

## **CHAPTER 5 - Construction Project Management**

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## **Introduction**

The term Project Manager (PM) is a general term used throughout this chapter for the Florida Department of Transportation (FDOT) employee responsible for managing a construction project. Unless specifically indicated otherwise, PM refers to the FDOT Construction PM.

This chapter deals with project management from the perspective of the FDOT PM and consultant Construction Engineering and Inspection (CEI) PM. Whether FDOT or consultant, the PM must concentrate on the four goals of a successful project:

- Fulfill project objectives
- Complete the project within the time specified
- Complete the project within the allocated funds
- Complete the project to the level of quality specified by the contract documents

Of these goals, the one that lingers longest after job completion is the quality of construction, and it should not be sacrificed for the sake of the other three.

Perhaps more so than for any other project phase, fiscal responsibility must have a high priority on a construction project. PMs are responsible for very large expenditures of state and federal money. Projects must be managed properly in every respect. Accurate and complete documentation is imperative.

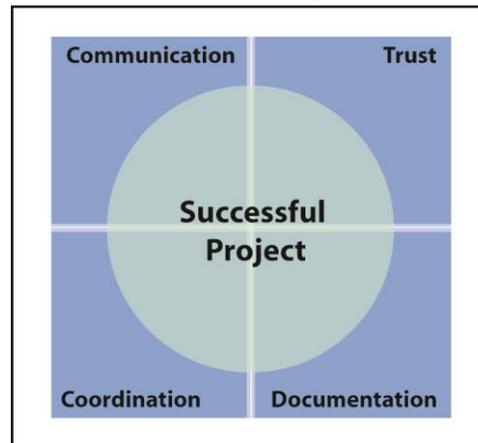
## **Construction Contract Management**

The PM manages construction contracts either directly or through a CEI consultant, who has responsibility to manage the construction contract on behalf of the FDOT. The PM may be responsible for more than one construction project. Following trends in other areas, the FDOT now out-sources management of many of its construction contracts; however, it still manages a select few with its own in-house staff. The FDOT competitively selects consultant firms to provide CEI services on a specific construction project or group of construction projects. The CEI consultant furnishes a team of engineers and inspectors fully qualified for and certified in all areas related to their responsibilities, including sampling, testing and inspection. A Senior Project Engineer oversees the CEI team effort and is responsible for coordination and monitoring contract progress. The Senior Project Engineer may oversee more than one construction project.

It is important for both the Senior Project Engineer and the PM to remember that the contractor is ultimately in charge of the construction effort. The contractor is obligated to provide the means, methods, and resources such as labor, equipment, materials and sub-contract services and to complete the job as specified in the contract documents. It is very important to establish a positive working relationship through a Partnering Program or similar means at the very outset of the job. For additional information on partnering, refer to the [Partnering Facilitators Manual](#).

Communications, trust, documentation and coordination are just a few of the key ingredients that go into managing a successful project, as shown in Figure 1, **Elements in Managing a Successful Project**. Both the PM and the CEI must work together to provide them.

Figure 1  
**Elements in Managing a Successful Project**



There are many guidelines and manuals describing the relationships of the FDOT, CEI, and the contractor. These relationships will differ slightly from job to job. Both the Senior Project Engineer and the PM must be very familiar with all contract documents. Reading and understanding them is essential. Two additional documents that must be thoroughly understood are the [FDOT Standard Specifications for Road and Bridge Construction](#), and **Procedure No. 700-000-000, [Construction Project Administration Manual \(CPAM\)](#)**. The FDOT Specifications establish the relationship between the FDOT and the contractor. The CPAM describes the relationship between the FDOT and the CEI firm; it also describes the CEI management scope and procedures required on the job.

## **CEI Contracts**

A construction project normally has three entities working together to achieve the project objectives of timely completion, within budget, and a quality product: the FDOT, the CEI and the contractor. The roles and responsibilities of each must be clearly defined and understood. For a project to run smoothly there must be clear leadership and coordination, without redundancy.

*"...CEI firms shall be allowed to exercise their independent professional judgement...The role of the Department's Project Manager (PM) is to ensure that these CEI firms are providing services in accordance with their Contract and not controlling the means and methods by which the CEI firm performs these services. Department procedures allow review and rating of such services and further provides for recovery of any errors and omissions made by the CEI firm."*

*Jose Abreu  
Secretary of Transportation  
February 6, 2004*

The PM should concentrate on the performance of the CEI firm and its daily operations. The PM should be personally involved in the selection process, defining the type and number of personnel needed, qualifications required and other important selection criteria. The PM should see that the selected CEI team is brought on board at the appropriate time and is fully familiar with the requirements of the contract and the scope of services to be provided. The **CPAM** describes CEI responsibilities in detail. In addition to monitoring CEI performance, the PM reviews invoices and results of sampling and verification testing. It is particularly important that the PM track the schedule and costs of the CEI and that the CEI track those of the construction contracts. The PM should coordinate other FDOT resources that may be required and key decisions that may be needed. The PM is the primary resource for decisions outside the CEI Scope. The CEI does not have the authority over R/W or Utility conflict issues.

Both the CPAM and the CEI contract scope of services clearly define the responsibilities of the Senior Project Engineer. The Senior Project Engineer is to be totally involved with the construction contractor on a day-to-day basis, from pre-construction activities through project completion and final acceptance. The Senior Project Engineer must monitor and document the contractor's activities.

**Scheduling the CEI Contract.** The appropriate time to bring the CEI on board will vary according to the type of construction contract, i.e. design-build, unit price, lump sum, etc. The PM should decide the appropriate level of involvement in any pre-letting activities such as plans review and comments, determining contract duration and recommending appropriate alternative contracting techniques. There are many good reasons to involve the CEI firm early in the process. The CEI firm's input in the early stages of a project can result in a more constructible project and thus lower construction cost.

The Work Program establishes the bid-letting date well in advance. Following this date, the contract is generally awarded within 20 days. The contractor executes the contract documents within 10 days following award of the contract. Once the contractor returns the contract documents, the FDOT has 5 days to execute them. The construction contractor's Notice to Proceed (NTP) is generally issued within 20 days following contract execution by both parties.

Figure 2  
Construction Contract Award Time Frame

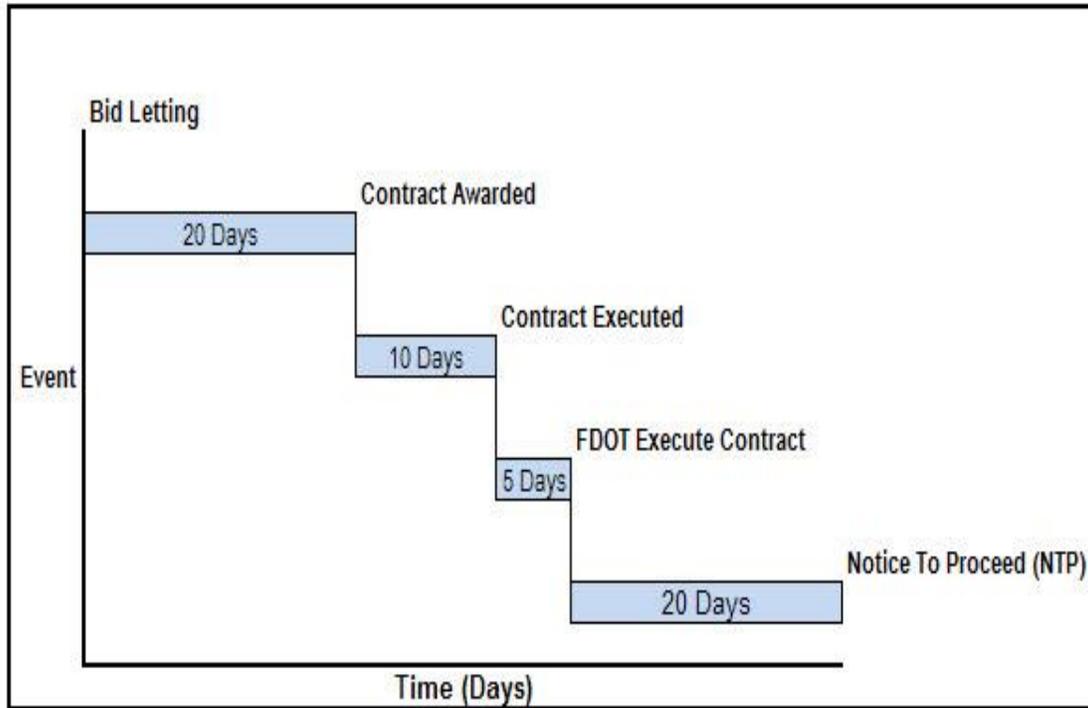


Figure 2, **Construction Contract Award Time Frame**, illustrates a typical construction contract award schedule.

The CEI firm should be on board well before the NTP for several reasons. It is not unusual to issue the NTP at the pre-construction conference, which is generally chaired by the CEI firm. Also, notices must be sent to all who will attend the pre-construction conference well in advance of the established date. The CEI team must have time to mobilize, assign personnel, establish office space (with telephones, computers, and other necessary supplies) and obtain necessary vehicles for project staff.

Similar allowances must be made at the end of the project. To consider final measurements and estimates, final inspections, warranties and guarantees, claims, as-builts, and other documentation and demobilization efforts at the end of a job, the CEI will need time beyond construction project completion.

Lump Sum CEI Contracts. The conventional method of CEI contracting is a cost plus fixed fee type contract, where the CEI is paid for the actual hours worked in each employee classification and all expenses are clearly defined and documented. Lump sum contracts are also used for CEI services. The PM should consider the risks and rewards possible for the CEI firm under a lump sum contract. If the project goes well and is completed on or ahead of schedule, the CEI firm is rewarded for contributing to an efficient operation. If a project does not go well and there are substantial time overruns, the CEI firm must absorb the additional costs. Once the lump sum fee is established, it can be renegotiated only under certain specified and pre-determined conditions.

It is important to select projects carefully for this contracting method to minimize risk to both the CEI and the FDOT. The following types of construction projects are most appropriate for a lump sum CEI contract:

- Design-Build or Lump Sum Construction Contracts
- Contracts that include incentives for early completion
- Corridor Projects with sufficient history regarding time and cost changes
- A construction project with a clearly defined scope and minimum variables

When a lump sum CEI contract is used, the selected CEI firm should be provided with as much information as possible about the project, the contractor and the project schedule prior to negotiating the lump sum fee. Prior to fee negotiations, the FDOT should have provided the consultant with as much information as possible about the project, the contractor and the project schedule.

From the FDOT point of view, the lump sum fee for CEI services is much easier to administer and monitor. Percentage payments should track the construction progress. Comparisons between more traditional and lump-sum CEI contracts are still being made. CEI consultants have concerns about the risk associated with these contracts, but they find the administration and documentation much easier. Guidelines for CEI lump sum contracts can be found on the [Construction Office](#) website.

**CEI Responsibilities.** The CEI consultant responsibilities are defined in the contract scope of services, which should be tailored to meet the special needs of each project. Generally, the CEI firm is responsible for administering the construction contract to ensure the project is constructed on time, within budget, with the specified quality and in reasonable conformance with the contract documents. The Senior Project Engineer represents the FDOT to the construction contractor and reports to the PM regarding construction progress. The CEI must report any actions on the part of the contractor that raise suspicion of illegal or inappropriate activities.

Each district maintains a standard CEI Scope of Services. This standard scope of services of the CEI consultant should be modified so that it is specific to the needs of the project. In general, the responsibilities in the scope are derived from two basic documents, the **CPAM** and the Standard Specifications. The PM should refer to these documents when preparing the scope of services. The Senior Project Engineer must be fully aware of the provisions of these documents and the scope of services.

**CEI Management Issues.** The CEI's first priority is the full-time administration of the construction project assigned. However, the resources for accomplishing this work are limited. The Senior Project Engineer must establish a list of critical items and events needed to meet the requirements of the project and then reasonably allocate the necessary resources to accomplish the project objectives at a profit for the CEI firm.

Management of a CEI contract is a challenge. Because of the task at hand and limited resources, the Senior Project Engineer must plan the day-to-day operation of his office carefully in order to meet or exceed the requirements of the FDOT and accommodate the contractor's construction operations to avoid any delays to the work. This operation can be rather routine. The contractor provides a schedule for all work activities, and the CEI meets that schedule with the necessary resources.

The real challenge for the Senior Project Engineer is managing situations when things do not go as planned. For example, schedules are delayed, costs tend to overrun, the contractor files notices of claims and unexpected site conditions are found on the job. The Senior Project Engineer must overcome these obstacles in a positive, economical manner while protecting the interests of the Department. Problems can be avoided or minimized by looking ahead on a project to anticipate possible problems and identifying potential solutions. Problems must be identified early and solutions aggressively sought.

On cost plus fixed fee contracts, it is particularly important for the CEI to track costs carefully. If it appears that contract limits will be exceeded, a request for fee increase must be submitted in sufficient time to negotiate a new fee and execute the necessary contract modification before costs actually exceed the current contract amount. The CEI cannot be reimbursed for costs that exceed contract limits. It is the Senior Project Engineer's responsibility to take these actions.

## **Community Awareness Plan**

A Community Awareness Plan (CAP) should be developed during the design phase of the project (see Part 2, Chapter 3 of this handbook). The hand-off from design to construction should include the CAP. The PM and the Senior Project Engineer should review the CAP and update it as necessary to make it useful during design. The CAP should be a factor in selecting the contracting method to be used, as discussed below. Construction phase CAP actions to be considered include:

- Mass mailings with information on construction dates and specific traffic impacts that are expected
- Pre-construction public information meetings to allow the public to review the plans and ask questions
- News releases
- Information flyers
- Specific business access issues
- Methods of dealing with complaints and inquiries from the public

## **Alternative Contracting Methods**

The method of contracting work on a particular project will, to some extent, dictate how the project should be managed. The FDOT has experimented with and continues to practice various methods of bidding for and awarding a construction contract to achieve a specific goal. Detailed information on alternative contracting methods can be found on the Construction Office website under [Alternative Contracting](#), and Section 1.2 of the CPAM. The FDOT has used the following methods of project delivery in the bidding and awarding process:

**Unit Price.** This method is the most common FDOT delivery method. Both the construction time and quality are specified, and unit prices are established in the bid for various items of work. The total cost is determined by extension using estimated quantities. Final costs are based on physical measurements of the quantity of work performed in each item of work.

**Lump Sum.** Time and quality are established in the bid documents, but the bidder determines the quantities of work and the cost and submits one bid price for all work required. This type of contract eliminates the need for final measuring of the job quantities.

**Design-Build (D-B).** This method is based on a selection procedure that considers qualifications, costs and other factors. The contractor is responsible for design. The major benefit of D-B is a significant reduction in the overall project delivery time that results from the overlap of design and construction. Demands on the PM and the CEI increase for this type of contract, both in the selection process and the actual monitoring of the contract. Since the contractor is responsible for design, Quality Assurance/Quality Control (QA/QC) must be emphasized. D-B Project Management is discussed in detail in Part 2, Chapter 6, Design-Build Project Management, of this handbook.

**Bid Averaging.** This method is one of the few that address cost. Instead of the traditional low bid, certain high and low bids may be thrown out, and the remaining bids are used to calculate an average cost (bid). The project is awarded to the bidder closest to this average cost.

**Lane Rental.** This method is useful in minimizing traffic impact of a project, particularly if the project will require frequent lane closures. Part of the bid is a rental rate for lane closures: a cost per lane per length (mile) per unit of time (hour or day). This strategy provides an incentive for the contractor to find ways to avoid or minimize lane closures and, when necessary, to minimize the time involved. The contractor is rewarded for keeping traffic lanes open as much as possible throughout the construction period.

**Incentive/Disincentive.** This concept of contracting is designed to reduce the overall contract time by giving the contractor an incentive for every day the contract is completed early and a disincentive for failure to complete a project on time. The amount of incentive/disincentive is established by FDOT in the bid package. A benefit-cost analysis is required to establish the incentive amount. Section 1.2 of the CPAM discusses the required procedure.

**No Excuse Bonus.** This method provides a monetary incentive bonus for the contractor who completes the project early within a specified time, regardless of any problems or unforeseen conditions. No time extensions are allowed for purposes of this bonus. This method normally would be used for major work with severe community impacts.

**Liquidated Savings.** This method awards the contractor for each calendar day the contract is completed and accepted prior to the expiration of allowable contract time. Contract time is adjusted for time extensions. The amount of award is based on the direct savings to the Department related to CEI and contract administration costs.

**A+B Bidding.** This method enables a contractor basically to establish his own construction time. Generally but not always, the bidder who can complete the project in the shortest time will be successful because a value is fixed in the bid process for each day of construction. This method normally is used on controversial projects with significant impacts to traffic or property access.

Figure 3, **Alternative Contracting Methods and Their Advantages**, outlines the benefits of these various alternative contracting methods.

Figure 3  
**Alternative Contracting Methods and Their Advantages**

Contracting Technique	Reduce Traffic Impacts	Reduce Community Impacts	Minimize Construction Time	Minimize Total Time	Minimize Administration	Minimize Claims	Maximize Control
Unit Price							★
Lump Sum					★		
Design-Build				★	★	★	
Bid Averaging					★	★	
Lane Rental	★						
Incentive/Disincentive	★	★	★				
No Excuse Bonus	★	★	★				
Liquidated Savings	★	★	★				
A+B Bidding	★	★	★				

## **Warranty Specifications**

The FDOT has developed performance-based warranty and guarantee specifications that are now being incorporated in design-build projects and all asphalt and concrete pavement, turf, and landscape projects. The contract documents specify that the contractor provide these assurances.

Under these specifications the contractor assumes a much greater role in the quality control, production and testing of the work items in which the contractor has such a vested interest in assuring their service life.

The PM must be familiar with the warranties/guarantees used in the contract documents. The inclusion of these requirements, which may require additional effort in the inspection and acceptance and the quality assurance testing, should enhance the project life.

## **Plan Revisions**

During the course of construction, certain revisions to plans are permissible under certain circumstances without voiding the construction contract. Section 4.3, Alteration of Plans or Character of Work, of the FDOT Specifications, deals specifically with this issue. The topic is also covered in Section 7.3.6.3 of the CPAM, and Section 3.5 of Procedure No. 700-050-010, [\*Preparation and Documentation Manual\*](#). These last two references, however, are not construction contract documents to be enforced on the contractor.

The need for plan revisions is anticipated in the contract documents. Reasons for revisions include but are not limited to the following:

- An increase, decrease, or actual alteration in the work
- Extra work assigned under the contract
- Differing site conditions found in the field
- Cost Savings Initiatives (CSI) submitted by the contractor, the FDOT or the CEI

When faced with a potential plan revision, the CEI should research the referenced documents, determine if costs or time are involved in the plan revision, and respond promptly so that the contractor's progress on the project is not impeded. The procedures to follow are all carefully detailed in the references. In no case should the contractor be allowed to proceed with any plan revision until written approval is issued. It is important that all significant changes made during construction be documented in the final as-built plans, as discussed in Chapter 4 of the **Preparation and Documentation Manual**. This reference should be followed in making any changes in final quantities and changes in the design that are reflected in the final estimate for the project.

## **Permits and Other Commitments**

The CEI is responsible for ensuring compliance with environmental permits and for ensuring that environmental commitments made during the project development are honored. The PM and the Senior Project Engineer must be aware of requirements and conditions specified in permits. These usually focus on measures to protect wetlands, wildlife and water quality. Other commitments may include socio-cultural commitments made to federal, state and local agencies, organizations and citizens groups. Examples include construction noise controls, dust control, maintenance of traffic issues and accommodation of special events. Provisions for these commitments should be included in the contract documents.

All utility permitting must be coordinated and managed in accordance with the district-established schedule. At some point in the design phase, all utility permitting coordination is turned over to the District Construction Office. These are in turn included in the CEI review responsibilities for a project. The CEI provides recommendations, but the Maintenance Office approves or denies the permits.

## **Alternate Designs**

The CEI may be challenged on the construction project by the submittal of an alternate design by the contractor. Alternate designs are generally submitted for one or more of these three objectives: project cost, project time or project quality. Therefore, they should be carefully and promptly considered, with a written response to the contractor. Contract documentation must be included if the submittal has been approved.

The contractor frequently offers alternate traffic control plans. Paragraph 4, Alternative Traffic Control Plan, in Section 102 of the Standard Specifications, describes the procedures and requirements governing such an alternate design. As with most contractor submittals, a specialty engineer is required to sign and seal the plans prior to submittal. The Senior Project Engineer must respond to these submittals in a timely manner.

A CSI could also represent an alternate design submittal by the contractor. These proposals have been discussed earlier. A timely response is of great importance.

## **Coordination with the Engineer of Record**

The Senior Project Engineer should have on-going coordination with the FDOT design project manager and the Engineer of Record (EOR) throughout project construction. The EOR is the designer of the project who was responsible for the preparation of the contract documents. The term "Engineer," mentioned in the contract documents refers to the State Construction Engineer, or his designee, not the EOR.

The Senior Project Engineer should remember that the FDOT design project manager and the EOR have been involved in the project through the design phase. They can explain the history of the design and how it evolved into the final construction phase. Generally, design contracts include some post-design (construction) services. The PM or CEI must understand the contractual issues related to obtaining the services of a consultant EOR. Usually the FDOT design PM must approve any chargeable services provided by the EOR. Consequently, it is important to work with the FDOT design project manager to establish the appropriate protocol for communication. The EOR should prove to be an excellent resource for the PM and the Senior Project Engineer throughout the construction period.

The FDOT design project manager and the EOR should be invited to the pre-construction conference, the partnering meeting, and at least to the earlier on-site construction progress meetings to establish open and direct lines of communication.

The PM's role includes monitoring the EOR's responsiveness during the construction period. The EOR must review and approve shop drawings submitted by the contractor within the allotted contract time, review and approve any contractor-proposed design changes, evaluate and respond to Requests for Information (RFI) or CSI submitted by the contractor, and address any other design-related issues.

A good working relationship between the Senior Project Engineer and the EOR is very important. Many of the EOR duties and responsibilities mentioned above have a direct impact on the project schedule. Communications must be clear and open. Contract deadline dates outlined in the documents should be well known, and they should have been discussed. The PM or Senior Project Engineer should provide as much lead-time as possible to the EOR.

## **Construction Quality Control Testing**

The FDOT has recently implemented changes in the construction specifications that shift more of the construction quality control responsibilities to the contractor. This change is a departure from past practice where the FDOT was responsible for all sampling and testing procedures. The approach, known as Contractor Quality Control (CQC), was developed over several years and is still being refined on construction projects today. There is much information available on the program in the contract documents, which the PM should review in detail.

Before starting any new construction project, the contractor is required to submit a Quality Control Plan to the FDOT for review and approval. There is not much leeway in the contractor's submittal, since the requirements are spelled out throughout the FDOT Specifications, particularly in Section 105, Contractor Quality Control General Requirements. The Plan must specify how the contractor is to assure a quality job in all phases of materials handling including, but not limited to: procurement, hauling, fabricating, stockpiling or storing, and producing.

The Senior Project Engineer must be aware of the many FDOT testing requirements. All tests must be met, and the contractor is responsible for having all sampling and testing on the project performed by FDOT certified personnel. The contractor may employ an independent certified laboratory, train his/her own personnel or use a combination of both methods to perform the required sampling and testing. To expedite training for the CQC program, the FDOT has contracted with outside firms to implement its training and qualifications program for construction technicians and contractor personnel. This program is better known as the Construction Training/Qualification Program (CTQP). The contractor's Quality Control Plan (including certifications) is reviewed and approved by the FDOT prior to the start of the job.

Despite this innovative approach to Florida road and bridge construction, the FDOT still maintains the right to perform any inspection and sampling and testing on the project it considers appropriate to verify the results submitted by the contractor on any materials or process. This procedure is known as verification testing, and it may be performed on a random-sampling basis.

The FDOT Design project manager must be notified immediately upon discovery of any design-related issues and must be involved in the resolution.

The State Materials Office and the State Construction Office have combined all pertinent contractor Quality Control information and requirements on the Contractor's Quality Control website. Again, the CPAM covers the entire scope of sampling and testing requirements for construction projects and provides excellent guidelines on how it is best implemented.

## **Coordination with the District Maintenance Office**

At the end of the construction phase, all projects are transferred to FDOT maintenance for operations. The District Maintenance Office provides continual inspection, repair and rehabilitation necessary to keep the project functional and safe. Since maintenance is the ultimate "owner" of the roadway, the appropriate maintenance personnel should be involved in the project throughout its many phases—PD&E, design, and construction. The Senior Project Engineer should work to keep the appropriate maintenance personnel involved throughout the construction phase. Utility permits must be coordinated with the District Maintenance Office.

The Senior Project Engineer should begin by inviting the appropriate maintenance personnel to attend the pre-construction meeting as part of the team. During the course of construction, maintenance personnel should be invited to tour the project and witness the construction procedures. Except as allowed in **Procedure No. 850-000-005, [Maintenance Responsibilities on Construction Contracts](#)**, the construction contractor will maintain the project until final acceptance by the FDOT. The acceptance procedure includes a final "walk-through" by the contractor, CEI (if assigned on the project), PM and maintenance personnel. At this time all questions should be answered and concerns addressed. Appropriate maintenance personnel should be involved in final acceptance of the project, which will then be assigned to them.

## **Project Closeout**

There are many important actions that must take place to properly close out a construction project. Figure 4, **Project Close-Out Checklist**, offers a quick reference.

Section 12.1 of the CPAM discusses final inspection and acceptance procedures.

Figure 4  
**Project Close-Out Checklist**

- A thorough research of the contract and Standard Specifications to identify all of the documentation required from the contractor and ensure that all are submitted and accepted**
- Submittal, review and acceptance of the final estimate**
- Final payment to the contractor**
- Identification of potential claims**
- Preparation of as-built plans**
- Final acceptance letter**
- Final contractor grades**
- Preparation of the files for storage**
- Submittal of final invoice by the CEI**
- Submittal of final grades for the CEI**