an occasional check for general conformity to specification requirements and for damage. Pipe can be damaged in transit or by poor handling practices. Drying stress cracks in RCP culvert do not necessarily indicate unacceptable pipe. Rust spots or exposed metal is not necessarily exposed reinforcement. This usually indicates the ends of wire spacer supports that hold the reinforcement in position in the form. If any pipe has apparent manufacturing defects, the Resident should check with Technical Services, for AASHTO specification requirements.

The Inspector should ascertain that the layout stakes are properly located as to line and grade. If the grade doesn't look right for efficient drainage, check for errors and, if necessary, bring the situation to the immediate attention of the Resident.

For inspection, measurement, and documentation of excavation, see Section 206 of this Manual. The trench should be wide enough to allow installation of the pipe and compaction of the backfill. The culvert should be inspected for proper grade and alignment before it is backfilled.

Metal pipe connecting bands shall be drawn up tight and all bolts thoroughly tightened. RCP "O" rings shall be lubricated, and sections drawn together with joints open no more than 20mm [$\frac{3}{4}$ in].

Polyethylene and PVC pipe sections should be firmly seated. Lifting holes in RCP pipe should be plugged.

Special care shall be taken to obtain proper compaction under the haunches of the pipe to obtain firm support; caution should be used to avoid over tamping to the extent that the pipe is lifted out of position.

Many failures of culvert pipe in the past could have been avoided by proper backfilling. Concrete or corrugated metal pipe cannot withstand heavy embankment loads unless the backfilling is performed in strict accordance with the Standard Specifications. During pipe laying and backfilling operations, the Inspector should occasionally observe the trench sides to see if shear cracks are developing.

Larger diameters of corrugated metal pipe (1200mm [48 in] and larger) come with steel rod struts placed horizontally on the interior. These struts deform the pipe making a shorter horizontal axis to compensate for vertical loads imposed by backfill material. Just prior to final acceptance these struts must be cut. Both the workers and the Inspector should be very careful when the cuts are made, as the struts are usually under considerable tension and often jump around unpredictably when cut through. Cutting should not be done too close to the pipe as it will damage the pipe coating.

Special fittings for pipes may be incidental to the work, or will be paid for as a special bid item. In those cases where they are not a bid item or not indicated on the plans, it will be necessary to follow the usual procedure for extra work; i.e., get a Lump Sum price from the Contractor if possible, or do the work "Force Account".

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Specifications prohibit placing pipe between December 15th and April 1st without written permission.

The Resident or Inspector will make visual inspections of all culvert pipes placed, to ascertain if the pipe has become damaged by construction hauling equipment or construction activities subsequent to its installation. Near completion of the Project, open systems should be checked for debris accumulation; necessary cleaning is usually done by flushing with water under high pressure.

The Inspector will document quantities for payment as follows:

- a. Open System Culverts - Record the plan dimension plus any additional lengths due to authorized field changes for each location.
- b. Closed System Culverts - Actual quantity may vary from plan dimensions due to field changes in locations of catch basins or outlets. Quantities documented will be determined from the computed lengths as verified by installation notes or from field measured lengths.

All measurements and other pertinent inspection notes will be recorded in a Diary.

603-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Drainage Book, Construction Book: The Resident or Inspector will keep drainage installation notes in the Drainage Book if the drainage is extensive or in a Construction Book if the drainage is a minor contract item. Section 901-3 describes Drainage Books in more detail.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book under each appropriate item. Entries will be signed, dated, and referenced to the source documentation in the Drainage Book or in the Construction Book.

Excavation to install drainage is incidental to the item except for rock and excavation “below grade”, as defined in the Standard Specifications. If a boulder or a concrete obstruction measuring 2 m³ [2 yd³] or more is encountered in the excavation, that portion within the limits of the trench is paid as structural rock and the portion outside the limits is paid as common rock excavation. Portions within and outside the trench limits can be estimated in fraction, example “½ boulder outside trench.” In a “full construction” area, if a portion of the boulder or concrete is above subgrade, that quantity will be paid as rock excavation and deducted from common excavation. Undercutting of earth, up to 300mm [1 ft] is incidental to the pipe. Below 300mm [1 ft] is paid as structural earth excavation. Refer to 206-7 for a further description of structural excavation for drainage. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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MANHOLES AND CATCH BASINS

604-1 GENERAL

References

(1) Construction Manual

Section 603 - Culverts and Storm Drains

Section 605 - Underdrains

Division 800 - Utilities

(2) Standard Specifications

Section 206 - Structural Excavation

Section 502 - Structural Concrete

Section 704 - Brick and block

(3) Standard Details, Highways and Bridges, for types, construction details, grates, steps and special details.

(4) Supplemental Specifications and Special Provisions.

(5) OSHA Construction Standard for Excavations

603-2 LAYOUT AND CONTROL

Catch basins and manholes will be laid out by the Contractor.

604-3 TESTING REQUIREMENTS

Certification Letter, as per Standard Specification Section 700

604-4 CONSTRUCTION

Equipment used for this work will be substantially the same as described in Section 603 of this Manual. The units are almost always constructed of pre-cast components, i.e. tub, barrel and cone sections. Sometimes it is

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necessary to construct the units utilizing concrete blocks and clay bricks due to conflicts with utilities, or to fit existing conditions. Concrete bricks should not be used as they deteriorate rapidly. Conflicts may be avoided with the use of offset cones or no-sump basins. Sometimes it is necessary to use units over the normal 1200mm [4 ft] diameter because of the size and/or number of culverts connecting with the unit.

Block alignment should be neat, but not necessarily absolutely perfect. As long as it is structurally sound and will adequately serve its intended function, it will normally be acceptable. Cutting or leaving holes to insert the pipes later necessitates a patch job in the masonry. If such cutting or patching is necessary, care must be taken to insure that all voids are filled. Some catch basins have rubber gaskets in the culvert openings, eliminating the need of patching around the culverts.

It should be determined exactly how deep the finished structure will be before the bottom is set. The top of the cone should be about 300mm [12 in] below finished grate grade to allow for the frame, mortar and bricks. The construction of any masonry structure in freezing weather should be discouraged.

Soil conditions under catch basins and manholes are important because of the weight of the structures. It is often necessary to undercut and replace the soil with compacted granular material. These excavations often end up being quite wide in relation to the size of the structure. For this reason the material should be placed far enough back to prevent a cave-in of the adjacent banking. A trench box or shoring is often necessary to protect workers.

As a general rule, a Utility will not be asked to move or relocate its installation if it can be avoided. The final decision will be made by the Resident.

Backfilling is done to subgrade using the material excavated, except for undercut material, and then Aggregate Subbase Gravel is used.

The frames and covers of manholes should be left temporarily below grade until paving surface. This can be done by temporarily setting the top course of masonry without mortar and setting the frames to their approximate final grades (usually a little bit low). Another common method is to leave the frame and cover off entirely. In this case, the top of the masonry or concrete structure is covered with a heavy wooden or steel cap until the work is complete, except for the surface course. In either of the above methods, the material placed around and/or over the cap or frame and cover is removed by cutting out the pavement and base as necessary. The frame is then set to final grade, depressed as shown on Standard Detail 604(08), using the bituminous binder course as a guide and installing bituminous concrete around the frame and cover from the gravel grade to the surface. It should be noted that the gravel and pavement around the frame should be graded to provide a "trough" at the gutterline, as shown on Standard detail 609(05).

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When altering catch basins, assure all loose bricks and mortar are removed before setting the new assembly. When rebuilding units, the existing structure should be removed to solid concrete or brick, and replaced. With new, altered, adjusted, or rebuilt units, cleaning of the sump is incidental.

604-5 INSPECTION

The materials and components for manholes and catch basins should be inspected when delivered to the project. The Inspector should ascertain the basins conform to the plans; i.e. culvert hole location and grade and total height of the unit. Grates and frames should be carefully inspected for large "blowholes", fractures, thin sections and open casting joints.

The grate grade of installed units may be checked using string or a straight edge from the next to last pavement course. Grates should be aligned properly with the flow.

604-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Excavation to install drainage is incidental to the item except for rock and excavation "below grade", as defined in the Standard Specifications. If a boulder or a concrete obstruction measuring two cubic meters or more is encountered in the excavation, that portion within the limits of the trench is paid as structural rock and the portion outside the limits is paid as common rock excavation. Portions within and outside the trench limits can be estimated in fraction, example "½ boulder outside trench"

In a "full construction" area, if a portion of the boulder or concrete is above subgrade, that quantity will be paid as rock excavation and deducted from common excavation

After acceptance of the installations, the height from floor to top of grate should be measured and recorded for final payment. Units up 2.5 meters [8 ft] will be 1 each. One fifth of a unit [one eighth of a unit] will be added for each additional 0.5 meters [1 ft] over 2.5 meters [8 ft] measured to the nearest 0.5 meters [1 ft]. Rebuild, alter and adjust items are measured as 1 each.

Drainage Book, Construction Book: The Resident or Inspector will keep drainage installation notes in the Drainage Book if the drainage is extensive or in the Construction Book if the drainage is a minor item in the contract.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book under each appropriate item. Entries will be signed, dated, and referenced to the source documentation in the Drainage Book or in the Construction Book. **All calculation and data entries must be signed, dated, and checked; the checker must sign a date his/her entries.**

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UNDERDRAINS

605-1 GENERAL

References:

(1) Construction Manual

Section 206 - Structural Excavation
Section 603 - Culverts and Storm Drains
Section 703 - Aggregates
Section 706 - Non-Metallic Pipe
Section 707 - Metal Pipe

(2) Standard Specifications

Section 206 - Structural Excavation
Section 603 - Pipe Culverts and Storm Drains
Section 703 - Aggregates
Section 706 - Non -Metallic Pipe
Section 707 - Metal Pipe

(3) Standard Details, Highways and Bridges

(4) OSHA Construction Standard for Excavations

(6) Supplemental Specifications and Special Provisions

(7) List of Minimum Testing Requirements

605-2 LAYOUT AND CONTROL

Layout for underdrain will be done by the Contractor.

605-3 TESTING REQUIREMENTS

Pipe: Certification Letter, per Standard Specifications, Section 700

Gradations: Underdrain sand and stone; see List of Minimum Testing Requirements

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605-4 CONSTRUCTION

Underdrain systems are invariably located well within the R/W limits. However, if outlets are relocated, they should not create drainage ways without easements or flood areas inside or outside the existing right-of-way. Many underdrains flow continuously, creating such a problem. Outlets should go into catch basins, manholes, or culverts or be directed to existing drainage ways if possible. The Right-of-Way team member should be contacted to ensure there will not be drainage easement problems. The Resident should check that provisions are made for the pipe if a system outlets through a bridge structure.

The Contractor shall make a choice of pipe material for use in Type B and Type C Underdrain. Underdrain pipe should not be used to take the place of culvert pipe. The upstream end of pipes should be capped, or sealed with a stone and mortar or bricks and mortar.

The direct connection of existing or new drains from abutting property to underdrain pipe is prohibited by State law. Contamination from these drains could cause the effluent of the system to need treatment. Current policy does allow these drains to outlet into the granular material of underdrain trenches, but this policy may change in the near future.

The Resident will often have to make decisions on new locations for underdrain, depending on soil conditions in the field.

Methods of construction and type of equipment used for installation of underdrain are substantially the same as discussed in Section 603 of this Manual, except special backfill of stone and/or sand are required for all types of underdrain. Backfill around Type "C" up to the perforations should be with a relatively impervious material except when in rock as explained below. Granular backfill for Types "B" and "C" shall be placed in 200mm [8 in] layers to subgrade elevation. Care should be taken to keep the surrounding earth or other dirt from contaminating this special backfill material.

In rock cuts, the blasting and excavating usually removes rocks well below the required depth. It is permissible to backfill with broken ledge rock or with material meeting the requirements for underwater granular borrow. Type "B" will then be backfilled in accordance with Specifications. Type "C" should be filled with granular borrow to the perforations and then backfilled in accordance with specifications.

When underdrain is installed in fill areas, the policy is to place the fill to subgrade elevation and then excavate the fill for the underdrain.

Material excavated should not be wasted unless there is no possible use for it on the Project. The Contractor should plan on its use and leave enough space to place this material.

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When a substantial amount of water is flowing into the excavation, care should be taken to prevent water flowing directly into the pipe already installed as clay or silt may be washed into the pipe reducing its effectiveness. This can often be accomplished by using a sump or pocket on the inlet end of each pipe section; if necessary for the Contractor to flush the system it would be at no cost to the State.

Outlets should run into a catch basin, manhole or a culvert wherever possible, assuring the outlet should not freeze or clog up readily. When outletting into a culvert, the flow line of the underdrain should enter the culvert above the one-third point or slightly above the spring line. Pipes outletting out of slopes should have the end 150mm [6 in] above the adjacent grade of the ground to prevent the pipe from being buried in the future.

The impervious material used as fill for Type "C" underdrain should be at or near its optimum moisture content. Soil that is too wet can cause "floating" of the pipe when it is compacted under the haunches of the pipe. Compacting is done most efficiently with pneumatic hammer type equipment. Holes in Type "C" underdrain, plugged with impervious fill, must be completely cleared before backfill is placed. This may be accomplished with an air hose or with hand tools.

Crushed stone placed over Type "C" should be placed in one 150mm [6 in] layer over the top of the pipe. Initial lifts of sand should be 300 mm [12 in] in depth to protect the pipe from compaction equipment on both types of underdrain.

605-5 INSPECTION

The Resident will brief the Inspector on the expected duties, making sure they have the proper equipment and access to all pertinent data regarding underdrain installation.

Locations of underground utilities should be noted on the plans; if not, have the utilities dig test holes to locate them for possible interference with underdrain locations. If circumstances prevent the utility from digging these test holes, it may be necessary to hire the Contractor to dig the holes.

All underdrain pipes should be given a visual inspection on delivery for manufacturing defects and damage. Pipe that apparently does not meet our specification requirements must not be used until a final decision has been made as to its acceptability.

The inspection of Structural Excavation work is an essential part of the underdrain installation. Reference is made to Section 206 of this Manual, Structural Excavation.

Some contractors will set stakes and place a grade line at a given height above the flow line. A marked pole or survey rod is used in conjunction with a hand level to grade the trench bottom and set the pipe accurately. Where possible a laser is frequently used for grade and line control, greatly simplifying the work.

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Special connections such as wyes, tees, elbows or crosses should be tied into the project centerline so they can be plotted on as-built plans, permitting them to be located in the future in case of plugging or failure of the system. Special connections are usually paid as 1 m [3 ft] of the largest size in the connection, and runs are measured through the connection.

605-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Quantities for payment will be documented by either of the following methods:

- a. Measurement of each run during or after installation. This method may be used to arrive at a final quantity or a progress quantity.
- b. Field count of the number of sections installed. This method may be used in itself for progress payment and to verify length figured between two known stations for final payment or for progress payment.
- c. Lengths of special connectors, i.e., elbow, wye or tee, will be included in the overall measured or computed length of the run of underdrain.

Drainage Book, Construction Book: The Resident or Inspector will keep drainage installation notes in the Drainage Book, if the drainage is extensive or in the Construction Book if the drainage is a minor item in the contract. Section 901.3 – Field Books in Division 900, describes in more detail the content of these fieldbooks.

Excavation to install drainage is incidental to the item except for rock and excavation “below grade”, defined in the Standard Specifications. If a boulder or a concrete obstruction measuring two cubic meters or more is encountered in the excavation, that portion within the limits of the trench is paid as structural rock and the portion outside the limits is paid as common rock excavation. Portions within and outside the trench limits can be estimated in fractions, example “½ boulder outside trench”.

In a “full construction” area, if a portion of the boulder or concrete is above subgrade, that quantity will be paid as rock excavation and deducted from common excavation.

Final Quantity Book: Final quantities for payment will be entered in the Final Quantity Book under each appropriate item. Entries will be signed, dated and referenced to the source documentation in the Drainage Book or in the Construction Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries**

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GUARDRAIL

606-1 GENERAL

References:

(1) Standard Specifications

Section 708 - Coating Materials

710 - Rails and Posts

(2) Standard Details

Design locations for guardrail are listed in the Construction Notes, Plan View, and Cross Sections.

606-2 LAYOUT AND CONTROL

The Contractor shall lay out ends of guardrail locations with stakes. The Inspector should review the location of the stakes and ensure that the placement is appropriate for actual jobsite conditions. Check to see that the end locations are extended enough to shield the hazard that the guardrail is intended to protect. Remember that end treatments do not count as protection when looking at length of need. Check to see if the guardrail run can be extended to eliminate an end treatment. If there is an appropriate place within 50 to 75 meters [up to 250 ft] for a radius, the radius end should be used. This is because it is typically cheaper, especially factoring in maintenance cost, to extend the run than place an end treatment with a widening. Any changes must be approved by the Resident, and a revised list of guardrail locations should be presented to the Contractor. Final end locations shall be staked prior to constructing shoulders or shoulder widening areas.

Actual line and grade for the guardrail run is set by the Contractor. The centerline paving joint is usually used for horizontal control, and the finished shoulder grade for vertical control. The Contractor may set up a string line to use as horizontal and vertical alignment for installing the posts. A common error is to crowd the line string with one post, thereby upsetting the alignment of all the others in that run of rail. Keep in mind that precise line and grade is not necessary. However, minor location adjustments can and should be made for visual appearance. It is important that the finished installation look correct to the eye because this is the way it will look to the motorist. Particular care should be taken on horizontal curves that several intermediate points are set to provide a smooth continuous curve. The offset from the roadway centerline should also be checked. Guardrail should not be placed closer than 1.2 m [4 ft] from the edge of travel lane or 5 m [16 ft] from the

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centerline of the roadway. The greater distance will control. (The 5 m [16 ft] minimum is critical to accommodate snowplow widths).

When the Contractor lays out guardrail and end treatments (MELTs, 350s, etc.) particular care should be taken to determine the exact locations of electrical conduit, underdrain, culverts and other underground installations. According to Dig Safe regulations, these utilities should be located and well marked. If underground conflicts exist with proposed guardrail locations, bring it to the immediate attention of the Resident. The Contractor is responsible for repair of damaged underground installations.

606-3 TESTING REQUIREMENTS

Beam Type Rail-Steel Posts-Offset Brackets and Fittings:

Certification - Refer to Division 700, as per the List of Minimum Testing Requirements.

Pressure Treated Posts, Wood and Polymer Blockouts:

Certification - Refer to Division 700. as per the List of Minimum Testing Requirements.

606-4 CONSTRUCTION

Contractors may either drive guardrail posts or hand-dig the holes. However, if the holes are dug deeper than required the fill under and around the posts must be backfilled in layers not exceeding 100 mm [4 in], and it must be thoroughly compacted. The Contractor must trim neat straight edge lines, and then fill the entire hole created by driving the post. If the guardrail is on a paved shoulder, ensure that bituminous patching is completed around the posts. The intent of this is to prevent erosion from occurring around the posts. Ensure that any posts that become damaged (bent, distorted, etc.) be removed and replaced. Also, check to see that the posts are set reasonably plumb and are at the correct height (730 mm [28 in] from finish ground level to top of post). If the guardrail height is outside of this range it needs to be adjusted to the proper height.

Placing posts on or in solid rock can be done in several ways. The preferred method is to blast the rock and set full-length posts in accordance with Plans and Specifications. In areas where blasting is not allowed, the rock can be removed with a jack-hammer. In situations where blasting is unwise or impractical, other methods may be used, but the method must be approved by the Resident. Sometimes posts can be shortened and set in concrete on top of the rock. Another solution may be to eliminate a post in an area of conflict and double up the W-beam in that section. When guardrail is to be installed in a fill section, rock shall not be placed in the embankment under the location of the guardrail to an elevation 1.2 m [4 ft] below the finished grade of the shoulder.

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Single posts for mailboxes should be placed at a location acceptable to the property owner and in accordance with Standard Detail 606(01). In case of conflict, postal requirements should be given the greater consideration. Ensure that multiple mailbox assemblies are constructed in accordance with Standard Detail 606(02). If they are supported by a plank, they are considered deadly fixed objects and should be replaced with a breakaway device. When existing mailbox facilities are removed due to construction, the boxes and posts, if necessary, shall be removed and placed beyond the lines of improvement. Further disposition or arrangements for mail delivery is up to the individual property owner.

606-5 INSPECTION

The Inspector should have a pop level, folding rule or tape, and a set of plans showing locations and details of the guardrail on the project. The Inspector must also be familiar with the Standard Details and specifications involving the types of guardrail to be constructed. Any new runs of guardrail on the NHS shall pass NCHRP 350 standards and be approved by FHWA. For Non-Proprietary guardrail devices (such as NCHRP 350 terminal ends), Contractors must submit a set of installation drawings and manufacturer's specifications to the Resident for approval of the device prior to installation.

When pressure-treated wood posts with pre-bored holes and pre-cut tops are used, the location of the holes is critical to the function of the guardrail. When wood posts are delivered they should be checked for dimension, spacing and location of holes, and that they do not have any serious structural defects as specified in the Standard Specifications, Section 710.07. Component parts should be checked for Plan and Specification compliance. Small pieces in particular, such as nuts, bolts, washers, spacers, clips, and similar items are all required to be hot dip galvanized and should be checked.

If previously erected guardrail is damaged during any non-suspended period that the Contract is in force, the Contractor is responsible for the repair of the damage incurred. (Refer to Section 104.2.7 of the Standard Specifications.) If damage occurs during a suspended period, it is the general policy of the Department to pay for the damage. Damage to guard rail that has apparently been done during the winter should be brought to the attention of the Construction Support Manager before a final decision is made on who is responsible for payment. (It may be possible that a State Maintenance crew will do the work.)

When installing new guardrail runs, the length of the run needs to be taken into consideration. The lane of traffic next to a guardrail run cannot be opened with an exposed end. A temporary end treatment must be installed nightly on uncompleted runs exposed to traffic.

Final acceptance should not be given until the installation is properly aligned and has a uniform appearance. Adjustment of new guardrail runs is included in the new guardrail price. Adjustment of existing runs where beams have been replaced is paid through the new beam areas. After erection, a check should be made to be sure that all bolts are in place and tightened. Also, check the w-beam rail to ensure that it was installed

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correctly. It must be lapped over in the direction of traffic flow so that the beam doesn't penetrate the vehicle in the event of a collision. Ensure that delineator posts are installed on the ends of the guardrail runs as well.

When connecting guardrail to a bridge, ensure that the first guardrail panel before the end post is a double layer modified guardrail panel and the additional guardrail posts are spaced as shown on the Standard Details, 606(25) and 606(26). The "Michigan Shoe" attachment must be lapped with the exposed end away from approaching traffic. Also ensure that the materials used for installing anchor bolts are on the current MDOT pre-qualified product list for anchoring materials. This list is available from the MDOT Internet site (<http://www.maine.gov/mdot/planning/products/product.htm>) or from the Bureau of Planning. When completing a splice due to a bridge connection, the length of panel must be at least two panels long, each 3.81 m [12.5 ft], or a total of 7.62 m [25 ft] from the end post prior to making the splice. When the existing run is 61 m [200 ft] or less, however, the entire run should be removed and reset and posts driven at the proper spacing.

The Inspector must check the galvanized surfaces of guardrail components. Any components that have been abraded or cut (such that the base metal is exposed) must be cleaned and painted with two coats of zinc galvanized rust-resistant paint.

606-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will document the Contractor's progress on guard rail items. If guardrail work on the project is extensive and if several items are involved, for example: remove, modify, and reset, or adjust, or remove and reset, the Resident should set up a "guardrail book". Each run guardrail to be worked on will be entered in this book primarily by location, i.e. station to station, left or right, and further identified by type of work to be done, whether remove, modify, and reset, or adjust, etc. As a run is complete and accepted, it will be so noted by the Inspector and dated.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book, signed, dated, and referenced to source documentation or noted as original entries.

Final quantities will be field measured or figured from station to station. **All calculation and data entries must be signed, dated, and checked; the checker must sign a date his/her entries.**

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FENCING

607-1 GENERAL

References:

(1) Construction Manual

Section 1001

(2) Standard Specifications

Section 710 - Metal Components

502 - Structural Concrete

(3) ASTM A-153

(4) Standard Details

Locations for types of fencing required are listed on the plan sheets, and are usually drawn on the Plans if a definite location has been established.

Concrete for posts or anchors should not require the services of a specially trained concrete plant inspector. This concrete is not for structural strength as such, but is more of a special fill. Depth of holes in ledge, size of forms for concrete and type of concrete are specified on the Standard Detail Sheets, Section 607.

On controlled access R/W, the State is responsible for the maintenance of permanent fencing. On R/W with no access control, the property owner maintains permanent fencing.

Fences erected under contract on highway projects will be located as follows:

Chain Link or Cattle Fence on Controlled Access R/W projects shall be erected with the fencing on the side of the posts away from the highway and so located that the fencing and posts are entirely within the Right of Way. It is suggested that the center of the posts be set on a line 150mm [6 in] inside the Right of Way Line.

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On all other projects, the fencing shall be installed entirely outside the Right of Way limits with the fencing on the side of the posts away from the highway. It is suggested that the center of the posts be set on a line 150mm [6 in] outside the Right of Way Line.

607-2 LAYOUT AND CONTROL

All layout necessary for fencing will be the responsibility of the Contractor. Depending upon the location it may be necessary to use a Survey Crew. When fencing is along R/W lines, it will be necessary for these lines to be precisely located. The Contractor will locate the fencing from the above control as required by the plans. Verification of location is suggested.

The amount of fencing required on a job often varies from the Plans. It is not uncommon to have a given quantity of fence at an "undetermined" location. The Contractor should be given a complete list of types and locations of fences required, far enough in advance to permit the ordering of materials.

Shop drawings are not normally necessary as detail sheets found in the Standard Details give sufficient data for most cases. However, special cases can always occur, for extra wide entrances or other situations requiring special details or equipment. In such cases, shop drawings will be requested, usually as a part of the Specifications. Approved copies must be on file before materials are ordered or work is started on the phase covered by the shop drawings.

607-3 TESTING REQUIREMENTS

Gates, Wires, Fabric, Posts & Braces: Certification - Refer to Division 700. It is recommended that a call be made to the Supervisor of Independent Assurance in Bangor, (207) 941-4531.

607-4 CONSTRUCTION

Where fencing is shown to be located within the R/W, the fencing Contractor must take extreme care that he does not encroach on abutting property unless the expressed permission of the Owner is obtained in writing. Where fencing is shown on the plans to be located off the R/W, the Right to Work Permit is obtained by the R/W Division. Spacing of posts is shown in 607(8) of the Standard Details.

Methods of accomplishing the work and the equipment necessary are fairly standard. Postholes are usually dug by machine if the location is in earth and is accessible. Otherwise, they are dug with hand operated gasoline powered augers or by hand labor.

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Single holes drilled in rock for metal posts should be at least 25mm [1 in] larger in diameter than the largest dimension of the post to be used. A sand-cement grout should be used to set posts in the drilled holes. Posts should be carefully plumbed when mortar is placed, making sure that the bracing used cannot be readily disturbed.

Fencing is not usually erected after frost penetrates more than a few inches, unless posts have been previously set. Fabric or wire can, of course, be placed any time as long as deep snow does not interfere.

Near the end of a run (approximately 12 to 18 meters [40 to 60 ft]), the bays should be balanced out to eliminate one or two obviously unbalanced bays at the end of the run. Round section bracing will usually be acceptable if the cross-sectional area is equal to the square bracing specified.

607-5 INSPECTION

Any layout the Contractor does should be checked by the Inspector assigned to cover the fencing items. It is easy to make the mistake of locating a fence 150mm [6 in] inside the R/W line when it is supposed to be 150mm [6 in] outside.

The Inspector will record work as it progresses, in either the Project Diary or an Inspector's Diary; i. e. station-to-station limits, fence length and other pertinent documentation. The Final Quantity accepted for payment will be field measured. Measurements will be recorded directly in the Final Quantity Book.

607-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will note the Contractor's progress on this item. Location of work, crew and equipment will be recorded.

Quantities for payment will be determined from field measurements or from plan dimensions verified by field notes. Notes and measurements will be entered in the Final Quantity Book.

Final Quantity Book: Final quantity for payment will be signed, dated, and referenced to field measurements, if such measurements are not entered directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Section 608 Sidewalks -- 2 Pages

SIDEWALKS

608-1 GENERAL

References:

(1) Standard Specifications

Section 403 - Bituminous Concrete

502 - Structural Concrete

705 - Joint Fillers

709 - Reinforcing Steel

(2) Standard Details Book (December 2002)

The general policy regarding existing walks is that they will be replaced at no cost to the Municipality, additional sidewalks are often paid for partly by the Municipality as per a Municipal/State Agreement. The only items involved in this cost are the gravel base and the pavement. Typically, items to be paid for by the Municipality have a different category number on the Progress Estimate Form.

Cross-sections usually give more accurate information as to exact location in relation to construction or survey base lines, and also exact width, transitions and other data necessary.

608-2 LAYOUT AND CONTROL

Locations, widths and types of walks are indicated on the Plans and Cross-sections. In most instances, sidewalks are constructed directly behind curbing. In those locations where they are directly behind the curbing, an offset line from centerline will provide an adequate basis for location by the Contractor.

608-3 TESTING REQUIREMENTS

None specifically required - Refer to Sections 304, 401, and 502 for tests required on items involved.

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608-4 CONSTRUCTION

Excavation to subgrade for walks will usually be done when the roadway is excavated. Sometimes this part of the work is left until last and the work done by an all-purpose excavator, or even by hand. In fills, material is placed and compacted as a part of the roadway embankment. Grading of subgrade and placement of gravel base is usually done after curbing is completed. Fine grading is by hand, just prior to placing of portland cement concrete or bituminous concrete pavements.

Finishing of the surface on Portland Cement Concrete walks can vary from the "shell" finish specified. The Special Conditions and Supplementary Specifications should be carefully checked. The finish requirement could also be varied if the walk abuts an existing sidewalk with a finish different from that specified. Joints finished with a grooving tool are becoming less and less common. This is done more often with joint cutting saws, in sidewalks as well as roadways.

608-5 INSPECTION

The usual equipment for field inspection is necessary. In addition, a string level or a carpenter's level is quite handy for accurate checking of the relatively small slopes of sidewalks.

608-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary: The Resident or Inspector will note the Contractor's progress or work on this item, compactive effort, depth of gravel, thickness of pavement; proper cross-slope will be recorded.

Field Measurements will be entered directly in the Final Quantity Book for sidewalk measured by the square meter [square yard]. For sidewalks measured "by the item", delivered slips will be taken for hot bituminous pavements, gravel will be figured separately, either in-place or by the delivery slip if the work consists only of shimming the existing sidewalks, gravel may be included in the overall plan quantity for roadway gravel and therefore paid as part of the roadway gravel.

Final Quantity Book: For sidewalk paid by the unit, measurements will be entered directly in the Final Quantity Book. For sidewalk paid by the item, quantities for payment will be entered under the appropriate pay item elsewhere in the Final Quantity Book. **All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work.**

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Section 609 Curbing -- 4 Pages

CURBING

609-1 GENERAL

References:

(1) Construction Manual

Section 612 - Bituminous Hand Sealing

(2) Standard Specifications

Section 609 - Curbing

(3) Standard Details

The type of curbing for a particular project will be as indicated on the list of bid items for that project. Normally, this will be one of the types designated in Section 609.01 of the Standard Specifications. The only variation will be in the case of special Cast-in-Place Portland Cement Concrete Curb. If such is specified, detailed Supplementary Specifications and appropriate drawings will be provided.

Vertical curb is generally used to keep water within the roadway, as a safety barrier between the traveled way and sidewalks, to keep sidewalks high enough to allow drainage to go into the gutter, and to define entrances to abutting property. Mountable-sloped curb is used around the perimeter of traffic islands and median strip for channelization purposes where emergency traffic can strike it or ride over it without going out of control.

609-2 LAYOUT AND CONTROL

In general, granite and concrete curb layout is shown on a separate plan sheet showing offsets to radii, PC's, and PT's based on computer data. If such a plan is not with the regular set of plans, it can be obtained from the Design Division. Layout will normally be done by the Contractor.

a. Granite or Concrete Curb The Contractor is responsible for grades required. In many cases, grades can be best obtained from the adjacent paved roadway by an offset line of nails placed in the base or binder course.

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b. Granite Edging Layout for edging is most commonly done by placing an offset line of nails on the base or binder course. Elevations are then taken on these nails and they are used as line and grade control to the top arris line. Lines for islands and short radii may be set by swinging a tape from the radius point as shown on the plans.

c. Bituminous Curb Layout for bituminous curb on roadways is usually done from centerline control points by locating an offset line on the pavement already placed. This line can be at actual curb line or be placed one foot inside the curb line and the Contractor will establish actual curb line just prior to placing the curbing. In general, grade is predetermined by the pavement grade. The exception is at catch basins and curb inlets. These areas should be shimmed so that the top of the curbing will be a true grade with no obvious sags and humps.

609-3 TESTING REQUIREMENTS

- a. Granite - none required.
- b. Precast Concrete - Letter of Compliance from Materials & Research.

609-4 CONSTRUCTION

Sectional type curb or edging should be handled with care when delivered to the project. A canvas sling or a set of steel tongs is usually used to prevent spalling and breakage.

Rough excavation is usually done just prior to setting final batter boards or pins for string grades. The rough grade should be thoroughly compacted at or near the correct moisture content, and left about one inch higher than the minimum final grade required. Proper compaction is very essential in order to help prevent undue future settlement of the curbing. Best practice dictates that aggregates over 25mm [1 in] be raked out of the top 50 to 75mm [2 to 3 in] of base directly beneath the curbing to facilitate fine grading and proper bedding of the curb stones. A final check for correct line and grade should be made just before placing surface course and adjustments made, if necessary.

A new method of installing granite curb has been tried with great success. A trench is dug in the gravel base to approximately 100mm [4 in] below the bottom of the curb and is thoroughly compacted. The curb is placed on small wooden wedges, set at each end of the curb. By gently tapping the wedges, the curb can be easily brought to line and grade. The curb is covered with a strip of plastic sheeting and fill concrete is placed, in the trench, under and around the curb up to the level of the Binder. This method of installation would be directed in the Special Provisions. An Extra Work Order is necessary to add this installation method after the Bid opening.

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a. Granite or Concrete Curbing Stones adjacent to previously set curb inlet stones must be set first and doweled using epoxy grout specified [Refer to Standard Detail 609(03)]. The remainder of the curb should be set working away from inlet stones.

Vertical type curb should preferably be installed prior to the binder course of bituminous concrete being placed, but can be installed prior to placing surface.

After bedding the stones, they are to be backfilled to subbase in thin 100 to 150 mm [4 to 6 in] layers of gravel base. Layers should be carefully and thoroughly tamped with a thin heavy tamping tool. Fill should be brought up equally on both sides of the stones as much as possible. Backfill material should be wet as necessary to obtain maximum compaction.

Contractors often leave the base course back 150 to 300 mm [6 to 9 in], set the curbing, and fill on one or both sides with binder or surface mix. Base course mix can be used but only to depth of base course. This fill material is placed by hand, but is paid for as machine-placed binder. (Refer to the Construction Manual, Section 401-5.) Layers should not be over 100 mm [4 in] thick and must be well compacted.

Actual and final locations of drive openings are best determined by eye in the field to be sure that they are located correctly in relation to the driveways as used. Widths should be according to plan. Plans usually call for a specified curb opening at driveways regardless of existing width of the driveways. There should be no objects in the curb line that would break a run of curbing. Present policy dictates that any object cannot be closer than one foot behind the face of the curb.

b. Granite Edging Edging should be placed before the wearing course of bituminous paving is placed. It should be placed so that the bottom arris line (at the gutter) will be at or below the finished pavement grade.

c. Bituminous Concrete Curb Bituminous curb should be placed to the exact line marked out. At catch basins where the grade is shimmed, it is very important that the shimming is correctly and carefully done with a fine sand mix or level mix. Otherwise, the end points will be rough and a sag with an adjacent hump accentuating it will result. A check should be made to be sure there is no bond-breaking paper in back of the face of the curb line where the shim material is placed.

609-5 INSPECTION

Curbing for a specific project is sometimes inspected at the manufacturer's plant. If this is done, it is at the Contractor's request in order that they may be paid for curbing that has been set aside for the project but has not been delivered to the job site. (Refer to Sections 108.2.1 and 108.4 of the Standard Specifications.) This does not mean that individual pieces cannot be rejected when they are delivered to the site. Standard Specifications, Section 712.04 shows the allowable tolerances for all types of granite curb and granite edging.

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Checks should be made for the minimum length required for circular granite curb [Standard Detail 609(01)], and for anchor bolt holes and end finish [Standard Specification 712.04 (e)] for bridge curbing.

Width of joints between individual stones can be controlled with a piece of wood of about 10 mm [$\frac{3}{8}$ in] in thickness. It is a good practice where bituminous concrete walks about the back of granite or concrete curb to use bituminous mix behind joints to prevent filtering of sand or loam through the joint.

Stones that get stained from fuel oil can often be cleaned with a strong detergent solution or Fuller's Earth or a combination of both. On bridge curbs, it is permissible to allow the linseed oil used on concrete to be used on the granite curb if the entire curb is covered with the oil.

Inspection of granite curb and edging should be made prior to placing the bituminous concrete wearing course. Checks should also be made during the paving operation to correct displaced stones before the mix cools and the stone is locked out of position. Portions of bituminous curb to be reflectorized should not be sealed.

609-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project diary, Inspector's Diary/Daily Report, Construction Book: The Resident or Inspector will note the Contractor's progress on these items; approximate station to station limits of work, crew, and equipment will be recorded.

Field measurements should be made after curb has been installed. Measurements shall be as specified and as shown on the Standard Detail Sheets, taking into account terminal ends and circular granite curb. There is no difference in price for circular bituminous curbing. Measurements shall be recorded in the Final Quantity Book. If the curbing is extensive, the Resident should set up a "curb Book" or at least a part of the construction Book before the contractor begins work. The location of each item of curb, i.e., "new", "reset", or "circular", and others, should be identified by sketches, station to station limits, left or right.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book, signed, dated, and referenced to measurements.

No separate payment is made for excavation to install curb, whether new or reset. Excavation is incidental to the curb item or to roadway excavation. There is no payment to remove existing curb. Only curb that is reset is measured for payment. Removal of existing curb that is not used is incidental to other items in the contract. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Section 610 Stone Fill, Riprap -- 2 Pages

STONE FILL, RIPRAP, STONE BLANKET, AND STONE DITCH PROTECTION

610-1 GENERAL

References:

(1) Standard Specifications

Section 610 - Stone Fill, Riprap, Stone Blanket and Stone Ditch Protection

Sections 703.25 thru 703.29 - Materials

(2) Standard Details

Section 610

(3) Best Management Practices for Erosion and Sediment Control

This work shall consist of excavating for and constructing a protective covering of stone, with or without grout.

610-2 LAYOUT AND CONTROL

Layout will be done by the Contractor, but should be checked for location and slope prior to work being started. This can be done with batter boards and a string line or a hand level and a wooden ruler.

610-3 CONSTRUCTION

As a rule of thumb, a cubic foot rock will average 68 to 77 kg [150 to 170 lb].

Larger stones should be used at the bottom of the slope. The bottom layer should be set in a toe trench to support the stone.

Stone Ditch should be angular so it can be keyed in to the other stones. It is typically placed 300mm [1 ft] deep and is placed on erosion control geotextile (See the Construction Manual, Section 620).

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Section 610 Stone Fill, Riprap -- 2 Pages

Riprap must be angular and clean according to Specifications. Pit tailings are not allowed. Riprap is typically placed 450mm [1.5 ft] deep and is placed on erosion control geotextile (See the Construction Manual, Section 620). Blasted ledge from the project often can be used as Riprap, as long as the size and cleanness is acceptable to the Resident.

When grout is called for in the Plans or Special Provisions, the grout should have the consistency of heavy cream so it can flow and fill all voids.

610-4 INSPECTION

Normally, excavation is incidental, the Inspector should check the Plans and notes for verification. The final acceptance of riprap areas may be contingent upon neatly cleaning up the surrounding slopes of all debris and choking up all voids with gravel or broken rock securely rammed into place. Riprap to be grouted should be left open enough for grout to run down through.

610-5 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary, and Construction Book: The Resident or Inspector will make notes documenting progress of work on these items. He/she will record source of material, whether rock from within the excavation limits on the project, pit tailing, or rock quarry. Measurements, sketches, and computations will be recorded in the Construction Book or directly in the Final Quantity Book.

Final Quantity Book: Final quantity for payment will be entered in the Final Quantity Book, signed, dated, and referenced to measurements and calculations. Quantities will be determined from surface area measurements to limits authorized by the Resident and to depths shown on the plans.

If riprap or stone fill is placed under water or on rough, irregular ground as required by the Resident or called for on the plans, quantity for payment can be measured by delivery slip with no reduction in volume. References are made to Section 610.05 of the Standard Specifications.

If the source of material is rock excavation, there will be no deduction from borrow, even though rock excavation is designated for use in the embankment, i.e., even though the project is a "borrow" job. Standard Specifications, Division 100, Section 104.3.13 allows the use of ledge for items designated under this Section without deductions from borrow.

There will be no payment for excavation beyond the face of riprap, stone ditch protection and stone blanket; only the excavation from original ground to face of the finished slope is allowed, i.e. excavation is incidental to riprap where rock is actually placed. More detailed explanation is given in Section 610 of the Standard Specification. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 612 Bituminous Sealing -- 2 Pages

BITUMINOUS SEALING

612-1 GENERAL

References:

(1) Standard Specifications

Section 612

Section 702.12

(2) Standard Details 609(03)

Emulsified sealing compound is occasionally applied on bituminous curb (when the mix does not have a “tight” appearance. A very rare situation with today’s curb mixes), paved gutters and paved islands (when directed on the Plans) to improve water-shedding properties and to improve appearance. The material is commercially marketed, usually delivered in five-gallon pails and has the capability of being diluted with additional water, if needed. Islands, medians and crosswalks may instead be included under Item 658.20 if an acrylic latex color is specified.

Sealing the shoulder area on a bridge is incidental to the bridge paving, and is discussed in the Standard Specifications, Subsection 403.03 (e) and (f).

612-2 LAYOUT AND CONTROL

Bituminous curb should be painted only on the top and front face. If the ends are to be reflectorized, sealing should not be done because it may bleed through the white paint. The vast majority of bituminous curbing will not need to be sealed with the finish today’s mixes give. This item is typically a throw in estimate and rarely used in the field.

Using the sketch shown on Standard Detail Sheet 609(03), the area to be reflectorized can be marked off on each run of curb, a top line designated, and the remaining area sealed with two applications of compound. Downspouts and islands, if not included item 658, will be completely covered with two coats.

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612-3 TESTING REQUIREMENTS

None required - must conform to specification requirements Subsection 702.12

612-4 CONSTRUCTION

Sealing compound is delivered either in diluted or in concentrated form. When diluted by the manufacturer, it should be used as it comes from the can. When undiluted, it should be diluted by adding not more than 50% water (i.e.-5 gallons of water to 10 gallons of undiluted emulsion). A stiff-bristled brush or broom works well on curb and downspouts, whereas a squeegee or sponge mop works better on island surfaces and will not leave brush marks. The areas treated with sealing compound must be protected with the use of traffic control devices when subject to vehicle, bicycle or pedestrian traffic for drying purposes.

Different name brands of sealer seem to act differently with the addition of water. Therefore, some experimentation by adding water slowly until a good workable mixture is produced is generally acceptable procedure.

612-5 INSPECTION

Areas to be sealed should be checked for cleanliness. Normally, sweeping and blowing is sufficient. Two coats are required, and drying required between coats. Air temperatures and sunlight will influence drying time. Notes should be included in bound book for documentation of manufacturer of material used, mixing and application.

612-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary: Appropriate notes will be made in the project records regarding weather conditions, temperature, and brand name.

Final Quantity Book: Final quantity for payment will be determined from field measurements or plan dimensions or a combination of both and will be properly referenced to the source documentation. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Section 613 Erosion Control Blankets -- 2 Pages

EROSION CONTROL BLANKETS

613-1 GENERAL

References:

Standard Specifications

Section 613 - Erosion Control Blankets

Section 615 - Loam

Section 618 - Seeding, Fertilizer, Lime

Section 619 - Hay Mulch

Section 717.061 - Erosion Control Blankets

Section 717.063 - Ground Anchors

Best Management Practices for Erosion and Sediment Control

Erosion Control Blanket, as specified in Special Provisions, will be used. The use of Erosion Control Blanket is not recommended where water velocity exceeds 1.5 m/s [5 ft/s].

613-2 LAYOUT AND CONTROL

Precise layout as such is not required. The Contractor will place the Blanket in such locations as designated on the plans and/or indicated by the Resident or Inspector. Blanket shall be used in locations such as shoulder berms, esplanade strips, curb sections, ditches, and drainage ways. **All excavated ditches should receive erosion control blanket or stone.**

613-3 TESTING REQUIREMENTS

Certification - Refer to Division 700, Materials & Tests.

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613-4 CONSTRUCTION

Seed will be sown prior to installation of the Erosion Control Blanket. No loam will be required under the blanket. Seed and its application will not be paid separately, but will be considered incidental to the item.

The only practical method of placing is by hand. The Standard Specifications, Section 613.05 and the Standard Details should be followed for placing the material. Corners or relatively sharp turns should be neatly folded and well pinned with fold-over laps facing downstream. Blanket must be in close contact with the soil at all points. To accomplish this, the soil must be smooth and free from rocks, lumps and other irregularities. Great care must be taken not to stretch the blanket when laying it. It should lie loosely on the soil and should be stapled starting in the middle of the strip and working toward the side. If the blanket is stretched or raised to ride over irregularities it will bridge. Water will run under it and start scouring.

The spacing of wire staples and turning down of edges as shown on Standard Details is important and should be closely checked.

613-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Quantity for payment will be field-measured, possibly with ditch measurements, and entered in a bound field book or directly into the Final Quantity Book. Measurements will be taken along the length and width of the installation. Overlapped or folded material is not included in the calculation; i.e. area covered, not area of material is the Pay Quantity. Blanket is commonly 1.2 meters [4 ft] wide.

Sample Quantity Book Entry

Item 613.319 Temporary Erosion Control Blanket				
Field Measured				
<u>Location</u>	<u>Length (M)</u>	<u>Width (M)</u>	<u>Area (M²)</u>	<u>Accum. Area (M²)</u>
RT/Sta. 1+350 to Sta 1+860	510	1.2	612.0	
LT/Sta. 2+015 to Sta 2+058	43	2.3	98.9	710.9
Entered By: <u>Sign & Date</u>				
Checked By: <u>Sign & Date</u>				

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Section 615 Loam -- 3 Pages

LOAM

615-1 GENERAL

References:

(1) Standard Specifications

Section 203

Section 615

(2) Best Management Practices for Erosion and Sediment Control

Sources of loam outside the lines of improvement must be approved by the Resident prior to its removal for use on the project. The loam specification was written to encourage the use of on-site soils. On-site soils can be amended with compost to provide loam; this is preferred to off-site sources. A condition of approval will be the acceptability of the arrangements for the final disposition of the proposed material sites. Unless the site is to be developed in a manner wherein remaining loam would be detrimental, an amount sufficient for site restoration must be reserved. (Refer to Pit Authorization Form)

If loam is taken from within the lines of improvement, its removal is paid for as earth excavation. Final placement of loam will be paid for at contract prices. It is the intent of the Department to salvage, and if necessary, to stockpile, all loam that can reasonably be salvaged.

Authorization for payment of loam used outside of designated grading limits should be made in writing (Diary notes and memo to Contractor) prior to the actual placing of the loam. Loam used to repair areas needlessly damaged by the Contractor's operations will not be measured for payment.

615-2 LAYOUT AND CONTROL

Any areas where loam is to be omitted but is shown on the plans to be loamed should be noted in a memo to the Contractor before the work is started. In some cases, stakes showing the location of a downspout, the limits of a ditch, the extension of a sodded area, or the extension of seeding may help clarify memo notations. Staking is the responsibility of the Contractor.

Before loaming operations are started, an inspection of the project should be made to determine if any areas would support a growth of grass without being loamed. This is usually determined as a material that meets the loam specifications.

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Section 615 Loam -- 3 Pages

615-3 TESTING REQUIREMENTS

Loam can be tested at the Resident's option. See Standard Specification 615.02.

615-4 CONSTRUCTION

Best Management Practices dictates that loam be placed on slopes as soon as possible after grading is completed in an area.

Slopes should be near grade when loam is applied. Excessive depths of loam on steep slopes should not be allowed due to the tendency to slump when subjected to heavy rains. Contractors should not be allowed to "rough out" slopes during excavation operations with the intention of using loam to bring slopes to grade. This often produces areas prone to slumping and areas with insufficient loam to maintain a growth of grass.

Due to the increasing scarcity and concurrent increase in cost, the wasting of loam by unwarranted and excessive depths should be discouraged at all times. Whenever possible, construct fill slopes of waste and strippings. Such material will usually support grass without the addition of loam.

The Contractor should be notified of any major increases in loam on a project as soon as possible, to enable the Contractor to stockpile loam far enough ahead so that the sod and organics will break down and provide a more friable loam.

The Inspector should make sure that the loaming operation does not contaminate other portions of the work. Contamination is often caused by tracking wet loam onto graveled or paved areas and by spillage when being removed from hauling vehicles. Spilled loam subjected to traffic quickly becomes compact "lenses". These lenses are easily removed with hand shovels. The removal of spillage with grading equipment often incorporates the loam into granular materials and should not be allowed.

Hand raking of loam areas prior to placing of the loam is not generally necessary. Necessary finish can be obtained with ordinary construction equipment. Hand raking to remove equipment tracks or other marks is not normally necessary except where seeding Method No. 1 is to be used.

Standard Specifications, Subsection 615.04 requires loam to be spread uniformly to proper depth. Clods, roots, and stones over 50 mm [2 in] and all other foreign matter must be removed. In Seeding Method No.1 areas, the maximum stone diameter is 25 mm [1 in].

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Section 615 Loam -- 3 Pages

615-5 INSPECTION

Except as provided in Standard Specifications, Section 615, Specifications for loam are general in nature. The wide variety of loam available in different areas and difficulty of quickly field testing material makes approval a matter of judgment.

Loam shall be free from admixture of subsoil, refuse, large stones, clods, roots or other undesirable foreign material.

Loam is just another name for good topsoil. Very light, sandy loam and heavy clay loam should be avoided unless nothing better is available. All soils can be improved with the addition of compost. Suitable material will maintain a spherical shape when molded in the hand, yet crumble when disturbed. Loam is best judged when slightly moist. Soil from swamps and bogs does not make suitable loam and should not be used. If in doubt of suitability of the material, consult the Landscape Unit. Loam should be placed sufficiently to be 100 mm [4 in] deep after rolling in Method No. 1 seeding areas, and 50 mm [2 in] after rolling in other areas.

615-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

The Resident or Inspector will keep notes describing the Contractor's loam, seed, and mulch operations. He/she will record location of areas worked, personnel equipment, and weather conditions. Depth of loam will be spot checked and recorded.

Final quantity for payment will be plan quantity or a quantity determined from measurements.

Plan Quantity. A review and check of the Engineer's estimate for reasonableness is an acceptable way to verify the quantity shown in the Schedule of Items. The plan quantity will be adjusted, upward or downward, if changes are made in the field.

Measurements. The accuracy and frequency of measurements will depend on the project. On a rural overlay job, station-to-station limits and typical widths scaled off the plans or field measurements are acceptable. On an urban job, areas will be divided into common shapes and field measured by length and width.

Loam and sod will be field measured. Field Measurements, scaled measurements, and load counts will be entered in a Construction Book, signed, and dated. Final Pay quantity will be entered in the Final Quantity Book and labeled as such, signed and dated, references will be made to the source documentation such as; measurements, load counts, and loading of the hydroseeder. **All calculation and data entries must be signed, dated and checked; the checker must sign and date his/her entries.**

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Section 616 Sodding -- 2 Pages

SODDING

616-1 GENERAL

References:

(1) Standard Specifications Section 616

(2) Special Provision

Section 717.01(b) - Fertilizer

Section 717.02 - Agricultural Ground Limestone

Section 615 - Loam

(3) Best Management Practices for Erosion and Sediment Control

616-2 LAYOUT AND CONTROL

Sod for front lawns is normally laid out by painting an edge line on the ground. Other than this, layout as such is not usually required for sodding. When required, layout is done by the Contractor and approved by the Resident or assigned Inspector. Sod is usually placed to align with previously constructed items, such as curb, shoulders, slopes, ditches or other previously set or previously graded items.

616-3 TESTING REQUIREMENTS

None required.

The sod should consist of a reasonably clean growth of grass. Sod that is full of moss and weeds should not be accepted.

616-4 CONSTRUCTION

Sod is always placed by hand over the prepared loam bed of not less than 100 mm [4 in]. The areas should be fertilized and limed before sod is placed. Loam should be moist; loam can be saturated as long as the

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Contractor can maintain the grade while installing the sod. Sod needs to be watered the day of installation; on hot dry days this should be done as soon after installation as possible.

Particular care should be taken when placing sod strips. It is recommended that the top of the sod be recessed 12 to 25mm [$\frac{1}{2}$ to 1 in] below the finished slope to be sure it does not block drainage. Lawn areas that are to be maintained by property owners should not be pegged even when the slopes are greater than 2:1. Pegs tend to work out of the ground and can become a hazard.

616-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Areas to be sodded shall be cleared of large stones, roots, clods and other debris. Area shall be brought to proper grade as per plan, or Resident direction, allowing for the depth of sod so that the sod is at proper finish grade. If an area consists of hard packed soil it shall be scarified, or otherwise loosened to a depth of 50 mm [2 in] before placing loam. Refer to Standard Specifications, Section 616.04.

Sod shall be moist when laid and laid on a moist soil bed. Sod shall be at right angles to flow of water, beginning at the lowest point and working upward, placing the sod edge to edge to form a uniform surface. Vertical joints should be offset to reduce runoff. All joints should be plugged with suitable material to produce a tight surface. Areas subjected to scour shall have the leading edge turned down and buried to a depth of at least 75 mm [3 in]. Sod shall be tamped or rolled to a smooth surface. Sod shall be watered at intervals to assure that roots remain moist.

Sodding is measured by the square meter [square yard] in place. Quantity accepted for payment will be measured and recorded in a bound field book, preferably the Final Quantity Book. Soil preparation including excavation for the placement of sod, supplying and applying fertilizer and agricultural limestone will not be paid for separately, but will be considered incidental to the item.

Sample Quantity Book Entry

<u>Location</u>	<u>Field Measured</u>			<u>Accum. Area (M²)</u>
	<u>Length (M)</u>	<u>Width (M)</u>	<u>Area (M²)</u>	
Sta. 1+350 to Sta 1+ 860	510	3.5	1785	
Sta. 2+015 to Sta. 2+058	43	2.0	86	1871
Entered By: <u>Sign & Date</u>				
Checked By: <u>Sign & Date</u>				

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Section 618 Seeding -- 3 Pages

SEEDING

618-1 GENERAL

References:

- (1) Standard Specifications, Section 618
- (2) Standard Specifications, Section 717
- (3) Best Management Practices for Erosion and Sediment Control

Method Number One seed mixture is generally intended solely for lawn areas, or any area that is to have intensive, close mowing. Method One shall be installed with fiber mulch only; no hay is to be used. Method Number Two seed mixture should be used on infrequently mowed areas such as inslopes, ditches and rural lawns. Method Number Three seed mixture should be used on areas not expected to be mowed, such as backslopes and behind guardrails. It is particularly important to use hay mulch and binder with Methods Two and Three. Where unusual conditions prevail, the Landscape Unit should be consulted in regard to making arrangements for special seeding. Lime and fertilizer shall be applied in conjunction with the seeding as per Specifications. When seeding ditches or near water bodies, fertilizer can be eliminated; lime shall always be used. Method Three does not require fertilizer when seeding.

618-2 LAYOUT AND CONTROL

Regardless of how the seeding is to be done, the seeding areas must be laid out in unit areas equivalent to one load of the device used to accomplish the seeding. One unit is defined as 100 m² [1000 ft²]. The capacity of the hydraulic seeder should be taken into account when determining what seeding loads will be applied to various areas. For example, if the capacity of the hydraulic seeder is 50 units, then 50-unit areas should be determined and laid out, as practical.

Measurement is made longitudinal to the centerline with widths taken perpendicular to the centerline at frequent intervals and area computed by the average end method. Seed is generally required on all disturbed areas, including Erosion Control Blanket areas that have been seeded prior to installation.

618-3 TESTING REQUIREMENTS

<u>Fertilizer:</u>	Certification
<u>Ground Limestone:</u>	Gradation and Certification.
<u>Seed:</u>	Certification & Sample to Bangor Lab.

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Section 618 Seeding -- 3 Pages

618-4 CONSTRUCTION

Preparation of areas to be seeded is well covered by the Standard Specifications. The seeding area should be sufficiently friable to a depth of at least 50 mm [2 in]. Stones up to 25 mm [1 in] will be allowed on Seeding Method No. 1 areas, and stones up to 50 mm [2 in] will be allowed on Seeding Method No. 2 areas. Method No. 1 shall be sown on 100 mm [4 in] of loam. In order to reduce weeds and provide a quality lawn, areas to be seeded to Method No. 1 should not be hay mulched; if mulch is required prior to seeding straw mulch shall be used. If there is sufficient hay or straw mulch already on the ground, seed may be applied over top of the mulch. If the ground is bare, seed will be applied before the mulch, or as directed by the Resident.

618-5 INSPECTION

The Inspector must obtain Certificates of Compliance for the seed to be used prior to placement of the seed. Where seeding is done by a hydraulic seeder, the tank must have an agitator to keep all materials suspended in water to assure a uniform application.

Determination of what constitutes a "satisfactory" growth for final acceptance of a given area is a matter of judgment. Refer to Standard Specifications, Section 618.10 "...a reasonably thick uniform stand of permanent grass species with at least 90 percent coverage, free from sizeable thin or bare spots". Applicable notes should be made in the Project Diary when areas attain an acceptable growth.

618-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT.

Field Documentation

Project Diary, Inspector's diary/Daily Report: The Resident or Inspector will keep notes describing the Contractor's loam, sod, seed, and mulch operations. He/she will record location of areas worked, personnel, equipment, and weather conditions. Depth of loam will be spot checked and recorded; loading of the hydroseeder with seed, lime, fertilizer, and mulch will also be documented.

Contract specifications require that, at the Resident's directive, a second seeding be applied within 60 calendar days of the Project completion at the Contractor's expense if there is no acceptable growth of grass at the first seeding. The Resident must notify the Contractor before the end of the 60 day period for the specification requirements to remain valid. Reference is made to seed specifications in the Contract Book for further clarification.

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Section 618 Seeding -- 3 Pages

Measurement and Payment

Final quantity for payment will be plan quantity, quantity determined from measurements, or load count.

Plan Quantity. Specifications state that final payment for seed and mulch will be based on the quantities shown in the Schedule of Items if estimated areas agree within 15 percent of actual areas. A review and check of the Engineer's Estimate for reasonableness is an acceptable way to verify the quantity shown in the Schedule of Items. The plan quantity will be adjusted, upward or downward, if changes are made in the field. An easy way to keep track of Plan Quantity is to agree with the Contractor on the amount to be seeded. This amount is then loaded into the hydroseeder and the load total can be entered into the Final Quantity Book.

Measurements. The accuracy and frequency of measurements will depend on the project. On a rural overlay job, station to station limits and typical widths scaled off the plans or field measured are acceptable. On an urban job, areas will be divided into common shapes and field measured by length and width.

Load Count. If the areas consist of numerous shapes and require time to field measure, the Resident can estimate the number of units to be loaded in the hydroseeder and advise the Contractor that load count will be the basis for final payment. (See Plan Quantity above)

Field measurements, scaled measurements, and load counts will be entered in the Construction Book, signed, and dated. Final pay quantity will be entered in the Final Quantity Book and labeled as such, signed and dated; references will be made to source documentation such as: measurements, load counts, and loading of the hydroseeder. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Section 619 Mulch -- 2 Pages

MULCH

619-1 GENERAL

References:

(1) Standard Specifications

Section 619

Section 717.04 - Mulch

Section 717.05 - Mulch Binder

(2) Best Management Practices for Erosion and Sediment Control

619-2 LAYOUT AND CONTROL

Layout, as such, is not required for this item. Mulch will be applied on all disturbed areas or those areas so designated by the Resident or the Inspector.

619-3 TESTING REQUIREMENTS

As per Standard Specifications, Section 717.04.

619-4 CONSTRUCTION

The requirement regarding chopped hay is not intended to prohibit the use of mulching machines that tear the bales apart and blow it over the intended areas as directed.

Application should appear to be reasonably uniform. The mulch should not form a heavy or dense mat, as air and rain should be able to circulate reasonably well. The soil should show plainly upon close examination but not comprise more than 10% of the area. Its purpose is to shade the seed but not to smother it. The binder is a required part of the Hay Mulch Specifications and must be applied as specified.

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Section 619 Mulch -- 2 Pages

The mulch can also be bound by staking and tying down with string if desired by the Contractor and approved by the Resident. If this, or any other approved method of anchoring the mulch is used, then full payment for placing the mulch must be made. If it is not practical or desirable to apply hay mulch by machine, e.g., in heavily built up urban areas, or on narrow esplanades, it can be spread by hand.

619-5 INSPECTION

Mulch will be measured by the unit, with one unit equaling 100 M² [1000 ft²]. Measurements may be those taken for loam and seed. Mulch can be stored on the project at any location suitable to the Contractor and Subcontractor.

619-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Refer to subsection 615-6 of this Manual for documentation requirements.

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Section 620 Geotextiles -- 2 Pages

GEOTEXTILES

620-1 GENERAL

References:

(1) Standard Specifications

Section 620

Section 722.01 - Stabilization / Reinforcement Geotextile

Section 722.02 - Drainage Geotextile

Section 722.03 - Erosion Control Geotextile

Section 722.04 - Separation Geotextile

(2) Standard Details, Section 620

(2) Best Management Practices for Erosion and Sediment Control

620-2 LAYOUT AND CONTROL

Geotextile shall be placed as directed on the Plans, or those areas so designated by the Resident or the Inspector.

620-3 TESTING REQUIREMENTS

None required; however, the material used must be one of the products listed on the Maine Department of Transportation's Approved Product List.

620-4 CONSTRUCTION

Methods of proper installation are described in the Standard Specifications, Section 620.03.

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Section 620 Geotextiles -- 2 Pages

620-5 INSPECTION

Geotextile will be measured by the square meter [square foot] of area covered. No measurement will be made for overlaps, patches, or repairs of damaged geotextile, unless required and authorized by the Resident. Field Measurements will be recorded in a bound field book or the Final Quantity Book. The name of the product used will be recorded in the Final Quantity Book. The contractor will submit a Product Data Sheet from the Manufacturer, more commonly called a "spec sheet". The spec sheet will be compared to DOT specifications to verify compliance of the material.

620-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will keep notes regarding the location of work and preparation of the area prior to placement of the material.

Final Quantity Book: Measurement for payment will be entered in the Final Quantity Book or Construction Book. Overlaps, patches, or repairs will not be included for payment. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her entries**

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Section 621 Landscaping -- 3 Pages

LANDSCAPING

621-1 GENERAL

References:

(1) Standard Specifications

Section 717.01(b) Fertilizer

Section 717.04(c) Mulch

Section 717.09 Peat Humus

(2) Construction Manual - Section 622 Transplanting

(3) American Standards for Nursery Stock

This work shall consist of furnishing and installing plant materials in accordance with the Specifications and in reasonably close conformity to the plans. The use of the term "Landscape Architect" denotes the Department's landscape staff or approved consultant engaged by the Department.

There shall be a pre-construction meeting with the contractor, the Resident, and the Landscape Architect to review the schedule of work, traffic control, utility locations, and changes in the quantities, Special Provisions, and material substitutions.

When plant material is to be installed the Resident will notify the Landscape Architect 48 hours in advance of any work. The Landscape representative will stake the final exact locations of the plants making adjustments as necessary for the design, to avoid utility locations and insure safety setbacks. The Contractor is always required to supply the stakes. All plant material shall meet the requirements of the Specifications and the "American Standard for Nursery Stock."

If the Contractor or their equipment will be in or near the travelway, the Contractor must use traffic control devices in accordance with the current edition of the "Manual on Uniform Traffic Control Devices" (MUTCD) and Standard Specification 652.

621-2 LAYOUT AND CONTROL

Locations for plant material are generally delineated in the field. At times, the locations may be changed because of unexpected site conditions. If there are questions or concerns, the Landscape Architect shall be contacted before the plants pits are dug, to certify locations and assist with the proper relocation of the plants.

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The Contractor should review the proposed locations of the plants as staked, and assure that the plants are properly located to conform to actual site conditions. On-site conditions to consider when laying out plant material include, but are not limited to, signage, overhead utilities, underground utilities, ledge, wet areas, sight distance setbacks and spacing. The locations of underground utilities should be well marked in advance of planting and shown to the Contractor. Final locations will be staked and approved by the Landscape Architect prior to plant installation.

621-3 TESTING REQUIREMENTS

The Contractor shall supply plant material that meets the Specifications. Any material that does not meet the Specifications will be removed from the site at any time before final acceptance of plants.

621-4 CONSTRUCTION

Planting specifications shall be followed for planting and performed by a qualified landscape contractor using competent personnel.

Plants should only be installed within the time of planting (Standard Specifications, Section 621.0020). If the Contractor has to install plants outside of the required planting time, the Landscape Architect shall be consulted by the Resident. Planting time changes and extensions will be based on special circumstances, as well as the type of plant material, time of year and the current weather conditions.

The Contractor shall assure that plants are installed in accordance with the Plans and Specifications. To certify this, a percentage of plant pits should be randomly inspected. If the Contractor is consistently in compliance, fewer pits will need to be inspected; if the Contractor is not in conformity, more frequent inspections will be needed. The Contractor is responsible for complying with the Specifications whether the work is inspected or not. Payment will be withheld for non-conforming work, pending reasonable notification to the Contractor.

Planting shall progress in logical order:

- a) Layout or stake plant locations.
- b) Excavated plant pits can be round or square. Pits shall be as deep as the plant root ball. The sides of the pit should not be glazed; a rough texture is best. The plant pits should have a minimum of 150mm [6 in] from the plant root ball to the edge of the pit for shrubs, and up to 600mm [2 ft] for large tree stock.
- c) Plants shall be set plumb, to the same depth as in the nursery or slightly elevated. Broken branches shall be removed at this time.

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d) Pits shall be backfilled halfway and compacted using feet. Fertilizer tablets shall be installed at this time. The Contractor may water at this time. To offset dry soil conditions, and for additional compaction, it is preferred to apply water at this time during mid-summer. The first watering shall include liquid fertilizer. Complete backfilling and compact. Backfill mix should have a dark rich brown color, have detectable organic matter, not have any unpleasant smells and be moist but not saturated. Build an earthen saucer around the base of the plant about the size of the plant pit, to hold water. Plants should be mulched at this time to a depth of 100mm [4 in].

e) Plants shall be watered on the day they are planted. The first watering shall include a liquid fertilizer as per the Specifications. Once installed, the key to plant survival usually lies in the amount of water it receives. The amount of water necessary will depend on the soils, time of year, and the weather conditions. Plants in sandy soil will need more water than in clay soils. When plants are actively growing in the spring and in full leaf during the summer, they will need more water. The soil around the plants shall be kept moist but not saturated. Light watering will not reach the roots of the plant. Water applied too fast or at too high a pressure will run off and not penetrate to the roots.

f) Clean up and remove debris.

621-5 INSPECTION

The Landscape Architect can assist the Resident in determining compliance with the suitability and preparation of the planting holes, the actual planting, mulching, pruning and fertilizing. The Landscape Architect will report all acceptable/unacceptable work to the Resident. The Landscape Architect will inspect the condition of the plantings during the establishment period. Any deficient-appearing plants will be documented and reported to the Contractor. The Landscape Architect will perform the final inspection of the plantings and certify acceptance in writing to the Resident.

621-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's diary/Daily Report: Notes will be made each day in the Project Diary or Inspector's Daily Report, pertaining to the work done under these items. They will refer to number and approximate vicinity of plants installed and other pertinent specification requirements, along with any field changes. Final quantity for payment will be determined from field counts or field measurements entered directly in the Final Quantity Book or a Construction Book. If landscaping on the Project is extensive, the Landscape inspect and provide the Resident quantities. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

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Section 622 Transplanting Trees and Shrubs -- 3 Pages

TRANSPLANTING TREES, SHRUBS, AND HEDGES

622-1 GENERAL

References:

(1) Standard Specifications

Section 717.01(b) Fertilizer

Section 717.04(c) Mulch

Section 717.09 Peat Humus

(2) Construction Manual - Section 621 Landscaping

(3) American Standards for Nursery Stock

This work shall consist of transplanting plant materials in accordance with the Specifications and in reasonably close conformity to the plans.

The use of the term "Landscape Architect" denotes the Department's landscape staff or approved consultant engaged by the Department.

The location of plants to be transplanted should be decided between the Resident and R/W negotiator, consulting with the Landscape Architect, and the Owner of the plant. The location of the plants and where they will be transplanted should be identified on the plan.

There shall be a pre-construction meeting with the Contractor, Resident, and the Landscape Architect to review the schedule of work, traffic control, utility locations, and Special Provisions. Transplanting is a fragile operation. The Resident and the Landscape Architect shall approve the timing of operations, planting season and dates.

When plant material is to be transplanted, the Resident will notify the Landscape Architect 48 hours in advance. The Landscape Architect and the Resident will approve locations before any planting.

622-2 LAYOUT AND CONTROL

Locations for plant material are generally delineated on the plans. At times, the locations may be changed because of unexpected site conditions. If there are questions or concerns, the Landscape Architect shall be

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contacted before the plant pits are actually dug, to certify locations and to assist with the proper relocation of the plants.

The Resident and Landscape Architect shall tag the plants to be transplanted and stake their destination. The Contractor should review the proposed locations of the staked plants, and assure that the plants are properly located to conform to actual site conditions. The locations of underground utilities should be well marked in advance of planting and shown to the Contractor. The Resident shall approve changes. Final locations will be staked and approved by the Landscape Architect prior to plant installation.

622-3 TESTING REQUIREMENTS

All plant material must be inspected by the Landscape Architect, who will inform the Resident of the condition of each plant and recommend its suitability for transplanting.

622-4 CONSTRUCTION

Planting Specifications shall be followed for transplanting and performed by a qualified landscape contractor using competent personnel.

Plants should be transplanted when they are dormant. If the Contractor has to transplant plants when they are growing or leafed out, the Landscape Architect shall be consulted by the Resident. Transplanting time changes and extensions will be based on special circumstances, as well as the type of plant material, time of year and the current weather conditions.

The Contractor shall assure that plants are installed in accordance with the Plans and Specifications. The Contractor is responsible for complying with the Specifications, whether the work is inspected or not. Payment will be withheld for non-conforming work, pending notification to the Contractor.

Planting shall progress in a logical order.

a) Layout or stake plant locations.

b) Dig plants. Soil shall be moist. If the soil is not moist it shall be watered before digging begins. The top of the plant shall be protected from damage. This may require the branches to be tied or other measures. The Contractor should dig a trench around the plant under the outer most branches (edge of canopy), forming a rough ball. The final root ball size shall conform to the "American Standards for Nursery Stock". Root balls shall contain enough plant roots to sustain the plant in a healthy condition after transplanting. The root ball shall not break or fall apart. This may require the ball to be secured with burlap or twine or other material. The Resident and the Landscape Architect shall determine if burlap and twine or other methods securing the root ball are required based on size of plant, soil type, etc. Roots that are cut shall

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be cut with a sharp tool producing a clean smooth cut without tearing. Evergreens transplanted in the fall should receive a coating of anti-desiccant to protect them.

c.) Heal in plants that cannot be immediately placed in a permanent location. Plants shall be placed in a protected area shielded from direct wind or sunlight. The root balls shall be covered with a mulch or soil and kept moist at all times.

d.) Planting shall comply with Standard Specifications, Section 621, and this Manual.

e.) Plants shall be watered on the day they are planted. The first watering shall include a liquid fertilizer as per the Specifications. Once installed, the key to plant survival usually lies in the amount of water it receives. The amount of water necessary will depend on the soils, time of year, and the weather conditions. Plants in sandy soil will need more water than in clay soils. When plants are actively growing in the spring and in full leaf during the summer they will need more water. The soil around plants shall be kept moist but not saturated. Light watering will not reach the roots of the plants. Water applied too fast or at too high a pressure will run off and not penetrate to the roots of the plant. Mulch shall be installed around the base of each plant to the outer limit of the plant pit saucer, to a depth of 100 mm [4 in].

f.) Clean up and remove debris.

622-5 INSPECTION

The Landscape Architect can assist the Resident in determining compliance with the suitability and preparation of the planting holes, the transplanting, and the healing in, the actual planting, mulching, pruning, fertilizing, and staking. The Landscape Architect will report all acceptable/unacceptable work to the Resident. The Landscape Architect will inspect the condition of the plants during the establishment period. Any deficient appearing plants will be documented and reported to the Contractor. The Landscape Architect will perform the final inspection of the plants and certify acceptance in writing to the Resident.

622-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Project Diary, Inspector's diary/Daily Report: Notes will be made each day in the Project Diary or Inspector's Daily Report, pertaining to the work done under these items. They will refer to number and approximate vicinity of plants installed and other pertinent specification requirements, along with any field changes. Final quantity for payment will be determined from field counts or field measurements entered directly in the Final Quantity Book or a Construction Book. If landscaping on the Project is extensive, the Landscape inspect and provide the Resident quantities. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

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MONUMENTS

623-1 GENERAL

References:

Standard Specifications

Section 502 - Structural Concrete

Section 503 - Reinforcing Steel

Section 623 - Monuments

Records of locations of R/W Monuments are kept by the Mapping Section. The monuments should be installed where indicated on the Plans, unless the location shown is either impossible or impractical from a construction point of view. An example might be when a location is in water or on the face of a steep ledge or large rock.

623-2 LAYOUT AND CONTROL

Monument locations shall be staked out and tied down by the Contractor. Right of Way Monuments should be staked out by a Registered Land Surveyor after all earthwork is done in that area. When the job is being staked out, high guard stakes should be placed to facilitate easy retrieval. These locations are normally flagged with blue ribbon.

If a Right of Way Monument cannot be physically located where shown on the plans, the monument should be relocated to another point on the R/W line, if possible, or replaced with a Survey Monument at some convenient point within the R/W, if necessary. A Change Order is required either for a change in location of the R/W Monument, or for substitution of a Survey Monument for the R/W Monument.

When laying out monuments, the Inspector should not forget the following basic data:

- a. Right of Way Monuments are always on the actual Right of Way line.
- b. Survey Monuments are not located on the Right of Way line.
- c. Bronze Pin Markers may be used to replace either R/W or Survey Monuments in locations where monuments cannot be set.

The Resident should ascertain whether the monument is to be set flush, below ground or above the ground for each monument location, and should so direct the Contractor for each location. It should be emphasized that R/W Monument, Survey Monument and Bronze Pin Marker locations are of the utmost importance in the

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overall consideration of the Construction project. These locations should be tied down such that they are readily reproducible at any time until the monument or marker is permanently set.

623-3 TESTING REQUIREMENTS

None Required for Granite. Precast Concrete and Steel should be inspected at the casting location.

623-4 CONSTRUCTION

R/W Monuments should be set so that the sides of the "H" in the top are perpendicular to the R/W line. Holes for monuments are almost always hand dug and hand backfilled. Monuments should not be shortened unless the rock base is solid and clean enough to adequately support a concrete collar.

If ledge is exposed, monuments shall be replaced with bronze pin markers in accordance with the Specifications. If ledge is below ground, installation shall be in accordance with Standard Details. The Inspector should keep in mind that if there is any possibility that the area may, in the future, be mowed by the State or by others, then any monuments in that area should be set flush with the ground surface.

623-5 INSPECTION

A 2 meter [6 ft] rule and a plumb bob is usually all that is necessary to check monument locations after they have been set, providing the ties are still there. If the Resident is satisfied that the work is being done carefully and that control stakes are being preserved, it is not necessary for the Inspector to be present during the entire operation of setting all monuments. The Inspector will record the accepted monuments and enter the quantity and other pertinent data in the Final Quantity Book.

Depth of rock excavated will be measured and recorded as Structural Rock Excavation. (Refer to Section 206 of the Specifications and of this Manual.)

623-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Field Documentation Depth of rock excavated will be measured and recorded as structural rock excavation. Quantity for payment will be figured from the top of ledge to depth authorized times a hypothetical diameter of 600mm [2 ft].

Quantities for final payment will be determined from field measurements recorded directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 626 Foundation, Conduit, and Junction Boxes -- 3 Pages

FOUNDATIONS, CONDUITS & JUNCTION BOXES FOR SIGNING, LIGHTING, AND SIGNALS

626-1 GENERAL

References:

(1) Construction Manual

Section 206 - Structural Excavation

Section 304 - Aggregate Bases & Subbase

Section 502 - Structural Concrete

Section 709.01 - Reinforcing Steel

Section 712.06 - Precast Concrete

Section 715.02 - Steel Conduit

Section 715.03 - Non-Metallic Conduit

Section 715.04 - Prewired Conduit

Section 715.05 - Metallic Junction & Fuse Box

Section 720.07 - Anchor Bolts

(2) Standard Specifications - Section 626 - Foundations, Conduits & Junction Boxes

(3) Standard Details - Sheets 626(01) thru 626(09)

(4) National Electric Code

This work shall consist of furnishing, installing, modifying or removing concrete foundations, conduits and junction boxes for highway lighting, highway signing and traffic signal installations.

626-2 LAYOUT AND CONTROL

Locations for all foundations, conduit and junction boxes shall be the responsibility of the Contractor. They should be checked in the field by the inspector to assure compliance with the plans. DIG SAFE should always be consulted before any work starts.

- a. Foundations If foundations are not properly placed, the signs, lighting, and signals may not be effective. Special attention should be given to the orientation of the anchor bolts. The Contractor is responsible for grades required. In many cases, grades can best be obtained from the adjacent paved roadway.

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Foundations should not protrude more than 75 mm [3 in] above the adjacent surface or a “Deadly Fixed Object” will be created.

b. Conduit Layout for the conduit is generally shown on the Plans, but can be changed in the field by the Engineer. The voltage carried within determines the depth of the conduit. Check the NEC for details. Although a laborer may install the conduit, an electrician is required for pulling in the wires. Check for appropriate license and record the number in the FQB.

c. Junction Boxes Layout for junction boxes is not as critical as other items, but the grade should be flush with the surrounding terrain.

626-3 TESTING REQUIREMENTS

Check the Minimum Testing Requirements for the project. Usually, there are requirements for concrete strength. Conduit should be marked in accordance with NEC and NESC standards. Some cities require electrical permits before any work is done. If the bases are to be precast, have the Contractor notify the Materials Testing Engineer so that appropriate inspection of the casting can be made. A Letter of Compliance is generally required for re-bar, poles, and anchor bolts. There is a 10-day functional test for traffic signals, and an inspection by the Traffic Engineering Section is required.

626-4 CONSTRUCTION

As with any excavated hole, the key to success is proper backfill material with thorough compaction. Where possible, drainage or weepers should be provided to keep the foundation dry.

626-5 INSPECTION MEASUREMENT AND FIELD DOCUMENTATION

The Inspector should keep a log of foundations installed, lengths of conduit buried, and junction boxes placed, daily in the Inspector's Diary. A construction book is useful to document each sign location, signal support pole, and light pole foundation.

Final measurements should be made after the conduit run is completed. Note that conduit placed within 300mm [1 ft] from each structure is incidental to the structure. Measurement shall be recorded in the Final Quantity Book, and referenced back to the inspector's diary or construction book.

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626-6 Field Documentation, Measurement, and Payment

Project Diary, Inspector's Diary/Daily Report: the Resident or Inspector will keep notes regarding the Contractor's progress of work on the installation of foundations, poles, signs, lights, and traffic signals. He/she will document inspection and approval of forms, re-steel or steel wire mesh, anchor rods, and conduit in the foundation units.

If the project is primarily a signing or lighting job, the Resident should set up a "Sign Book" before the Contractor begins work. Signs will be identified in this book by location. The Resident or Inspector will record the type of sign required and will document when the foundation is placed, when the poles, signs and lights are erected, and lengths of conduit and wiring installed. As noted above, inspection and acceptance of forms, re-steel, anchor rods, and conduits will be recorded; other pertinent information will be noted as required.

Final Quantity Book: Final quantity for foundations, junction boxes, conduit, and wiring will be entered under the appropriate items in the Final Quantity Book. Reference will be made to field counts or field measurements. The Sign Book can be eliminated if signing and lighting is not a major portion of the contract; measurements and documentation can be entered directly in the Final Quantity Book or in the Construction Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 627 Pavement Markings -- 2 Pages

PAVEMENT MARKINGS

627-1 GENERAL

References

- (1) Manual of Uniform Traffic Control Devices 2001
- (2) Standard Details, Revision of December 2002
- (3) Standard Specifications,

Section 627

Section 708.03, Pavement Marking Paint

Section 712.05, Reflectorized Plastic Pavement Marking

This work shall consist of furnishing and placing reflectorized pavement lines and markings, removing pavement lines and markings, and furnishing and applying reflectorized paint to curbing in reasonably close conformity with the plans and as designated by the Resident.

627-2 LAYOUT AND CONTROL

Layout shall be the responsibility of the Contractor. It is a good idea to check with the Division Traffic Engineer if any new features have been added to the project, or the alignment has changed appreciably so as to affect the passing sight distance. All pavement markings placed shall meet the tolerance limits shown on the plans. Painted lines or Temporary Object Markers (T.O.M.s) can be used as temporary pavement marking lines. Special Provision 652 and/or the Construction Notes, will state when only painted lines are acceptable.

627-3 TESTING REQUIREMENTS

Check the Minimum Testing Requirements for the project. Usually there are requirements for plastic materials. A Certificate of Compliance covers this item.

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627-4 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Standard Specifications, Section 627.09 explains payment of the various types of striping. Some items are paid Plan Quantity, subject to field changes; some items are field measured and paid by the linear or square unit.

All measurements should be recorded in a bound field book or the Final Quantity Book.

Quantities will be determined from field measurements recorded directly in the Final Quantity Book, or references to the work being done according to Plan. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 629 Hand Labor -- 1 Pages

HAND LABOR

629-1 GENERAL

Reference:

Standard Specifications Section 629 - Hand Labor

This item is more or less a catch-all for work that must be done by hand, not covered by another contract item.

629-2 LAYOUT AND CONTROL

No particular layout and control is required for this item. The nature of the work contemplated will govern the requirements for any layout required.

629-4 CONSTRUCTION

The actual work will be as required or as directed by the Resident. Tools may be shovels, rakes, axes, wheelbarrows, or other hand tools as necessary to complete the stated work.

629-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Daily Report of Labor and Equipment Rental: The Resident will use this form to document hours for payment. Approval for hourly work, if not bid items, will be in writing by Work Order, and verbally by the Resident if bid items are involved. A detailed explanation of the work done and references should be noted in the Remarks section of the Report.

Whereas payment for hourly work often is extra and unforeseen and therefore authorized by work order, the Resident should refer to Section 109.

Final quantity for payment will be entered in the Final Quantity Book, signed and dated. Reference will be made to notes in the Daily Report of Labor and Equipment Rental. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

Exhibit 629-A

629.05 Hand Labor, Straight Time

Date	Report #	Hours	Accum. Hours	Entry By & Date
8-15-03	1	3		B.B. 8-15-03
8-17-03	2	2.5	5.5	B.B. 8-17-03

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Section 631 Equipment Rental -- 2 Pages

EQUIPMENT RENTAL

631-1 GENERAL

Reference:

Standard Specifications, Section 631 - Equipment Rental

A Contract Modification is not necessary for equipment rental work unless the total hours listed on the Bid have been substantially exceeded. When such work is part of an Extra Work Order, the quantities should be included in the Order, whether it exceeds the original estimated quantity or not. Correct procedure is to estimate the work to be done and submit the Change or Extra Work Order if necessary.

631-2 LAYOUT AND CONTROL

Layout and Control will be in accordance to the requirements of the work involved.

631-4 CONSTRUCTION

The equipment specified is the minimum that is expected to do average work on a project. If heavier equipment is required, a rate for its hire should be requested, but if the equipment specified will do the work, any heavier and/or higher cost equipment used by the Contractor should not be authorized. This is particularly true of "small" vs. "large" trucks, and also bulldozers.

631-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Daily Report of Labor and Equipment Rental: The Resident will use this form to document hours for payment. Approval for hourly work, if not bid items, will be in writing by Work Order, and verbally by the Resident if bid items are involved. A detailed explanation of the work done and references should be noted in the Remarks section of the Report.

Whereas payment for hourly work often is extra and unforeseen and therefore authorized by work order, the Resident should refer to Section 109.

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Hours will be based on production rates of experienced operators familiar with the work being performed. Operators determined to be below normal acceptable standards will be paid for at reduced hours, as determined by the Resident.

When it is necessary to pay for work by the use of equipment rental items, the work should be performed at a time when the Contractor's regular sequence of operations places the necessary equipment in the vicinity of the work site. However, if the work cannot await such timing the Resident may authorize the payment of moving time from within the project limits, to and from the site. Supervision of equipment rental work is incidental unless expressly stated on the plans or notes.

Final quantity for payment will be entered in the Final Quantity Book, signed and dated. Reference will be made to notes in the Daily Report of Labor and Equipment Rental. **All calculations and data must be signed, dated, and checked; the checker must sign and date his/her entries.**

Exhibit 631-A

Item # Description

Date	Report #	Hours	Accum. Hours	Entry by & Date
8-15-03	1	3		B.B. 8-15-03
8-17-03	2	2.5	5.5	B.B. 8-17-03

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Section 634 Highway Lighting -- 3 Pages

HIGHWAY LIGHTING

634-1 GENERAL

References:

(1) Standard Specifications

Section 502 - Structural Concrete

Section 703.06 - Aggregate Base and Subbase

Section 709.01 - Reinforcing Steel

Section 713.01 - Structural Steel

Section 715.01 - Aluminum Light Standards

Section 715.02 - Steel Conduit

Section 715.03 - Non-Metallic Conduit

(2) ASTM A-153 - Galvanizing

(3) Standard Details - Section 634

(4) National Bureau of Standards Handbook H-32

634-2 LAYOUT AND CONTROL

Location of light standard bases should be accurately done. Consideration should be given to actual curb thickness, taper of bases and other possible sources of interference. Elevations of bases should be set in accordance with actual (as-built) grades.

Underground conduit should be placed so it will not interfere with other construction, particularly signposts, delineator posts, guardrail, or other items that are wholly or partially underground. The exact layout of conduit so that it does not conflict with other construction, is determined by the Contractor from roadway line and grades as shown the Standard Detail Sheets. Plowed-in conduit shall be located as shown on Special Detail Sheets.

634-3 TESTING REQUIREMENTS

Testing Requirements are usually satisfied by Certification - Refer to Division 700, Materials & Tests

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<u>Concrete:</u>	Cement	1 Statement from M & R
	Quality	1 per source
	Gradation	1 Set of Field Gradations per 40 M ³ [50 yd ³] of Concrete.
	Colorimetric	1 per source
	Cylinders	1 set per 40 M ³ [50 yd ³] of Concrete.

634-4 CONSTRUCTION

Excavation work, if required, is usually done by backhoe or by hand. Pre-wired conduit is "plowed" in using special equipment. Some special locations may call for the conduit to be embedded in concrete. In such cases, forms are not usually used. Excavation should be kept to minimum widths and depths. Regardless of the method of construction used, the Resident should be fully aware of the locations of existing conduits, pipes and other items that may conflict with the new system.

Drainage tees should be used only where they will perform the function of draining the conduit in which they are installed.

634-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

The assigned Inspector should be satisfied that location of conduit is such that it will not interfere with other installations or work on the project.

Conduit connections should be tight. Connector sleeves should be checked to make sure they have not split when installed.

Concrete inspection will be done by a qualified Inspector assigned through the Resident. Measurement and documentation of concrete for payment will be in accordance with Section 502 of this Manual. The quantity of concrete is not usually measured separately for payment, but the minimum testing requirements require an approximate measurement to ascertain the frequency of testing.

The Inspector will verify and note in the Project Records that the size of the forms for bases conforms to plan dimensions.

Reinforcing steel should be checked to make sure it is according to plan. Refer to Section 503 of this Manual for inspection, measurement and documentation procedures for reinforcing.

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Section 634 Highway Lighting -- 3 Pages

Bolt templates should be the thickness that bolts protrude to make sure that the bolts will be perfectly plumb. The Inspector should make sure that the bolts do protrude enough to assure that there is enough room for the leveling nuts, the base and the attachment nuts.

Backfill around bases should be thoroughly compacted in maximum 200 mm [8 in] layers.

Shop drawings from pole and other parts manufacturers must be approved and on file prior to installation or erection of any item. Refer to Standard Specifications, Section 105.7.

Where the area behind bituminous concrete curb is filled to the level of the top of curb, standards and pull boxes should also be set to the elevation of top of curb. This is especially true at the noses of outlet ramps.

Upon setting the standard, care should be taken that washers are used on both sides of the base plate, and that all leveling and top nuts are pulled tight. The National Electric Underwriters' Code requires grounding of all systems by a separate, continuous grounding wire. The grounding wire will then be properly attached to a standard ground rod at the power source, thus effectively grounding the entire system.

Before the Resident accepts any electrical system, the Traffic Engineering Division should be contacted and an Electrical Inspector should inspect and approve the electrical portions of the work. Before acceptance of the work, the Electrical Inspector should write a statement to the Project Resident that the installation was accepted on that date.

The Inspector should check that the concrete foundation is level, the weep holes for the base are clear, and that the nuts are tightened to torque requirements.

Inspection and acceptance of Highway Lighting items paid by the unit and field measured lengths of conduit will be noted in the records, preferably in the Final Quantity Book.

634-6 FIELD DOCUMENTATION, MEASUREMENT, AND PAYMENT

Quantities will be determined from actual field measurements for items paid by the linear foot and from statements of acceptance for items paid by the unit or by Lump Sum.

Excavation is usually not paid for unless it is necessary to undercut. In cases of undercut, it is measured and paid for in the same manner as Standard Specifications, Section 206, Structural Excavation. Excavation in rock and undercut in unsuitable soil will be field measured for payment.

Quantities will be determined from field measurements recorded directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 635 Prefabricated Bin Type Retaining Wall -- 3 Pages

PREFABRICATED BIN TYPE RETAINING WALL

635-1 GENERAL

References:

- (1) Construction Plans
- (2) Approved Shop Drawings
- (3) Standard Specifications

Section 635 - Prefabricated Bin Type Retaining Wall
Section 502 - Structural Concrete
Section 701 - Structural Concrete Related Materials
Section 703.06 - Aggregate Subbase
Section 712.06 - Precast Concrete
Section 713.07 - Metal Bin Type Retaining Wall

635-2 LAYOUT AND CONTROL

Control reference points will be established by an MDOT survey crew, as part of the project control, at the direction of the Resident. The Contractor will be responsible for layout of the wall using the control points provided. The Inspector should coordinate with the Contractor to ensure that the layout has been properly done and is correct, or alternately should spot check the Contractor's layout.

635-3 TESTING REQUIREMENTS

Refer to the Minimum Testing Requirements for the project to determine the tests and/or certifications required. Refer to the Standard Specifications or the Special Provisions, Section 700 for requirements of materials certifications.

635-4 CONSTRUCTION

The Inspector should review the approved shop drawings to become familiar with the wall details walls.

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The Contractor is responsible for the proper compaction and depth of gravel bedding and correct grading of the gravel, as well as correct details of any footings or other substructures. The Inspector should work with the Contractor to ensure these details are adhered to, and require the Contractor to remove and replace any defective work found.

The Plans and/or Specifications will determine if the manufacturer of the bin wall is required to send their representative to the job, and the duration the representative is required to be on-site. The Inspector should ensure that this requirement is met, unless such on-site representation is not warranted. A reason for this could be that the Contractor is very experienced in doing this work. Regardless, the Contractor is responsible for the correct performance of the work

Any work that is damaged will be required to be repaired or replaced. On metal bin walls, dents or minor scratches may be repaired by touching-up with an asphalt coating on the unexposed side only. The manufacturer's recommendations should always be obtained when doing repair work. Work which is damaged beyond repair or which compromises the integrity of the work shall be replaced. Examples of metal bin walls that must be replaced are sections that are badly dented, twisted, have holes through the metal, or are otherwise badly damaged. Examples of precast walls that must be replaced are sections which have been cast incorrectly so that they will not fit properly, are so badly damaged in transit or installation that they will not fit properly, have been damaged to expose reinforcing steel, or the face is damaged or not properly finished such that a neat appearance cannot be obtained.

The Plans should be reviewed to determine that all wall drainage, including underdrains, has been installed, and backfill placed to the required limits. Backfill must be placed in horizontal layers and thoroughly compacted all the way back to where the original ground has been excavated.

635-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

The compaction and grading of the foundation bedding is critical, as is the compaction of the backfill. Remind the Contractor that the final appearances and correct fitting and alignment of all the members above will depend upon this, and it must be correct if the finished wall is to be correct. A slight error at the bottom may well result in the upper courses being out of alignment enough so that they cannot be properly bolted together. Such discrepancies in the beginning may result in final rejection of the work.

The Minimum Testing Requirements may require a number of gradation and compaction tests. At a minimum, spot-checking with random compaction tests should be done to document proper compaction, and a gradation obtained to document the proper material.

The metal bin wall must be checked to confirm that proper erection of pieces was done, and that the bolts were properly torqued to the manufacturer's specifications. Random checks with a torque wrench will suffice. A

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visual inspection of bolts will often detect bolts that were not torqued, in that they will not shine like bolts that were hit with an impact wrench.

For precast concrete walls, the proper erection sequence as detailed in the shop drawings must be followed. The manufacturer's detailed instructions for the erection of the units must be followed to obtain a satisfactory finished wall.

The batter of the face of a bin wall must be closely maintained. For precast concrete walls, the alignment and batter is critical for a neat finished appearance. The sequence of erection is also critical, and the shop drawings are to be followed in this regard. The Contractor should make a slope template several feet long to check the face batter as he proceeds. The Inspector may use the Contractor's template to verify that the installation, or portion thereof, has been completed and is correct.

Document the work completed with a statement of inspection and acceptance either in a bound field book or Inspector's Daily Report, along with any field changes and measurements. The Inspector may plot the progress on the shop drawing erection plan, which helps to keep track of the work done. Measurements of the completed work are by the square meter of the surface area to the dimensions shown on the plans or as approved.

Quantities for final payment will be determined from plan dimensions, or from field measurements recorded in a Construction Book directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 637 Dust Control -- 2 Pages

DUST CONTROL

637-1 GENERAL

References:

Standard Specifications

Section 637 - Dust Control

Section 712.02 - Calcium Chloride

It is the general policy of the Department to apply water and/or calcium chloride on the roadway or haul roads before dust becomes a nuisance or may constitute a hazard. Inate abutters, citizens, or environmentalists do not help the Department's public image. It is therefore required of every Resident to use water and/or calcium as necessary, to preclude any complaints from the public regarding dust on construction projects.

637-4 CONSTRUCTION

Areas designated to be treated should be well-watered before the calcium is applied.

It is preferable to spread calcium with a mechanical type spreader. Most contractors have such a machine that can be used.

A reasonable figure for job estimating is approximately 550 Mg/km [2 ton/mile] for a normal 7.2 m [24 ft] roadway when applied with a mechanical spreader. For smaller areas, apply about 0.5 to 1 kg/m² [1 to 1 ½ lb/yd²]. for the first application. (This should last about a week. Additional applications, if necessary, can be at about ½ to ? the above amounts.) Calcium should be washed off the clothes and skin with clear water as soon as possible. Also, rubber footwear should be used as Calcium will dry out and ruin leather.

Water must be applied under pressure as specified. The Specifications definitely prohibit the use of salt or brackish water. If the Contractor has a source and requests to use salt or brackish water, the request should be submitted as a Change Order changing the specification.

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637-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

For a "Quantity" Contract The Resident or Inspector should determine the volume of sprinkling trucks and document the fact in a hardbound field book, preferably the Final Quantity Book. Tank volume may be determined from the manufacturer's rated capacity, by measurement, or by weighing. 1 Mg of water equals 1 M³ of water. Sprinkling shall be measured by the M³ [1000 gal]. Calcium shall be measured by the Mg [ton].

The documentation of tank volumes must be related to the tank used, if the tank is a trailer or a skid tank. The measurements and/or volumes should be recorded in a hardbound field book and properly referred to when documenting their use.

Documentation for the calcium used on weekends or holidays must be completed on the first working day following the use of the materials. At this time, properly completed delivery slips must be picked up by the Inspector and documented that the materials were used on a certain date, both by notations in the Inspector's Diary, if applicable, and by recording Delivery Slips in the Final Quantity Book. (See Exhibit 637-A.)

Quantities of water and calcium chloride will be measured by delivery slip. Only one delivery slip for each day's application of water or calcium will be required. Daily totals will be entered directly into the Final Quantity Book as the delivery slips are received. Entries must be initialed and dated; then checked, initialed and dated.

For a "Lump Sum" Contract Documentation should be made in the Project Diary, consisting of weekly statements of acceptance. If Special Provision 637 for Lump Sum Dust Control is included in the Bid book, but there is no item in the Schedule of Items, this work is considered incidental to the Contract.

637-6 COMPUTATION OF QUANTITIES

For a Bid Items Contract, quantities will be determined from Delivery Slips documented as required in 637-5 above.

Final quantity for payment will be determined from delivery slip totals recorded directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 642 Steps -- 2 Pages

STEPS

642-1 GENERAL

References:

(1) Standard Specifications

Section 642 - Steps

Section 502- Structural Concrete

Section 708.01 - Exterior Paint

Section 708.05 - Timber Preservative

Section 712.06 - Precast Concrete Units

(2) Standard Details, Section 642

Steps are usually tailored to individual situations, and the design will vary depending upon what has to be matched, if anything. Individual details will be indicated on the Plans.

642-2 LAYOUT AND CONTROL

Layout will, in general, be by the Contractor or Subcontractor. This is a job for an experienced carpenter experienced in laying out stairs. The Resident or Inspector should check the run and rise as laid out to ensure that the completed steps will be satisfactory in that respect.

642-3 TESTING REQUIREMENTS

Certification Letter on wood and precast concrete steps

Method C Specification on cast-in-place concrete steps

642-4 CONSTRUCTION

Wood Steps This work should be done by an experienced carpenter. The Inspector should be sure the base is upon solid ground and that the work is in a workmanlike manner and is according to Plan details and

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Specifications. Cuts made in CCA treated lumber should immediately be treated with approved preservative to prevent absorption of moisture, which causes splitting.

Concrete Steps Specifications require a 300 mm [12 in] base of Aggregate Subbase Gravel (Item 304.10) under the steps. Plans might call for insulation board in the gravel to prevent frost heaving.

Precast units are almost always currently used. Specifications allow the use of steps of alternate but equal design to the steps depicted. Designs should be checked for compliance with American Disabilities Act regulations.

Cast-in-place steps might be necessary to fit local conditions. This work should be as per Sections 502 of this Manual and Standard Specifications, Section 502, Structural Concrete.

642-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

Lumber materials for wood steps should be dry. The delivery slip should state the grade of lumber delivered and it should match that specified. Nails specified to be galvanized can be aluminum type if so desired.

Precast steps are usually paid per Each. An entry in the Final Quantity Book with reference to a Diary of the work will be sufficient documentation.

Cast-In-Place steps will require measurements of the treads and width of the steps. A check of the rebar, which is incidental, should be noted in a Diary. The quantity of concrete will have to be calculated for payment. (See Standard Detail 642(01))

The gravel base will be measured in place and paid as Item 304.10, Aggregate Subbase Course - Gravel.

Quantities for final payment will be determined from calculations, either on computation sheets or in a bound field book, or from field counts or measurements recorded directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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TRAFFIC SIGNALS

643-1 GENERAL

References:

(1) Standard Specifications

Section 626 Foundations

Section 634 Highway Lighting

Sections 715.02 through 715.07

Section 718 Traffic Signal Materials

Section 720 Structural Supports for Highway Signs, Luminaires and Traffic Signals.

(2) Standard Details, Section 643

(3) NEMA or UL Standards

(4) NEC, ASTM Standards, and ANSI Specifications

643-2 LAYOUT AND CONTROL

Layout will, in general, be by the Contractor or Subcontractor. This is a job for an experienced Electrician. The Resident should check the distance from the stop bar to the signal heads for maximum visibility and compliance with the MUTCD. The most important thing is that the Contractor calls DIGSAFE and all underground utilities are located before the signal work begins.

643-3 TESTING REQUIREMENTS

Testing requirements are spelled out in the Standard Specifications. The Contractor will submit four sets of shop drawings for all materials incorporated into the project. The Resident should forward three copies to the Fabrication Engineer for distribution to the Traffic Section and Bridge Engineers for pole strength verification. A letter of certification will cover most of the materials.

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643-4 CONSTRUCTION INSPECTION

Assure that the foundations will not interfere with other utilities both overhead and underground. Signal heads can be moved on span wires to correct some problems. The signal will only function properly if the detectors are placed where the traffic will trigger them. Loops must be accurately placed. Observe the existing traffic pattern and lane usage. Try to avoid placing loops in severely cracked pavement. If possible, placing the loops in a lower pavement lift or on the milled surface extends their life. Microwave sensors are becoming more reliable and less costly. Their placement is critical as they are limited in range and direction. Video cameras have been tried with varied results. They are limited by atmospheric conditions and weather variables. Assure that the controller cabinet is large enough to hold all of the components. Look for dents, scratches and poor workmanship. Call Traffic Engineering in Augusta and ask for an electrical inspection when the installation is complete. (A form for this purpose is included in the Resident's packet.) Measure and record the height of the signal heads.

The keys and operation manuals should be collected and turned in to Augusta at the completion of the project.

643-5 COMPUTATION OF QUANTITIES

Final Quantity Book: final quantity for payment will be lump sum or per each. The final figure will be entered in the Final Quantity Book: signed dated, and referenced to Diary entries or field counts as appropriate. All calculations and data entries must be signed, dated and checked; the checker must sign and date his/her work. All entries should be made directly in the final Quantity Book as much as possible.

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HIGHWAY SIGNING

645-1 GENERAL

References:

(1) Standard Specifications

Section 626 Foundations

Section 645 Highway Signing

Section 719.01 Reflective Sheeting

Section 719.02 Demountable High-Intensity Reflectorized Letter, Numerals, Symbols and
Borders

Section 719.03 Aluminum Extrusions

Section 719.04 Aluminum Sheets

Section 719.05 Plywood

Section 719.06 Demountable Reflectorized Delineators

Section 719.07 Assembly Hardware

Section 720.01 Aluminum Supports

Section 720.03 Steel Supports

Section 720.06 Steel H-beam Poles

Section 720.07 Anchor Bolts

Section 720.08 U-channel Posts

Section 720.12 Wood Sign Posts

Section 721.01 Breakaway Devices

(2) AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals"

(3) Standard Details

This work consists of furnishing and installing new signs, signs supports, delineators, and breakaway devices, and removing, relocating, and/or modifying existing signs and sign supports as per Plans, Standard Specifications, Special Provisions, Supplemental Specifications, and/or as directed.

645-2 LAYOUT AND CONTROL

Layout will, in general, be by the Contractor or Subcontractor. This is a job for an experienced carpenter or land surveyor. The Resident or Inspector should check the offset and angle of approaching traffic to the sign face. Refer to the Standard Specifications, Section 645.06 (b).

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645-3 TESTING REQUIREMENTS

Testing requirements are generally by Certification. If you suspect the contractor is using the wrong H-beam Posts, call your nearest IA inspector to verify galvanizing, thickness, and post dimensions. Reflectivity tests can be made in the field with appropriate equipment. Two sets of shop drawings are required for new signs and sign supports before any work is started. The Engineer in the field may approve these, but it is strongly suggested that they be submitted to the Fabrication Engineer for review. These drawings should address sign face, layout detail, and scale drawings.

For Bridge, Cantilever, and Butterfly-type sign supports the Contractor shall submit 3 Copies of detailed design computations for the structure, including the foundation. It is highly recommended that these be forwarded to the Fabrication Engineer for approval. Approval for overpass-mounted sign supports will be on the basis of the applicable provisions of the Standard Specifications, Section 105.7.

645-4 CONSTRUCTION INSPECTION

The Inspector shall assure that all the work for the bases is in accordance with Section 626 of the Standard Specifications. If breakaway devices are used THERE IS NO TOLERANCE. Adapters may be used to shim the beam, but this is frowned upon. The Resident shall determine the exact location for the signing in the field, keeping clear of all visual obstructions and to provide the best possible visibility of the signs by the motorists. The Inspector shall assure that all dimensions are as specified on the Plans and that all materials incorporated into the project meet standards as specified in the Standard Specifications Section 700.

Demounting and reinstalling of existing signs and poles shall be carefully watched to see if the Contractor damages any of the material. The Resident shall specify the location of delivery for any signs or posts to be salvaged.

645-5 MEASUREMENT AND FIELD DOCUMENTATION

The Inspector assigned to cover the item should check any layout by the Contractor. The Inspector will note in his diary, a record of work as it progresses. He/she shall measure all posts for length, all signs for size, and note the number of breakaway devices installed. Special Provisions and General Notes on the plans should be carefully read to determine what items are payable and what work is incidental.

645-6 COMPUTATION OF QUANTITIES

Final Quantity Book: Final quantity for payment will be lump sum, per each, or by the unit and referenced to field measurements, field counts or statements of inspection and acceptance. Acceptance entries will be made directly in the Final Quantity Book when feasible or the Sign Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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MAINTENANCE OF TRAFFIC

652-1 GENERAL

References:

- (1) Standard Specifications, Sections 652, 700, 719
- (2) Special Provisions & Supplemental Specifications
- (3) Standard Details, Highways and Bridges
- (4) Project Plans
- (5) Manual of Uniform Traffic Control Devices
- (6) NCHRP 350 Guidelines

This work consists of furnishing and maintaining traffic control items.

652-2 LAYOUT AND CONTROL

Layout for sign placement is done by the Contractor, and should be checked by the Resident/Inspector for visibility issues. Locations for Portable-Changeable Message Boards shall be determined by the Resident or by the Contractor if shown on the Plans. Keep in mind that these signs must be located behind suitable cones or barricades, so as not to be a "Deadly Fixed Object". Usually the message boards are located just off the paved shoulder, well in advance of the actual construction signing.

652-3 TESTING REQUIREMENTS

Certification – See Standard Specifications, Section 700

652-4 CONSTRUCTION

Traffic Control Plan The Traffic Control Plan (TCP) is prepared by the Contractor, based on information provided in the 652 Standard Specifications or Special Provisions for minimum roadway width and equipment storage. The TCP must be submitted by the Preconstruction Meeting and no work using the TCP can begin without Department approval. The TCP shall contain:

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- a. The name, telephone number, and other contact numbers (cellular phone, pager, if any) of the Contractor's employee (the "Responsible Person") with overall responsibility for following the TCP, and who is empowered to immediately resolve any traffic control deficiencies or issues.
- b. Proposed construction phasing or sequencing that reasonably minimizes traffic impacts. The Contractor shall conduct the Work such that traffic delays do not exceed 5 minutes unless longer periods are authorized by the Department. The Contractor shall provide advance signing to warn motorists of expected traffic backups or queues.
- c. A written narrative and/or plan explaining how traffic and pedestrians will be moved through the Project Limits, including transitions during the change from one phase of construction to the next, as applicable.
- d. Temporary traffic control treatments at all intersections with roads, rail crossings, businesses, parking lots, pedestrian ways, bike paths, trails, residences, garages, farms, and other access points, as applicable.
- e. A list of all certified flaggers to be used on the Project, together with the number of flaggers which will be used for each type of operation that flagging is needed. If the Contractor is using a flagging Subcontractor, then the name and address of the Subcontractor may be provided instead of a list of flaggers.
- f. A procedure for notifying the Resident, local emergency officials, and local government officials (including the name and phone numbers of such officials) whenever significant traffic impacts are anticipated or occur. For a related provision, see Standard Specifications, Section 105.2.2 - Project Specific Emergency Planning.
- g. A description of any special detours including provisions for constructing, maintaining, signing, and removing the detour or detours, including all temporary bridges and accessory features, and complete restoration of the impacted land.
- h. The maximum length of requested contiguous lane closure. The Contractor shall not close excessive lengths of traffic lane to avoid moving traffic control devices.
- i. The proposed temporary roadway surface conditions and treatments. The Contractor shall provide an adequate roadway surface at all times; taking into account traffic speed, volume, and duration.
- j. The coordination of appropriate temporary items (drainage, concrete barriers, barrier end treatments, impact attenuators, and traffic signals) with the TCP.

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The Department will review the TCP for completeness and conformity with Federal requirements, Contract provisions, the current edition of the MUTCD, and Department policy and procedures. The Division Traffic Engineer can help with this review. If the TCP is ineffective, the Contractor is required to modify it at no additional cost.

General No equipment or vehicles of the Contractor shall be parked or stopped on lanes carrying traffic, or on lanes or shoulders adjacent to lanes carrying traffic, at any time, except as required by ongoing work operations. Contractor equipment or vehicles shall never be used to stop, block, or channelize traffic. The Contractor shall not store material or park equipment within 4.6 m [15 ft] of the edge of the established travel lanes. Equipment parked overnight between 4.6 and 9.1 m [15 and 30 ft] of the edge of the travel lane shall be placed behind positive barriers if feasible, or clearly marked by channelizing devices or other reflective devices. The Contractor shall provide a minimum roadway width of 6.7 m [22 ft] for two-way traffic and 3.4 m [11 ft] for one-way traffic. The existing travelway width shall be maintained to the maximum extent practical. Vertical panel markers, drums, cones, or striping shall be used to clearly delineate the roadway through the construction area. Two-way traffic operation shall be provided at all times that the Contractor is not working on the project. One-way traffic shall be controlled through work areas by flaggers, utilizing radios, field telephones, or other means of direct communication.

Channelization devices consisting of barricades or drums, at a maximum spacing of 15 m [50 ft], shall be used in guardrail areas when neither the existing guardrail nor the new guardrail is in place. The Contractor shall not remove guardrail until absolutely necessary for construction operations in that area. The guardrail shall be replaced as soon as possible thereafter.

Installation

Note: All Traffic Control Devices shall meet NCHRP 350 Guidelines and Standards.

Signs shall be erected on temporary sign supports so that the bottom of the sign is either 1) 300 mm [12 in] or 2) greater than 1.5 m [5 ft] above the traveled way. Post-mounted signs shall be erected so the bottom of the sign is no less than 1500 mm [5 ft] above the traveled way, and 2100 mm [7 ft] above the traveled way in business, commercial, and residential areas. Signs must be erected so that the sign face is in a true vertical position. All signs shall be placed so that they are not obstructed in any manner and immediately modified to ensure proper visibility if obstructed.

Vertical panel markers shall be mounted with the top at least 1200 mm [4 ft] above the traveled way. Drums shall not be weighted on the top. Drain holes shall be provided to prevent water from accumulating in the drums. Drums may be weighted with up to 150 mm [6 in] of loose dry sand.

The Contractor shall maintain the devices in proper position and clean them as necessary. Maintenance shall include the covering and uncovering of all signs when no longer applicable (even if for a very short

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duration). The sign shall be considered adequately covered when no part of the sign face is visible either around or through the covering. The Contractor shall replace damaged traffic control devices with devices of acceptable quality, as directed by the Resident.

652-5 INSPECTION, MEASUREMENT & FIELD DOCUMENTATION

Traffic control devices should be routinely inspected for acceptable visibility, cleanliness, and condition. Items that do not meet these requirements shall be brought to the Contractor's attention for immediate action.

Cones shall be at least 700 mm [28 in] high with a band of retroreflective tape. Tack-covered cones are not allowed.

Drums shall 900 mm [36 in] high and 450 mm [18 in] in diameter.

SLOW/STOP paddles must be octagonal in shape with the appropriate color scheme.

All construction signs shall be in acceptable condition at the beginning of the Project. Marginal and unacceptable signs shall not be used. Signs shall be retroreflective (check for the honeycomb background).

a. Field Documentation Project Diary, Inspector's Diary/Daily Report: The Resident or Inspector will note at least weekly that the Maintenance of Traffic Control Devices is OK to pay for the week. If there is an accident, or unacceptable traffic control, the condition of the traffic control items should be noted.

b. Measurement and Payment Final quantity for traffic control can be figured by any one or a combination of the following methods:

1. Lump Sum The Lump Sum traffic control includes all Traffic Control Supervisor, approach signs, work area signs, drums, cones, delineators, barricades, etc. and maintenance thereof. Flaggers may be included also, check the Special Provisions, Section 652.

Maintenance of signs includes: replacing devices damaged, lost, or stolen, and cleaning and moving any signs as many times as necessary throughout the life of the contract, regardless whether the work areas or projects are geographically separated or not separated.

The Lump Sum will be payable in installments as follows: 5% of the Lump Sum once the approach signing is complete and approved, with the 95% balance to be paid as the work progresses at a rate proportional to the percentage completion of the Contract.

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Failure by the Contractor to follow the Special Provisions, Section 652 and/or The Manual on Uniform Traffic Control Devices (MUTCD) and/or The Contractor's own Traffic Control Plan will result in a reduction in payment, computed by reducing The Lump Sum Total by 5% per occurrence. The Resident has the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item.

There will be no payment for work done under this pay item after the expiration of contract time.

2. Pay Items Flashing Arrow Board, Type I, II, and III Barricades, Drums, Cones and Portable-Changeable Message Signs are measured by the each. The maximum number in use at any one time is paid for. For multi-PIN projects, it is the maximum number in use on all projects at one time. This maximum number is then pro-rated among the projects involved, based on the percentages in the Progress Estimate.

Construction Signs are paid by the square meter (2 decimal places) or square foot (one decimal place).

Maintenance of Traffic Control Devices is paid by the Lump Sum or Calendar Day. Acceptable MTCD should be noted at least weekly, and unacceptable MTCD should be noted daily. Days with unacceptable MTCD should not be paid for.

Flaggers are paid by the hour to the nearest ¼ hour. The Contractor shall supply a list of certified flaggers to the Resident. Uncertified or undocumented flaggers are not allowed to flag.

There will be no payment made for any 652 items after the adjusted completion date.

Final Quantity for payment will be entered in the Final Quantity Book and labeled as such. Reference will be made to diary entries, measurements, and computations in the project records, as necessary. Measurements must be entered in a bound book, which can be the Final Quantity Book or the Construction Book. Reference is made to Section 901 of this Manual for further discussion of field books. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date their work.**

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Section 656 Temporary Erosion Control -- 2 Pages

TEMPORARY EROSION CONTROL

656-1 GENERAL

References:

- (1) MDOT Best Management Practices for Erosion and Sediment Control (MDOT BMP Manual), latest version.
- (2) Standard Specifications, Section 656
- (3) Special Provision, 105, (Instream Work)

In lieu of developing specific Erosion Control Plans for projects that would be subject to review and inspection by the Maine Department of Environmental Protection (MDEP), in 1997 the Department signed a Memorandum of Agreement with the MDEP and Maine Turnpike Authority (MTA) stating that all road and rail transportation projects shall comply with the requirements for Erosion and Sedimentation Control Plans as set out in Section II D and C respectively of the MDOT, BMP Manual. The Standard Specification 656 places the responsibility for developing and implementing a Soil Erosion and Water Pollution Control Plan (SEWPCP) to the Contractor. The Resident is responsible for reviewing and understanding the SEWPCP, and assuring the Contractor follows it. Temporary erosion and sedimentation control practices (BMPs) will be specified in the SEWPCP, and refer to the MDOT BMP Manual for material and construction specifications. Some projects have a State-written SEWPCP included in Special Provision 656 of the Bid book. This will serve as the Contractor's plan and will be paid for.

656-2 LAYOUT AND CONTROL

The SEWPCP will specify the temporary BMPs to be employed, as well as their scheduled installation and location.

656-4 CONSTRUCTION

There are different erosion and sedimentation control practices specified in the MDOT BMP Manual. Reference this manual for specific construction specifications.

Materials shall be installed in accordance with the manufacturer's recommendations, when available.

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656-5 INSPECTION, MEASUREMENT AND FIELD DOCUMENTATION

The SEWPCP designates the Contractor's "Environmental Coordinator." This person is responsible for providing inspection and monitoring of all BMPs for the duration of the project and keeping notes in a written log. The log must include daily on-site precipitation and air temperature, as well as performance, failure and any corrective action for the controls in place.

When work requires the placement of fresh concrete that will come in contact with natural water bodies, elevated pH levels are a concern, and a procedure for monitoring and treatment of pH will be specified in the SEWPCP. Documentation of pH readings shall be kept in the Contractor's log.

The Resident and/or Inspector should accompany the Environmental Coordinator on their weekly inspections to ensure that the SEWPCP is being followed.

Documentation by the Resident should be made in the Project Diary consisting of weekly statements of acceptance.

656-6 COMPUTATION OF QUANTITIES

Quantities of BMP application are as specified in the SEWPCP. The Contractor is responsible for certification of installation. Payment is made on a Lump Sum basis. Ten percent is to be paid once the final SEWPCP is approved, and the initial soil erosion and water pollution controls are in place and certified by the Contractor. The ninety percent balance is to be paid as the Work progresses, at a rate proportional to the percentage of completion of the contract.

Failure by the Contractor to comply with its SEWPCP will result in a reduction in payment. Refer to the Standard Specifications, Section 656.5.1 for details.

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Section 658 Acrylic Latex Color Finish -- 2 Pages

ACRYLIC LATEX COLOR FINISH

658-1 GENERAL

References:

Standard Specifications, Section 658

Work consists of applying a color finish to bituminous pavement or Portland cement concrete surfaces designated on the plans for median strips, islands, and certain crosswalks.

658-2 CONSTRUCTION

a. Materials Only materials on a provided list of approved acrylic latex coating shall be used. The list can usually be found in the Special Provisions.

b. Surface Preparation The pavement or concrete surface shall be free of loose dirt, dust, grease, oil, or any other contaminant. Grease and oils shall be removed by a detergent wash, flushed with water and followed by high-pressure water or air or hand sweeping. Pavement shall have been placed at least seven days prior to application of the coating.

New portland cement concrete must cure at least 30 days prior to the application of coating. The concrete surface shall first be washed with a phosphoric acid solution (8:1 water/acid ratio) then coated with a tie-coat before the color finish coat can be applied. The surface shall be accepted by the Inspector prior to application of the finish color coat.

c. Application The coating shall be applied according to the Manufacturer's recommendations. Particular attention should be paid to temperature and moisture of the air and the surface. No color coating should be allowed to run or drip onto adjacent areas, especially curbing.

658-3 MEASUREMENT AND FIELD DOCUMENTATION

The Color Finish shall be measured by the square meter of surface covered. If the covered area (sidewalk, island, etc.) was installed reasonably according to the Plans, and the area is a difficult shape to field measure, the area may be measured from the Plans with scales and/or a planimeter. Documentation will consist of field

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measurements and notes in a bound Field Book, usually the Construction Book, and final quantities to be entered into the Final Quantity Book.

The accepted quantity of Acrylic Latex Color Finish will be paid for at the contract unit price per square meter complete in place. If the Contractor chooses to apply the coating outside of the Manufacturer's recommendations for temperature or outside of specified dates in the contract, payment will be held until the following spring, pending the performance of the coating.

Quantities will be determined from the plans or from field measurements recorded directly in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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Section 660 On-the-Job Training -- 1 Page

ON-THE-JOB TRAINING

660-1 GENERAL

References:

Standard Specifications, Section 660

Office of Human Resources web page

http://www.state.me.us/mdot/humnres/o_equalo/cdwbed_h.htm

Work consists training approved applicants for construction careers.

660-2 MEASUREMENT AND FIELD DOCUMENTATION

OJT is measured by the hour to the nearest ¼ hour. Weekly time sheets are completed and signed by the Contractor and signed by the trainee and the Resident. One copy is for the trainee, one for the Contractor, one for the Project files, and one copy to the DOT Office of Human Resources. (624-3066)

The trainees presence will be noted in the Project Diary once a week. Off-site training on non-DOT Projects, if approved by the Department, may count towards training purposes but are not eligible for payment.

Quantities will be determined from the weekly time sheets and recorded in the Final Quantity Book. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

SECTION 700

MATERIALS

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Section 700 Materials and Tests -- 11 Pages

MATERIALS AND TESTS

700-1 GENERAL

This section includes general data regarding materials and tests. Specific information pertaining to particular materials or items is contained in applicable Sections of this Manual.

700-2 DEFINITIONS FOR STANDARD TESTING

PROCESS CONTROL: Samples and tests performed on materials that are to be incorporated into a project, the results of which may be used to establish a standard or a basis for Acceptance testing.
EXAMPLES: Bituminous Mix Designs, Qualities, Proctors, and Degradations.

ACCEPTANCE: Samples and tests performed by, or under the direction of, State personnel, including materials randomly sampled and tested for Quality Assurance Projects, to ascertain whether the quality of the materials incorporated into the construction process are in conformity with specifications.

INDEPENDENT ASSURANCE: Samples and observations used for the purpose of making independent checks of the reliability of the results obtained in acceptance sampling and testing, and not for determining the quality of materials directly. State personnel who do not have direct responsibility for acceptance sampling and testing normally accomplish this.

VERIFICATION: Samples and tests performed by or under the direction of State personnel to verify Contractor quality control tests, certificates of analysis, and or certificates of compliance for manufactured materials.

QUALITY CONTROL: Samples and tests performed by the Contractors or their representatives to determine if materials meet specifications before being incorporated into a project, or materials randomly sampled and tested by the contractor on Quality Assurance Projects.

QUALITY ASSURANCE: Quality Assurance is used with statistical specification and a Quality Assurance Program. It includes Quality Control (QC) by the Contractor, Acceptance by the MDOT, Independent Assurance by the MDOT, and the use of Qualified Laboratories and Personnel by both parties.

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Section 700 Materials and Tests -- 11 Pages

The objectives of sampling and testing on construction projects are:

- (1) To determine whether the construction operations and materials used or proposed for use in the construction work, that are controlled by sampling and testing, are in reasonably close conformity with approved Plans and Specifications, including approved changes.
- (2) To provide Independent Assurance Sampling and Testing as a check for reliability of Process Control and Acceptance sampling and testing.
- (3) To provide opportunity for timely remedial action when results of sampling and testing indicate materials used or proposed for use and the construction work, accomplished or in progress, are not in reasonably close conformity with the approved Plans and Specifications including approved changes.

When Residents are assigned to a project, they will be supplied with a guide schedule entitled "Estimated Minimum Testing Requirements", and a complete indexing system for proper record keeping. Each item on the list of estimated minimum testing requirements will be reviewed and unusual items explained in detail by the Resident's Supervisor or the Testing Engineer (or their representative) at the time of the pre-construction conference. The Resident will make certain that the specified acceptance tests as outlined are completed. Residents should bear in mind that the number and frequency of tests described is only an estimate, and if quantities change then adjustments need to be made to the Estimated Minimum Testing Requirements. When the Resident determines that the project conditions are unusual (such as when materials from a pit vary considerably), the Resident should increase the number of samples and tests, as deemed necessary, to obtain the results intended by the Specifications.

All testing records will be kept in a ring binder in the field office. It is imperative that these testing records be kept current, and the project testing files maintained in such a manner that a person unfamiliar with the project can easily review the reports and determine that all materials used to date meet Specification requirements.

The responsibility for proper materials control has been delegated to the Resident. Tests and references, which prescribe sampling and testing procedures, are available to the Resident. Area Testing Supervisors and all MDOT testing labs have been supplied with copies of the AASHTO Highway Materials Texts, Part I, Specifications, and Part II, Tests.

The assigned testing personnel shall be qualified, or NETTCP certified, and have been trained in the latest technical procedures regarding proper sampling, testing and reporting relative to control of construction materials. To insure continual compliance, the Area Testing Supervisor and Independent Assurance personnel review their work procedures. It is also essential that there be continual cooperation between the Resident and the Testing Technician so that the required field tests are completed. The Testing Supervisor and the Resident

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will evaluate the effectiveness of the project testing program and resolve any problems related to testing or testing procedures.

Requests for testing assistance should be made through the Resident's Supervisor or by calling the Testing Office in Bangor, Telephone at 941-4545, or the Freeport Lab at 865-0164. Residents should also call the Bangor or Freeport labs to schedule HMA or PCC plant monitoring and inspections. When field or laboratory tests are required, as much advance notice as possible is desired. Once assigned, the Technician reports directly to the Resident.

700-3 TESTING AND CERTIFICATION

It is a responsibility of the Resident to make sure that the specified acceptance tests indicated in the various sections of this Manual are completed. Even though this Manual establishes a testing frequency for various materials, rigid conformity to a uniform pattern should be discouraged. The frequency of testing may vary for individual projects or phases of projects in accordance with job conditions, such as the uniformity of materials at the source, the methods and equipment used, and weather conditions.

The sampling and testing should be supplemented by visual inspection of the materials as a whole to ascertain whether the samples and tests are reasonably representative of the entire mass of materials. There should also be sufficient observation of the actual construction operations and processes to ascertain that they can be expected to consistently produce uniformly satisfactory results.

Reliance should not be placed wholly on the results of sampling and testing in determining the acceptability of the materials and construction work. Whenever a change in material or questionable work by the Contractor is observed, the Resident should arrange for additional samples and tests.

Although each project may have a qualified Technician assigned for sampling and testing, the Resident (if qualified) may submit samples to the Central Laboratory for testing. The importance of promptness in submitting samples of material in time to be tested and the results returned to the Project cannot be over-emphasized. Instructions for selecting and shipping samples to the Central Laboratory are outlined in Exhibit 700-A at the end of this Section. Reports of test results should be received and on file before use of the material is authorized and it is incorporated into the work.

Details of the classes of tests are as follows:

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a. PROCESS CONTROL TESTS

These are tests performed at the request of the Resident. They are samples taken and tested for the purpose of establishing standards for Acceptance testing such as proctors and materials that need HMA or PCC aggregate Quality tests.

If any of the soil/aggregate materials being incorporated into the project have compaction requirements, the Resident must arrange for sampling of these materials for proctor testing as soon as each source is available. Proctor tests are time-consuming, and must be completed before any in-place density testing can occur. (See 105.3.1)

b. ACCEPTANCE TESTS

These are samples and tests performed to ascertain on a day-to-day basis whether the quality and acceptability of the materials and workmanship of the construction work being produced are in reasonably close conformity with the Plans and Specifications. They constitute the principal means of determining whether the materials and workmanship are satisfactory prior to, or at the time of, the construction operations, or whether corrective action should be taken before the work proceeds further. They also serve as the principal basis for determining the acceptability of the completed construction.

Concrete aggregates, underdrain backfill material, aggregate surface materials, granular borrow for underwater backfill and French drain materials may be sampled for acceptance testing from stockpiles. Material should not be used until it has been tested and found to meet the Specification requirements. HMA and PCC shall be sampled and tested as per their respective 401 and 502 specifications.

When material is field tested, the original test data sheet of the test results must be given to the Resident for their files. Results of tests performed on samples forwarded to the Central Laboratory will be electronically transmitted to the Resident. Failing aggregate test results will also be reported by phone.

When test results are outside the specification limits on materials which are under the direct control of the Resident, such as aggregates used for embankment and base courses, the following procedures will apply: (Refer also to 304)

- (1) Whenever a failing aggregate test occurs, the Contractor or his appointed representative must immediately be notified in writing by the Resident. A copy of the "Notice of Failing Materials Test" will be attached to the original Sieve Analysis Data Sheet, Laboratory Test Report, or

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Compaction Test Data Sheet, and filed under the appropriate item. (Form letters of "Notice of Failing Material Test" may be obtained from the Program Office.)

(2) Another test will be performed on a sample taken from the area where the Contractor is presently placing base or subbase to ascertain the continuation or suspension of the Contractor's operation.

(3) The results of the test taken in (2) above will determine which of the following options will be used:

(a) If the test taken in (2) above passes, the Contractor's operation may continue if the following is adhered to:

i. The limits of the material represented by the failing test will be determined by the Resident.

ii. The area determined in (i) above must be corrected by the Contractor and the corrective action substantiated by a passing test.

(b) If the test taken in (2) above fails, the Contractor's operations in the area will be suspended until corrective measures are taken and passing material obtained.

If the moisture content of embankment material (common borrow) obtained during compaction tests exceeds optimum by more than 4%, the Resident will require that corrective action be taken by the Contractor to decrease the moisture content of the embankment material.

NOTE: Refer to Section 203 for more detailed data regarding embankment compaction and to Section 304 for examples of various situations that most commonly occur regarding gradation and density tests on aggregate base and subbase materials.

Whenever the results of an acceptance test indicate that material does not meet Specifications, the Resident will document under "Remarks", or on the back of the Sieve Analysis Data Sheet, Laboratory Test Report, or if applicable, on the back of the Compaction Test Data Sheet, what disposition was made of the material represented by the failing test.

Examples of acceptable documentary comments currently being used on failing gradation and/or compaction tests are as follows:

"Material removed and replaced."

"Contractor applied more compactive effort."

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"Contractor increased moisture content."

"Contractor decreased moisture content."

"Quantity of material as represented by the test removed from stockpile."

"Quantity of material as represented by this test not used."

"Rejected all material in this stockpile."

"Quantity represented by this test not reasonable representative of material as placed."

Other documentary notation will be made under "Remarks" on the Gradation Summary Sheet and/or on the Compaction Summary Sheet. These notations will refer to the applicable passing follow-up test number.

When the Contractor actually removes and replaces embankment and/or base material, appropriate project diary entries under the applicable item will include the station limits, offset, and the day the work was performed.

c. INDEPENDENT ASSURANCE TESTS

These are inspections performed on samples/tests to provide an independent check on the reliability of the results obtained in Acceptance sampling and testing. Independent Assurance will inspect Quality Control sampling and testing that is part of a Quality Assurance specification if the test results are included in the pay factor. Samples/Tests are periodically taken at the same locations and time in the production process as Acceptance samples. They may be taken from materials delivered but not incorporated in the work and/or from work in progress.

Independent Assurance Inspections are applicable to materials such as soils and aggregates (gradation and compaction tests), hot mix asphalt, portland cement concrete, and reinforcing steel. Independent Assurance inspections are keyed to individual inspector/testers and are completed on a per person, per type of test, per time frame, per number of tests basis.

Independent Assurance Inspections are a service performed by personnel of the MDOT Central Laboratory IA Staff.

Independent Assurance Inspectors will confer with the Resident prior to sampling/ testing to determine the work schedule and persons sampling/testing so as to schedule their work. The Resident is responsible for assuring their inspectors/testers have an Independent Assurance inspection when necessary.

Independent Assurance Samples will be shipped to the Central Laboratory for testing and comparing with the Acceptance/Quality Assurance tests. Field tests will be compared at the project or test site.

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When corrective action is necessary due to non-comparing test results, errors in test procedures, or equipment, a corrective action report will be completed by the IA Supervisor and forwarded to the Acceptance/Quality Control inspector's supervisor and the IA inspector for their comments and any action to correct deficiencies. This report will be completed and returned to the IA supervisor on a timely basis.

Independent Assurance Test results will be reported on a variety of forms. The Independent Assurance files will be maintained at the MDOT Central Laboratory in Bangor. Due to the systematic approach to IA now used by the MDOT it is not necessary to maintain project files of Independent Assurance activities.

d. VERIFICATION

These are samples, tests and inspections performed by the MDOT to verify certificates and Contractor quality control tests. Normally, Independent Assurance personnel will be responsible for all pipes (concrete, plastic and metal), catch basins and manholes at the precast plants, rebar, emulsions and guardrail. Acceptance testing personnel assigned to the Testing Section are responsible for verification items at HMA and PCC plants. Independent Assurance or the Acceptance testing personnel should be contacted for sampling and/or testing of verification items prior to their incorporation into the project.

e. QUALITY CONTROL

These are samples and tests performed by the contractor. Passing QC test results should be sent to the Resident before the item is incorporated into the project and before it is tested by the MDOT. This includes project aggregates such as underdrain stone, underdrain sand, granular borrow, aggregate subbase materials, etc. Quality Control samples and tests that are part of a Quality Assurance Specification will be governed by the particular specification in use.

700-3 AGGREGATE FOR BITUMINOUS MIXES

Sampling and testing for HMA designs and qualities is the responsibility of the MDOT Testing Section. Contact the HMA section of the Central Lab in Bangor to obtain the quantity of materials to be sampled for qualities. During production, HMA aggregates should be sampled from the "collector belt" for quality testing at the rate of once per 15,000 Mg [16,500 ton]. If a sample fails a quality test, the Resident and the Contractor shall be notified, and a second sample taken as soon as practical. If the second sample fails, production shall cease until the Contractor demonstrates that passing material is being produced. New HMA designs will not be approved with failing qualities.

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700-4 AGGREGATES FOR PORTLAND CEMENT CONCRETE

Aggregates shall not be used unless they have been laboratory tested for quality within one year prior to the date of their proposed use.

When the results of laboratory or field tests (verification or acceptance) indicate failing materials, immediate action must be taken to prevent incorporation of the failing material in the work. The following procedure will apply:

- a. Whenever a failing test occurs, the Contractor or his appointed representative must immediately be notified in writing. A copy of the "Notice of Failing Materials Test" shall be attached to the original sieve analysis data sheet filed under the appropriate item. (Form letters of "Notice of Failing Materials Test" may be obtained from the Program Offices.)
- b. If the second test fails, this material will not be used until corrective measures are taken.
- c. If the second test passes, the material may continue to be used, but the frequency of assurance tests should be increased to insure compliance of the material to the Specifications.
- d. Should a visual inspection reveal detrimental amounts of deleterious material as described in Standard Specifications Section 703.02, 2nd paragraph, the operation should be suspended immediately and not be resumed until corrective measures are taken, and/or passing material is obtained.

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EXHIBIT 700-A

INSTRUCTIONS FOR SELECTING AND SHIPPING SAMPLES OF HIGHWAY MATERIALS

Type of Material	Type of Test	Min Amt Material	Containers	Remarks
Agg Sub Gravel & Other Project Aggs	Gradation	60 lbs. (1.5 bags)	MDOT Sample Bags w/ Plastic Liners	Fill Sample Bags w/ Approx. 40 lbs of Material
ASG, Borrow and Dense Graded Crushed Agg	Proctor, Degradation, LA Wear	120 lbs. (3 Bags)	MDOT Sample Bags w/ Plastic Liners	Fill Sample Bags w/ Approx. 40 lbs of Material
PCC Aggregates	Gradation & or Quality	40 lbs. (1 Bag ea. Size)	MDOT Sample Bags w/ Plastic Liners	Put PCC Design # on ID Tag
Cement	Standard Tests	1 Gal Can	Clean Tight Covered Can	
PCC Cylinders	Strength	2 per Age	6"X 12" Molds	Protect from Drying Cold / Rough Handling
PCC Cylinders	Permeability	2 per Age	4"X 8" Molds	Protect from Drying Cold / Rough Handling
HMA Agg (stockpiles)	Quality	120 lbs (3 Bags ea size)	40 lbs per bag	Check w/ Bit Mix Lab for Stockpile Sizes & Quantity
HMA Agg Belt Samples	Quality	80 lbs (2 Bags)		Put Design # on Tags
HMA	Standard Tests	50 lbs	(4) 8" Square Boxes	Use 4 Way splitter to put HMA into Boxes
PGAB	Standard Tests	(2) 1 qt cans	Clean Tight Covered Can	Prevent spills, Wear Heat-Resistant Gloves Contractor gets sample
Asphalt Emulsion	Standard Tests	0.5 Gal	Clean sealed plastic container	Pack to prevent spills Avoid Excessive Cold
Salt	Standard Tests	10 lbs	MDOT Sample Bag w/ Plastic Liners	Use Clean Liner

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EXHIBIT 700-B

Sample Tag – HMA and PCC

Maine Department of Transportation		HMA and PCC Sample Identification Form				Materials Testing and Exploration	
Sample Type <input type="checkbox"/> Accept. Method A <input type="checkbox"/> Accept. Method B <input type="checkbox"/> Accept. Method C <input type="checkbox"/> Indep. Assurance <input type="checkbox"/> Verification <input type="checkbox"/> Maintenance <input type="checkbox"/> Other	Reference Number	Sample Description					
	Date Sampled	Sampler			PIN		
	Town	Contractor					
	Plant	Plant Location					
	Item No.	Lot No.	Sublot No.	Sublot Size			
	Mix Design No.		IA Comparison No.				
HMA Mix Samples							
Ticket No.	Temperature	<input type="checkbox"/> °F <input type="checkbox"/> °C	Station	Offset CL	<input type="checkbox"/> Lt. <input type="checkbox"/> Rt. <input type="checkbox"/>		
HMA Cores							
Station	Offset Rt.	<input type="checkbox"/> Lt. <input type="checkbox"/>	<input type="checkbox"/> Meth. A Standard <input type="checkbox"/> Meth. A Reduced	Mix Sample Reference No.			
	<input type="checkbox"/> CL	<input type="checkbox"/> Informational (shoulder, test strip)					
Portland Cement Concrete							
Admixture Type	oz / yd³	Ticket No.	Slump in	Air %	Temp. <input type="checkbox"/> °F <input type="checkbox"/> °C	Actual w/c Ratio	
		Age to Break: <input type="checkbox"/> 3 <input type="checkbox"/> 7 <input type="checkbox"/> 14 <input type="checkbox"/> 21 <input type="checkbox"/> 28	Permeability: <input type="checkbox"/> 14 <input type="checkbox"/> 28 <input type="checkbox"/> 56 <input type="checkbox"/> 120				
		Represents _____ of _____ yd ³ (total placement size)					
		Comments:					

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EXHIBIT 700-C

Sample Tag – Other than HMA and PCC

SAMPLE IDENTIFICATION FORM						
Maine Department of Transportation—Materials Testing & Exploration						
Sample Type: <input type="checkbox"/> Acceptance <input type="checkbox"/> Geotechnical <input type="checkbox"/> Indep. Assurance <input type="checkbox"/> Maintenance <input type="checkbox"/> Process Control <input type="checkbox"/> Verification <input type="checkbox"/> Other	Reference Number	IA Comparison Reference No.		Retest of Ref No.		
	Sample Description					
	Date Sampled	Sampler		Contractor		
	PIN		Town			
	Sampled from	Station	Offset		<input type="checkbox"/> Lt. <input type="checkbox"/> Rt.	<input type="checkbox"/> Cl
Aggregate Type:	Temp., °C	Truck No.	Item No.		DBFG/ Sample Depth	
	<input type="checkbox"/> Bituminous			Boring No.	Geotechnical Sample No.	
Plant Name			Location			
<input type="checkbox"/> Pit Name <input type="checkbox"/> Shed Name			Location			
Supplier			Location			
Manufacturer			Location			
Cert. No.	Batch No.	Fastener Lot No.	Inv. No.	Trailer/ Dist. No.	Terminal Tank No.	
Silo No.	Hauler		Comments:			
<input type="checkbox"/> STANDARD T99 or <input type="checkbox"/> T180 <input type="checkbox"/> Gradation (no wash) <input type="checkbox"/> Std. Tube Opening <input type="checkbox"/> Degradation <input type="checkbox"/> Content <input type="checkbox"/> Other _____						
<input type="checkbox"/> SUPERPAVE CONSENSUS QUALITIES <input type="checkbox"/> Gradation (wash) <input type="checkbox"/> Consolidation						
<input type="checkbox"/> OTHER QUALITIES <input type="checkbox"/> Grain Size (w/hydro) <input type="checkbox"/> Direct Shear						
<input type="checkbox"/> Proctor (<input type="checkbox"/> <input type="checkbox"/> Wash. <input type="checkbox"/> Water						
<input type="checkbox"/> L.A. Wear <input type="checkbox"/> Atterburg Limits						
Date Results Needed: _____						

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MINIMUM TESTING FREQUENCY GUIDELINES

701-1 GENERAL

The following are recommended guidelines for testing frequencies for commonly found items on most projects. In addition, you should also review the Contract Bid Book for changes in Specification requirements, testing and submittals by the Contractor, Manufacturers' Certifications, and other special requirements. For items that are not listed here, contact the Project Review Engineer for the testing frequency rate.

The "Minimum Testing Requirements" which are part of your Resident's packet are made up from these guidelines. Testing may be increased or decreased on your Project if you have changes in quantities. Look at the testing frequency on the "Minimum Testing Requirements" to determine the new total of tests required. It is also important to remember that these are the minimum number of tests required. The Resident may increase the testing frequency if it is felt necessary. If the source of the aggregate materials to be used on your project was recently used on an MDOT project (within the past year), you may use proctor and degradations test results that are on file. Acceptance testing supervisors, Wade McClay (865-0164) and Jim Osgood (941-4532) will provide you with test results from other jobs and provide other assistance, as you need it. Reasons must be documented in detail in the Project Diary.

Item 203 Embankment

Control density fill - Two compactions per 300 m [1000 ft] per layer except in fills less than 150 m [500 ft] where it will be one passing compaction every layer.

Bridge Approaches, Box Culverts and Structural Plate Pipes - Generally one passing compaction every other layer each side of the approach. You may relax the number of tests taken if the Contractor continues to provide the same compactive effort throughout the entire backfill operation. Notes should be made in the Project Diary pertinent to the matter.

Common Borrow - One moisture content per 11,400 m³ [15,000 cy].
One passing gradation per 3,800 m³ [5,000 cy].

Granular Borrow - One passing gradation per 3,800 m³ [5,000 cy].

Gravel Borrow - One passing gradation per 3,800 m³ [5,000 cy].

Item 204 Shoulder Rehabilitation & Item 205 Reconstruct Existing Shoulder

One passing gradation per 6,350 m² [15,000 sy].

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Item 304 Aggregate Base and Subbase Course

Base - One passing gradation per 1,200 m³ [1,500 cy]

Subbase - One passing gradation per 1,900 m³ [2,500 cy]

One passing compaction per 600 m [2000 ft] per lane per layer.

Item 307, 308 and 309 Full Depth Recycled Pavement

One passing compaction per 600 m [2000 ft]. Items 308 and 309 will need to be compacted and tested before the bituminous stabilizer or foamed asphalt processes, and again the same day the bituminous stabilizer or foamed asphalt is added. Testing personnel will assist with running the field proctor necessary for testing the compaction of these materials. For assistance, call the Acceptance Testing Supervisor at the Freeport lab at 865-0164, or at the Bangor lab at 941-4545. Pertinent notes should be made in the Project Diary.

Item 403 Hot Mix Asphalt

See Sections 106, 401 and 403 of the Standard Specifications and Special Provisions. Generally the mix type and testing method (A, B, or C) will be designated in Special Provision 403. Two scale checks and two plant checks are required for each five days of paving. An MDOT-approved HMA mix design and a Plant Acceptability Inspection are required before any HMA is accepted on the project. Normally, testing personnel will perform these checks. Call the Southern Area Acceptance Supervisor at 865-0164 (Freeport) or the Northern Area Acceptance Supervisor at 941-4532 or 941-4545 (Bangor). Hot Mix Asphalt for bituminous curb, around granite curb, around concrete curb, or around catch basins and manholes does not have to be tested. Plant inspections and designs are not required of curb mix or mix used for chinking curb, manholes or catch basins.

Item 411 Untreated Aggregate Surface Course

One passing gradation per 400 m³ [500 cy].

Item 502 Structural Concrete

See Sections 106 and 502 of the Standard Specifications and Special Provisions. Generally the mix type and testing method (A, B, or C) will be designated in Special Provision 502. One PCC plant check is required for each five sublots of concrete with a minimum of one per lot. Normally, testing personnel will perform these checks. Call the Southern Area Acceptance Supervisor at 865-0164 (Freeport) or the Northern Area Acceptance Supervisor at 941-4532 or 941-4545 (Bangor). An MDOT-approved PCC mix design and a Plant Acceptability Inspection are required before any concrete is accepted on the project.

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Concrete Testing In General:

For bridges, box culverts, abutments and abutment patches, piers and pier patches, high retaining walls, bridge joint modifications, end post modifications, high mast pole bases, and overhead sign bases, refer to Item 502.

Steps, ornamental light bases, break-away sign bases, curbs, bridge approach slabs, sidewalks, conduits, pipe collars, wing caps, and medians: Normally these items will be Method C. If they are not so designated in Special Provision 502, see Standard Specification 106.6.

Item 512 French Drain Stone

One passing gradation per project (Residents option if material is visually acceptable).

Item 526 Permanent Concrete Barrier

See 502 above.

Item 535 Precast Prestressed Concrete

If the Supplier is required to perform testing during production, MDOT personnel will observe these tests for conformance to Specifications. The MDOT tester will also obtain one set of cylinders and one set of gradations per 100 m³ [150 cy] for verification testing.

See Standard and Special Provisions for Item 535.

Item 605 Underdrain Backfill

Sand - One passing gradation per 300 m [1000 ft].

Stone - One passing gradation per 600 m [2000 ft].

Item 608 Sidewalks and Item 626 Foundations, J-Boxes, Highway Signing, Lighting & Signals

See 502 above.

Item 635 Prefabricated Concrete Units- Retaining Walls, T-Walls, etc.

See Standard Specification and Special Provision 712.

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UTILITIES & **RAILROADS**

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UTILITIES & RAILROADS

800-1 GENERAL

References:

- (1) Special Provisions Section 104
- (2) Construction Plans
- (3) Standard Specifications
Section 104.4.6
Section 104.4.8
- (4) MDOT Utility Accommodation Policy (17-229 CMR Chapter 210)
- (5) Code of Federal Regulations (CFR)
- (6) Maine Revised Statutes Annotated (MRSA)
- (7) Manual on Uniform Traffic Control Devices (MUTCD)

800-2 BACKGROUND

a. Utilities

In order to provide the citizens of Maine with cost effective utility services, laws were passed to authorize utilities to utilize the highway corridors throughout the state. Specific authorization may be found in 35-A MRSA Chapter 23. These rights are provided to utilities subject to the terms and conditions of the licensing authority defined in 35-A MRSA §2502. In the case of state and state-aid highways outside of compact areas, the Maine Department of Transportation is the licensing authority. (Within compact areas, the municipality is normally the licensing authority. However, the Department technically has control within the limits of an active construction project. For this reason, project decisions regarding utilities within the limits of highway projects in compact areas should be made in coordination with the municipality.)

(1) Location Permits

The instrument through which the Department authorizes utilities to use the state's highway corridors is the Location Permit. General requirements for obtaining Location Permits are

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specified in 35-A MRSA §2503 and specific MDOT procedures and location requirements are further defined in the MDOT Utility Accommodation Policy.

A Location Permit is a license for a utility to use a portion of the highway corridor for an unspecified period. When those locations are no longer appropriate (for example, as a result of a safety concern or an unavoidable conflict with highway improvements), the utility is directed to relocate their facilities to another permit location. Additional information on Location Permits is provided in 800-4, Construction.

(2) Relocation Costs

Since Location Permits convey no property rights, all costs associated with the relocation of utility facilities located by permit are the sole responsibility of the utility. Since any costs to a utility are ultimately passed on to the utility customers (the same customers served by the Department), it is important to assure that these costs are kept to a minimum whenever possible.

However, in some instances, utility work may be either partially or fully reimbursable. This will usually occur under the following circumstances:

(a) When the utility can provide evidence of its existing plant being located upon property either held in fee by the utility or covered by an easement. (Such rights must be reviewed and verified by the Department's Legal Division)

(b) When the relocation is made necessary by Interstate-funded highway construction as specified in 23 MRSA §255.

b. Railroads

Railroads are considerably different from utilities. While utilities are typically located by permit within state highway corridors, railroads are not. Railroad corridors throughout Maine are owned by several different entities and governed by various federal and state laws. Where such corridors cross highway corridors, prevailing rights can become extremely vague and will often require research through the Department's Legal Division to determine ultimate authority.

To assure the safety of highway and rail traffic, railroad flagging and/or other work is common. In most cases, such work will be reimbursable from the project funds. Agreements will exist on each project where this occurs and should be closely reviewed for specific details.

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800-3 DESIGN-PHASE COORDINATION

At the start of each project, a person is assigned the responsibility to identify existing and proposed utility facilities and to address how conflicts between those facilities, existing railroads, and the proposed project will be resolved. This person is known as the Utility Coordinator. The results of the Utility Coordinator's design-phase coordination efforts will typically include the following components:

List of Contacts: Identification of the primary contact person for each utility and/or railroad having facilities within the project limits.

Utility/Railroad Special Provision: A thorough description of the anticipated utility and/or railroad work that will occur as a result of the project (often informally referred to as the "Utility Spec.").

Certification: A formal statement that Utility Coordination has been properly completed.

Agreements: Formal documents defining how reimbursable issues will be addressed (as applicable).

Each of these items is generally discussed below and further discussed in 800-4, Construction.

a. Contacts

Frequently, the Utility Coordinator will work with a different group of utility contacts than those that are needed by the Resident. A Utility Coordinator will typically work with utility engineering personnel, while the Resident will typically work with utility construction personnel. When smaller utilities are involved, these people are often one and the same.

In most cases, the list of contacts will be provided to the Resident at the Preconstruction Meeting. These contacts should be used for day-to-day issues, to assure that there is good communication between all parties and to assure that utility and railroad work is progressing as planned. However, as soon as any unforeseen conflicts arise or utility/railroad work begins to fall behind schedule, it is important to notify the project's Utility Coordinator as soon as possible.

b. Special Provisions

The Utility and Railroad Special Provision is the primary work product that summarizes the utility/railroad coordination process. This document is included in Section 104 of the Special Provisions and should include the following information:

A summary of all utilities and railroads involved within the project limits.

A description of the specific work that must occur in conjunction with the project.

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An approximation of how long the utility and railroad work will take to complete.

Any special conditions relating to the utilities or railroads that may affect the Contractor's work.

The utilities' revised Location Permits are processed from the information provided in this specification, so it is important to assure that the Utility Coordinator is aware of any necessary field changes that require utility facilities to be located in different locations than originally specified.

When a project includes work adjacent to an active railroad, the contract documents will also include a section known as the Protection of Railroad Traffic and Structures (PRTS). The PRTS specifies the insurance a Contractor must carry to work near the rail line, and the distance from the tracks within which rail flagging will be necessary. In most cases, an agreement will exist with the railroad whenever a PRTS is in a contract.

c. Certification

Upon completion of the Pre-construction coordination process, a formal letter of certification is prepared and filed with the project records. This certification is a final statement that all foreseeable utility and railroad conflicts associated with the proposed project have been identified, and that a strategy has been developed for addressing those conflicts. This certification is required prior to project advertising for any projects utilizing federal funds.

d. Agreements

Agreements with utility or railroad companies are frequently necessary for a variety of reasons. Agreement Administration is covered in greater detail in Section 800-4. The two most common reasons for having agreements include:

Specifying the method and amount of reimbursement for any reimbursable utility/railroad work that must occur as a result of the project.

Specifying the terms of including utility work in the project contract. (Such work may be either reimbursable or non-reimbursable as stated in the agreement. Railroads or electric, gas, and communications utilities typically elect to do their own work.)

800-4 CONSTRUCTION

a. Pre-construction Utility Meeting

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A post-award, Pre-construction Utility Meeting, attended by the Contractor, utility personnel, railroad personnel, Utility Coordinator, and the Resident, is often essential to successfully starting the construction phase of a project. Section 104 of the project Special Provisions will state the contractual requirements for this meeting. This meeting is held for the following purposes:

- (1) To bring together personnel representing each party for a discussion of mutual problems.
- (2) To develop an orderly procedure and timing for utility relocations with due consideration of the construction procedures proposed by the Contractor.
- (3) To provide information the Contractor may develop a realistic construction schedule.

The Resident, through consultation with the Contractor, establishes the date and location of the Pre-construction Meeting. The Resident then notifies the Utility Coordinator, so that all utility and railroad contacts can be notified. It is important to assure that the Utility Coordinator is provided enough notice to reasonably assemble the utility/railroad personnel for the meeting.

The Utility Coordinator will act as the chair and secretary for the utility portion of the Pre-construction Meeting. Following the meeting, the Utility Coordinator will write and distribute a report of the discussion and agreements to all who were invited or in attendance. The report is essentially an amendment to the contract documents. In the absence of contradictory evidence, it is the official record of the agreements that were reached at the meeting and outlines the obligations that have been assumed by the contractor, the Department and the utilities/railroad. In some cases, this document may be used by the Contractor as the basis for a claim for damages due to delay/interference by the utilities/railroad. Therefore, as construction progresses, the Resident should keep good records of any pertinent variations from these agreements. When variations are recognized, the Resident should notify the Utility Coordinator and arrange an immediate meeting of the parties involved.

b. Ongoing Coordination

On many projects, a single Pre-construction Utility Meeting may not be sufficient to assure that utility/railroad work remains on schedule. On projects that involve extensive utility/railroad work, it is often worthwhile to organize bi-weekly meetings to assure that all parties continue to work together toward a common goal. In the absence of such meetings, delays can frequently arise as a result of poor communication between utilities or conflicting work areas between the utilities/railroad and the Contractor.

In general, day-to-day coordination between the Resident and the utilities should occur through the utility contacts provided at the Pre-construction Meeting. A utility's on-site contractor or consultant engineer should not become a primary contact unless specifically requested by the utility. However, in the case of an immediate safety issue (such as that discussed under Maintenance of Traffic or otherwise) the individuals

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on-site should be immediately directed to correct the issue and the utility contact person and Utility Coordinator should be notified of as soon as practical thereafter.

c. Dig Safe Law (23 MRSA §3360-A)

Maine has a law that requires all excavators to provide notice of 3 business days to all owners/operators having facilities in an excavation area prior to the start of any excavation. This law is informally known as the “Dig Safe Law”. The Dig Safe Law derives its name from the call center that receives calls from excavators (contractors) and then routes the details of the proposed excavation to its “member utilities”. Although the Dig Safe “member utilities” include many of the utilities located throughout the State of Maine (and several other states throughout New England), it is important to recognize that many other utilities are not members of the Dig Safe system and, by law, must be notified separately. Water and sewer utilities and individuals that may have privately-owned facilities in the public way are some common examples of those who must be notified separately. Since the presence of privately owned facilities is difficult to determine, it is recommended that whenever notice of a proposed excavation is called-in to the Dig Safe center and water/sewer utilities, abutting property owners should be notified as well. This assures maximum protection from liability for the excavator.

Regardless of whether an individual or utility is a member of Dig Safe, the law requires all who have been notified to mark the horizontal location of their facilities on the surface of the ground within 3 business days. Such marks must be within 450 mm [18 in] of the actual facility location, and they establish who will be liable for any accidents that may occur. Therefore, it is important to be aware of where these initial marks are placed. Although any marks provided as a result of the process set forth in law override the approximate utility locations provided on the construction plans, any recognized conflicts between the two should be verified with the owner of the facility in question.

Contractually, the Department obligates all of its Contractors to be responsible for compliance with the Dig Safe Law for the construction of MDOT projects.

d. Right-of-Way

During the design-phase coordination, the Utility Coordinator will normally have worked with the utilities to incorporate their right-of-way needs in the right-of-way acquired for the project. Such accommodation is not only critical to maintaining utility service during the construction of the highway, but it is also critical to achieving the timely relocation of the utilities. In general, the Department will normally acquire enough right-of-way to reasonably accommodate a utility’s main line facilities, not including spot-guying and clearing/trimming that may be necessary. However, in instances where a utility’s clearing/trimming or guying needs become extensive, the project schedule may benefit by acquiring enough right-of-way to accommodate those needs as well.

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When the Department acquires easements for a project, those easements may or may not be written to include utility facilities. If it becomes necessary to locate utility facilities in an easement area, this option must be discussed with both the Utility Coordinator and the project Right-of-Way Agent.

This Department has no control over any utility action that takes place outside of the highway right-of-way limits.

e. Clearing/Trimming

Clearing/trimming to accommodate utility facilities within the right-of-way is common on MDOT projects. Clearing/Trimming that is necessary for both the highway construction and the utilities is paid out of the project funds, whereas clearing/trimming that is solely required for the utilities is the responsibility of the respective utility. Before speaking with property owners about what clearing/trimming may be necessary for a project, it is important to fully understand all of the clearing/trimming that will be required for the utility work. The Utility Coordinator will normally have addressed most of these details during the design-phase coordination and should be consulted for information regarding utility clearing/trimming. A property owner should never be promised that a tree is not to be cut until all utility work has been taken into consideration.

When a utility removes a tree, it will usually not remove the stump. However, all other debris shall be removed and the site should be left in a presentable condition. On some projects, agreements may be processed to allow either the Department to perform necessary clearing/trimming for a utility or vice-versa.

f. Maintenance of Traffic

In the course of performing construction or maintenance activities within the limits of public roads, utilities and railroads are obligated to protect the traveling public in accordance with the standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD). This obligation is stated in the Code of Federal Regulations and the MDOT's Utility Accommodation Policy. If a utility or railroad does not use proper traffic control while working within the right-of-way limits of a construction project, the Resident and/or prime Contractor should notify them immediately. If corrective action is not taken, the Resident should immediately notify the Utility Coordinator. If the utility/railroad continues to disregard the directives and continues to conduct their work in an unsafe manner, the Department has the authorization to remove them from the public way.

g. Permits

There are generally two types of permits issued to utilities by the Department: Location Permits and Highway Opening Permits. Due to differing areas of applicability and administration, these permits are developed separately. However, it is likely that these permits will be combined in the future. At the time of this writing, Location Permits are issued from the Department's central office in Augusta, whereas,

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Highway Opening Permits are issued by the respective Division Offices. In most cases, both permits will be in place prior to the construction phase of a project, however, situations are likely to arise that will require a basic understanding of their purpose.

(1) Location Permits:

As discussed in Section 800-2 of this Manual, Background, Location permits are the instruments through which the Department licenses a utility to occupy a defined portion of the right-of-way. A utility typically obtains a Location Permit by submitting an application to the Department. However, when utility relocations occur as a result of a MDOT Project, a Location Permit is assigned through the Utility Coordinator by recording the specifics of the Utility Specification. This is one of the reasons why it is important to keep the Utility Coordinator informed of any necessary field changes in utility locations.

When utility work occurs in conjunction with a MDOT Project, the utility is expected to obtain a Location Permit through the traditional application process. A Resident may obtain a copy of any Location Permit either through the Utility Coordinator or by contacting the Utility Permitting Section directly.

(2) Highway Opening Permits:

Highway Opening Permits authorizes a utility to actually begin making an excavation within the right-of-way limits. This permit is not necessary for the installation of utility poles.

If underground utility work will be occurring in conjunction with the construction of a MDOT project, a Highway Opening Permit is not necessary and the Resident will be the Department's agent for assuring that the interests of the Highway are protected. However, if underground utility work is occurring before or after project construction or will extend beyond the project limits, the Division Office must issue a Highway Opening Permit.

h. Utility Location Standards

The standards by which utilities are accommodated within the right-of-way of state and state-aid highways are specified in the MDOT's Utility Accommodation Policy. This policy defines requirements for bridge attachment standards, cover depth for underground facilities, and horizontal offsets for aboveground facilities. The Resident may obtain a copy of this policy from the Utility Coordinator, the Utility Permitting Section, or from the web at www.maine.gov/mdot/utility. The Utility Special Provisions for each project are prepared using the standards set forth in this policy.

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i. Agreement Administration

It is important to review the terms of each agreement prior to the start of work. An agreement will usually specify responsibilities relating to inspection, documentation and other factors that will affect the relationship between the Resident and the utility/railroad. Utilities/railroads are usually obligated to submit daily or weekly reports to the Resident whenever work covered by an agreement occurs. There is no standard form prescribed for these reports and the Resident should reach an agreement with the utility/railroad regarding how they will be prepared and submitted. These reports must be reviewed and verified as submitted and will serve as a reference for future billing purposes.

Agreements will generally structure pay items in two ways:

(1) Unit Price

If work is being done under a unit price contract, the Resident should keep notes of the apparent quantity of work being done. Observations should be periodically checked with the records of the field representative for the utility/railroad. The Resident is not expected to measure or compute quantities; however, if errors in documentation are apparent, the Resident is expected to resolve the error to their satisfaction.

(2) Lump Sum

If work is being done under a lump sum contract, the Resident should keep records sufficient to verify that the work has been done substantially according to plan.

Agreement Change Orders are required for any change in the nature of the work covered by an agreement. These Change Orders require the same type of information required for a Change Order to the project contract and must have sign-off from all parties of the original agreement. The Utility Coordinator should be included in any necessary Change Orders to assure that the agreement remains consistent with original discussions and to assure that the necessary documentation is prepared to allow appropriate payment. Major changes must be approved before the work is done.

The Resident and Utility Coordinator must communicate as work covered by agreements is completed. For accounts receivable, the Resident must keep the Utility Coordinator informed as to what work has occurred in the field so that he/she can assure that appropriate billing is sent to the utility/railroad. For accounts Payable, the Utility Coordinator must assure that bills from the utility/railroad are routed to the Resident for verification (based upon the daily/weekly field reports) and that payment is ultimately sent to the utility/railroad.

SECTION 900

**PROJECT RECORDS &
CLOSEOUT**

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PREPARATION OF PROJECT RECORDS

901-1 GENERAL

This Section describes the requirements for preparation of the project records by the Resident and his/her Inspectors for final review. Field record keeping and testing procedures for the individual pay items are explained in the appropriate sections of this Manual.

901-2 PROJECT RECORDS

a. Final Quantity Computations Book

This book contains all computations that support pay quantities and that are done on 8 ½ by 11 sheets or other loose sheets. These computations may be done manually or may be computer generated. Dimensions, measurements, and computer data used in the computations must be referenced to source, whether it is plans or field measurements. **All calculations and data entries must be signed, dated, and checked; the checker must sign and date his/her work.**

Computation sheets will be filed by pay item, beginning with the lowest numbered. Example: Item 201 - Clearing. A summary sheet will precede the computations for each pay item. Totals shown on each summary sheet will be transferred to the appropriate pay item in the Final Quantity Book. The pages of each item should be numbered consecutively. Computation sheets will be bound together in a red acco-press binder, titled in one-inch lettering: Project Number, P.I.N., Town, and "Final Quantity Computations Book".

Daily Reports of Hourly Work and Flagger Reports should be filed in the Final Quantity Computations Book, located as items 629-631, and item 652, respectively. Following the item computation sheets is a copy of all Extra Work Orders, and Resident's Work Orders. A list of plotting rolls and plans, and a list of field books is also required. Index tabs will be used to locate each pay item or list.

b. Field Books

A project will have, typically: a Project Diary, a Final Quantity Book, and a Construction Book; these field books may be combined if the job is small. A full construction project, complex in nature, would probably also have one or more Drainage Books, a Grade Check Book, and an Inspector's Diary. For identification purposes, all field books will have: project number and town noted on the

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front cover, and labeled on the inside: MDOT, 16 State House Station, Augusta, Maine 04333-0016. 287-2127. Books must also be indexed and titled as to content. The binding must be left blank for use by the Augusta Office.

If the Resident uses the computer program Field Manager, the Final Quantity Book would be replaced by the "Item History to Date" and the Project Diary would be called the Daily Diary. This would be supplemented by the Inspector's Daily Report, also known as the IDR, which has to be made out in order that a progress estimate can be generated. The Resident can combine the IDR and the Daily Diary to avoid duplication.

Whether or not the Resident uses Field Manager, a Construction Book will be required on every job to record field measurements, layout notes, and other field data that cannot be readily entered in Field Manager.

(1) Final Quantity Book

The Final Quantity Book, or Item History to Date if the job is set up using Field Manager, is the mainstay of the project records. Every bid item originally in the contract and all contract modifications involving additional payment must be entered in this book; no job can be paid off without it.

Funding of a contract is sometimes divided into several funding sources, which usually result in pay items being grouped under different categories and P.I.N.s within the contract. The Final Quantity Book must be organized to reflect the different categories and P.I.N.s. P.I.N.s and categories will show on the first Progress Estimate, but if the Resident needs this information before the first estimate is issued, the Contracts Section will provide it.

Urban full construction or reconstruction projects usually involve the town, sewer/water districts or other utilities. A formal agreement called a Municipal Agreement or a City-State Agreement drawn up between the parties will stipulate payment responsibilities and other contractual responsibilities. These agreements will frequently make the Town or the Utility District liable for a share of the project cost. The Resident should have in their possession a copy of this agreement; there may be several and they are available from the Project Manager. Items involved will normally show as a category in the Progress Estimate, but if not, they still need to be entered separately in the Final Quantity Book.

The Final Quantity Book/Item History to Date will have no more than one item per page. Item number, description, and estimated quantity will be entered at the top of the page. Final pay quantity will be entered at the bottom and so labeled. **All entries must be signed, dated, and checked; the checker must sign and date his/her work.**

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A reference trail from the final pay quantity to the original documentation, whether it is notes of inspection and acceptance, measurements, or computations, must always be provided. It is suggested that the Resident and his/her Inspectors enter original documentation and calculations to the extent feasible, directly in the Final Quantity Book.

(2) Project Diary

Every job must have a Project Diary, or, in the case of Field Manager, a Daily Diary or a combination Daily Diary and Inspector's Daily Report. The Project Diary is intended to give the reader a general accounting of the Contractor's and subcontractors' day-by-day activities such as: pay items worked and locations, source and disposition of excavation, borrow, gravel, and pavement grindings. Non-routine matters must be recorded as well. Examples are: the Contractor not paying attention to traffic maintenance and erosion control, disregarding contract specifications, not staffing the job enough to complete work within required time limits, and other issues that could result in contractor claims. Matters dealing with town officials, utilities, developers, and other abutters should also be recorded.

The Resident will enter such boilerplate information in the Diary as:

- a. Day, month, year, Contractor's and subcontractors' working hours, and weather.
- b. Contractor's and subcontractors' personnel and equipment. This information may be recorded once a week if there are no changes.
- c. State inspection personnel on the project, and visitors.
- d. Signature of the Resident, or typed name if Field Manager is used. If someone other than the Resident makes out the diary, then the Resident should initial the diary entry under the signature of the person making out the diary, to signify that they have read and agree with the entry.

(3) Construction Book

This book is a catch-all; whether the Resident uses Field Manager or the conventional method of keeping project records, i.e., field books, a "construction book" is usually necessary and handy to have. Complex field measurements, field data, or sketches that must be recorded before that work is buried and cannot be easily recorded in the Final Quantity Book can be entered in the Construction Book.

Typically, measurements for riprap, loam, seed, mulch, undercuts, top of ledge elevations, boulders, gravel used for traffic maintenance, grade checks on concrete forms and drainage systems, and layout in general will be entered in the Construction Book.

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(4) Drainage Book

If a job has a large quantity of drainage, such as on a complex urban project, documentation of drainage installations should be entered in a separate book called a Drainage Book. This book should be organized before the work is done; each run of pipe and each catch basin or manhole would have its own page or pages.

As the work progresses, Inspector's notes and measurements would be entered under the appropriate run. The entries may include length of pipe and catch basins installed, gravel used for traffic maintenance, undercutting and bedding material used, ledge removed, riprap at pipe inlets or outlets, or utilities encountered. Quantities for payment would then be summarized in this book and transferred into the Final Quantity Book.

(5) Inspector's Diary

If a job is staffed by more than one inspector, the Resident may want his inspectors to keep diaries. This diary would contain the same boilerplate information as the Project Diary but would have a more detailed accounting of the Contractor's activities and progress of work. The Inspector's observation notes and some measurements may also be recorded.

(6) Grade Check Book

On a large, full construction project a grade check book should be set up prior to the work being done. The Inspector will then have at their disposition a handy tool to use for checking subgrade, top of gravel ("fine-grading"), ditches and backslopes. A copy may be given to the Contractor's grade foreman for their use. The Contractor's foreman is in effect performing a Quality Control activity and the Department's Inspector is performing a Quality Assurance activity by checking, at random, the Contractor's grading accuracy.

c. Testing File

This file contains all test reports and test data that document the quality of materials incorporated into the project. Reports and related data will be filed chronologically with the most recent on top and will be grouped by pay item in the same order as shown on the list of Minimum Testing Requirements, a copy of which must be included in the front. The Testing File will be bound by a black acco-press binder and labeled in gummed white labels: Testing File, Project No., P.I.N., and Town. Index tabs will be used to separate and identify the items.

The Minimum Testing Requirements, also known as the "Minimums", specify the frequencies and types of tests to be taken of materials used on the project. The Minimums are determined by the

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Materials Section in Bangor, web address: Network Neighborhood/DOTBGR1/ Shared/Minimums, telephone 941-4545. General testing requirements will be found in each Section of this Manual. The Minimums may vary from these general testing requirements to meet the needs of each particular project. The Northern Area Acceptance Testing Supervisor issues the "Minimums" for all projects; e-mail the requirements will be sent to the Resident if it is known who is assigned to the job. However, if you don't receive them, they are available at the above noted address.

The Resident is to use the list of Minimum Testing Requirements as their guide to test job materials. The minimum number of any particular test should not be less than the listed requirement without serious reason. Changes are to be explained by memo filed with the item involved. The most frequently seen change is a decrease in the number of densities required. However, due to changes in material sources, borderline materials, or work being done in several small sections (mostly on urban projects), more tests than the minimum may be necessary. The Resident must use their discretion to determine when more tests are necessary. The Resident must also explain the outcome of failing materials, i.e., removed and replaced, or accepted on the basis of substantial conformance.

If the contract contains a QC/QA specification for hot bituminous pavement and for concrete, the Contractor's QC test data and the Engineer's QA test data will be filed together for each day under the pertinent item. Pay factor computations will also be filed with the test data. They will be done by the Resident and checked by someone knowledgeable in the calculation of pay factors. The Contractor should be given the opportunity to review the factors before the Resident submits the project records to the Contracts Section for review.

901-3 PROJECT FILES

Project files consist of job records exclusive of final quantity computations, field books, and test data, and are turned in to the Contracts Section at the completion of the project. The following types of records should be grouped and submitted in manila envelopes: general correspondence, right-of-way records, utility records, submittals (shop drawings), permits, payrolls, delivery slips, and cover slips. The envelopes should be labeled with the project number, town, and contents. Work orders, flagger reports, and daily work reports become part of the Final Quantity Computations Book when the Resident assembles it. Test data become part of the Testing File. The preliminary engineering file, known also as "PE" file, the engineer's estimate and one copy of the bid book (Special Provisions) should also be turned in with the project records. Extra copies of the proposal book, and progress estimates, vouchers, and estimate computations may be discarded before the project records are submitted for final review. Delivery slips for hot mix asphalt should be kept until the Contractor has agreed with all of the Final Pay Quantities, after final review. The most recent progress estimate must be kept, as it will be used to prepare the Final Quantity Estimate during final review.

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REVIEW, CLOSEOUT, and FINAL PAYMENT

902-1 GENERAL

This Section describes the procedure the Resident is to follow when he/she submits the project records to the Project Review Unit of the Contracts Section for final review and close-out of the project.

The purpose of the final review is to assure that both the quality and quantity of materials and work performed by the Contractor are tested and documented according to Departmental policy and procedure.

After the job records have been assembled as described in Section 901 of this Manual, the Resident will contact the Project Review Unit and make an appointment to submit the records for final review. This should take place within 60 calendar days of physical completion of the project. Physical completion is described in Section 107.9.3 of the Standard Specifications.

902-2 REVIEW

The Resident and the Reviewer will go over the project records together to assure that the Final Quantities for payment are substantiated by field measurements and other original documentation as required. A “project review checklist”, is to be used as a guide. Also at this time, the Testing File will be reviewed to verify that materials have been tested according to the list of Minimum Testing Requirements and Departmental policy.

Work and materials that are not documented and tested in accordance with departmental policy may require additional tests, measurements, or field documentation, or may be shown as “non-participating” on the Final Quantity Estimate; that is, ineligible for Federal funds.

As part of the review, the Final Quantity Estimate will be made out and labeled as such, signed and dated by the Resident and co-signed by the Reviewer. If the Resident uses “Field Manager” to make progress payments, he/she should contact the Project Review Unit, prior to submitting records for review, so that a paper copy of the most recent progress estimate can be prepared. This estimate will then be used to make out the Final Quantity Estimate. Every project must have a paper copy of the Final Quantity Estimate as part of the final contract documents.

Quantities to be billed to Towns, Sewer & Water Districts, Utility Companies, Developers, and Abutters are to be summarized and forwarded to the Bureau of Finance & Administration. Municipal Agreements, discussed under Subsection 901(b) 1 of this Manual, are to be reviewed and billings done accordingly.

In addition, the following final documents are also required:

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a. Time Charge Report: This report shows the required contract completion date and actual completion date. The Resident will discuss time overruns with his/her supervisor and document resolution of such overrun by a memo to the Project Review Unit, whether it is a time extension or assessment of liquidated damages. A meeting with the Contractor may be required in the process. All waivers of liquidated damages need to be explained in memo form to be forwarded to FHWA.

b. Right-of-Way Encroachment Memo: This memo lists kind and location of encroachments within the right-of-way, only if new right-of-way is taken. Pre-existing encroachments need not be reported.

c. Contractor Evaluation: This form is an evaluation of the Contractor's performance during construction of the project. It must be completed and signed by the Resident and co-signed by the Contractor's Superintendent.

d. Explanation of Overruns and Underruns: Policy for explanation of overruns and underruns is given below: (Only required in FHWA oversight Projects)

1. Tabulation of Items. This is a list of items in the contract and those added by work order. The following information will show in the heading portion: project number, town, estimated cost, final cost, and percent over or under for the contract. In the body of this document will be listed: estimated quantity, actual quantity, and percent over or under estimated quantity for each item.

2. Explanations. Rules for explanations are: If the final cost of the project is 3 percent or less over the estimated cost, explanation of quantity overruns and underruns are not required. The 3 percent limitation is concurrent with the Department's work approval policy which gives the Resident authority to direct or approve changes up to 3 percent of the estimated contract cost. If the final cost of the project is in excess of 3 percent over the estimated cost, the following rules apply:

a. If both original cost and final cost for any one item are under \$3000, no explanation is necessary, regardless of the percent over or under.

b. If the original cost for the item is under \$3000 and the final cost is over \$3000, an explanation is needed if the final cost is more than 50 percent.

c. If the original cost for the item is between \$3000 and \$10,000, an explanation is needed if the overrun or underrun is more than 50 percent.

d. If the original cost exceeds \$10,000 for the item, an explanation is needed of the overrun or underrun is more than 10 percent.

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If an overrun or an underrun requires an explanation, only the quantity over or under the allowed percent needs to be explained, not the entire amount. When explanations are written, it is necessary to give reasons why the item overruns; a comparison of the estimated quantity and the final quantity in itself is not sufficient.

The Resident should complete the above documents prior to final review; these documents are available from the Contracts Section in Augusta. The Final Quantity Estimate will be made out during the final review process.

Two brief reports, in the form of memos to the project file and usually one page each in length, will be written by the Reviewer stating that project records have been reviewed and properly substantiate the quantity and quality of work and materials incorporated into the job. Deficiencies and how they are resolved will be noted. A memo will be written addressing quantities, and one will be written addressing quality of materials.

It may be the situation that, at the completion of final review, there remains contractor issues that are unresolved, usually: potential liquidated damages, disagreement over pay factors for hot mix asphalt or concrete, or Contractor claims. The Resident likely will be called on to help settle these items by meeting in Augusta with his/her Supervisors and with the Contractor; this will be done before the Project Review Unit makes final payment and the project is closed out.

902-3 CLOSEOUT AND FINAL PAYMENT

A project cannot be closed out until all outstanding issues are resolved on the project, and final payment is made.

Following the final review, the Project Review Unit will send a copy of Final Quantities to the Contractor, with a cover letter stating that the Final Quantities are included, and what final documents are to be submitted and issues remaining to be settled before final payment can be made. Contractor's final documents are:

1. Certificate of Materials. See Standard Specifications, Section 700
2. "Buy America" Statement. See Standard Specifications, Appendix A to Section 100, Section 3, Subsection A
3. Letter "All Bills Paid". See Standard Specifications, Subsection 107.9.4
4. FHWA Form "PR-47" on projects with full Federal oversight over \$1 million in estimated cost. See Standard Specifications, Appendix A to Section 100, "Start of 1273 Required Contract Provisions", Section VI, Subsection 1, Paragraph C (page A-31)

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5. Letter stating amounts paid to Disadvantaged Business Enterprises, Division 100, Appendix A, Section 1, Section D (page A-12)

Standard Specifications, Section 101.2 - Closeout Documentation discusses the above listed documents. Contract Evaluation Forms, Resident Evaluation Forms, and PR-47 Forms are available from the Contracts Section in Augusta.

Contractors will not generally submit the “All Bills Paid” letter until they have seen the Final Quantity Estimate and have settled all items of contention with the Department, liquidated damages being the most frequent problem.

A portion of the monies withheld from the Contractor (the “retent”) may be paid at the time of final review or prior to it, depending on the status of the job. If there are no liquidated damages, no claims or disagreements with quantities, or no remaining work to be done in the field (such as clean-up), most of the retent may be paid. A fixed amount will be held pending the receipt of final documents. The retainage will not be released on a Project without consulting the Resident.

After the Contractor submits the final documents to the Project Review Unit and all issues have been settled, final payment is made. This payment includes final adjustments, and also the remainder of the retent. When the “Final Estimate” is paid, the project records are filed with the Program. The Bureau of Finance and Administration will continue the closeout process by issuing the last check to the Contractor, and working with the FHWA for reimbursement for the Federal share of the project.

SECTION 1000

RIGHT-OF-WAY

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RIGHT OF WAY

1001-1 RIGHT OF WAY ACQUISITION

Land, and rights in land, must often be acquired from abutting owners to facilitate construction of the project as designed. Owner's rights to just compensation and due process are protected by the 5th Amendment to the U. S. Constitution. The processes to insure that owner's rights are protected are outlined in both State and Federal statutory law and Federal Regulation. Right of Way team members are responsible for the implementation these procedures.

Some basic owner entitlements under the law are as follows:

1. The right to receive just compensation for their property, which may not be less than the agency's approved appraisal of the fair market value.
2. The right to have just compensation determined by a court of law.
3. An opportunity to accompany the appraiser when inspecting their property.
4. A written statement of, and a summary of the basis for, the amount established by the acquiring agency as just compensation.
5. Payment of the offering price before being required to surrender possession of the property.
6. At least 90 days written notice to vacate occupied property.
7. The right to negotiate without coercion from the acquiring agency.

Working on private property without completion of the acquisition process or express permission of the owner is considered a trespass.

Owners who do not settle are referred to the State Claims Commission 60 days following condemnation, by law. Either party may appeal the Claims Commission award within 30 days of notification. Negotiations with owners are ongoing until cases are heard.

"Estates" or interests in land acquired typically fall into the following categories:

FEE SIMPLE ABSOLUTE: Often called "fee interest" or just "fee". This type of acquisition represents all right, title and interest in the property taken and leaves the owner with no remaining rights.

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PERMANENT EASEMENTS: These acquisitions take less than fee interest and leave the owner with the right to use the land for purposes that don't conflict with rights conferred to MDOT by the easements. Permanent easements are taken for slopes, drainages, construction and maintenance, clear sight and other similar purposes.

TEMPORARY CONSTRUCTION EASEMENTS: This estate was developed over the last several years. The TCE is used in situations where a right is necessary to build, but not necessary to maintain, the project. TCE's are typically condemned, providing assurance the right will be obtained, and these rights expire when the construction is complete.

GRADING RIGHTS: Grading rights are also temporary but are typically acquired to do work beneficial to the abutting property (i.e. matching drives or lawns to the project). These rights are not condemned and, if not granted by the owner, the work is adjusted to remain within the right of way.

It is important that work be constantly checked to keep all construction work within the limits of the right of way or easements acquired.

Right to work permits give permission to do only as much work as is absolutely necessary to complete the intent of the work. This does not mean cutting trees or other major work. If there is any doubt, the Resident should contact the Right of Way Division.

1001-2 RIGHT OF WAY PRECONSTRUCTION CONFERENCE

In order to properly coordinate Construction and Right of Way activities, a Right of Way conference is to be held following the award of a contract on projects involving acquisition of land or rights. Prior to this conference, the Right of Way Representative will prepare a Status of Negotiations Report. This report will list all owners on the project, the owner's settlement status, any agreements made by the Representative, and a summary of any outstanding issues. A copy of the report will be provided via e-mail to the Resident and Project Manager on or about the project advertise date.

The Conference should take place as part of the Pre-Construction meeting. This will provide an opportunity for all involved in the delivery of the project to become aware of potential problems and/or conflicts with abutting owners and to develop plans for reducing conflict.

During the course of construction, the Resident should be mindful of requests or concerns voiced by unsettled owners. Approval of any requests should be coordinated through the Right of Way Representative to maximize any opportunity for settlement.

More detailed information is available in the Right of Way Manual.