

## Issue Paper

# Management of Florida's Intelligent Transportation System Deployments

## Florida's Contracting Policies and the System Manager Approach

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## **Table of Contents**

<b>List of Tables .....</b>	<b>iii</b>
<b>List of Figures .....</b>	<b>iii</b>
<b>List of Acronyms.....</b>	<b>iv</b>
<b>1. Introduction .....</b>	<b>1</b>
<b>1.1 Organization of this Document .....</b>	<b>1</b>
<b>1.2 Background.....</b>	<b>2</b>
1.2.1 Design-Bid-Build Approach.....	2
1.2.1 Design-Build Approach.....	2
<b>2. What is a System Manager?.....</b>	<b>4</b>
<b>2.1 Definition.....</b>	<b>4</b>
<b>2.2 Advantages and Disadvantages.....</b>	<b>5</b>
<b>2.3 The System Manager Contract.....</b>	<b>5</b>
<b>3. The System Manager Survey .....</b>	<b>7</b>
<b>4. Implementation Issues with the System Manager Approach .....</b>	<b>9</b>
<b>4.1 Federal Laws and Regulations.....</b>	<b>9</b>
<b>4.2 Florida Code.....</b>	<b>11</b>

**5. Florida’s Work Program and Phases ..... 13**

**5.1 Work Program Phase Details..... 13**

**5.2 Flexibility of the System Manager Approach ..... 14**

**5.3 Comments on the System Manager Approach ..... 15**

**6. Conclusion ..... 16**

**7. References..... 17**

### **List of Appendices**

- Appendix A – Questionnaire for the System Manager Approach
- Appendix B – Questionnaire Responses from Four States

### **List of Tables**

Table 5.1 – Listings of Work Program Phase Groups and Phase Types .....13

### **List of Figures**

Figure 4.1 – FHWA Federal-Aid Procurement Regulations and Contracting Options .....11

## **List of Acronyms**

<i>CCNA</i>	<i>Consultants' Competitive Negotiation Act</i>
CE&I	Construction, Engineering, and Inspection
<i>CFP</i>	<i>Cost Feasible Plan</i>
<i>CFR</i>	<i>Code of Federal Regulation</i>
DOT	Department of Transportation
<i>FAC</i>	<i>Florida Administrative Code</i>
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FIHS	Florida Intrastate Highway System
FMS	Freeway Management System
I-275	Interstate 275
I-4	Interstate 4
I-75	Interstate 75
ITS	Intelligent Transportation System
PDO	Program Development Office
PE	Preliminary Engineering
PS&E	Plans, Specifications, and Estimates
RFP	Request for Proposal
ROW	Right-of-Way
<i>SEMP</i>	<i>System Engineering Management Plan</i>
SMIS	Surveillance and Motorist Information System
SOQ	Statement of Qualifications
SR	State Road
<i>USC</i>	<i>United States Code</i>
USDOT	United States Department of Transportation
VE	Value Engineering
<i>WPI</i>	<i>Work Program Instructions</i>

## **1. Introduction**

The Florida Department of Transportation (FDOT) *Ten-Year ITS Cost Feasible Plan (CFP)* (October 2002) guides intelligent transportation system (ITS) project planning and deployments on the Florida Intrastate Highway System (FIHS). The FDOT has taken extensive measures to promote ITS deployments as a means of reducing delays, improving safety, and increasing efficiency of traffic flow on Florida's transportation network. An ITS project's success depends on the planning, design, and efficient deployment of ITS devices, and also on the effectiveness of the consultant procurement process.

To support these ITS deployments, the FDOT is investigating innovative delivery mechanisms that will allow faster, more efficient deployment. This *Issue Paper* discusses the use of a system manager in the ITS design and deployment process.

This document has been prepared to assist the FDOT Traffic Operations Office and the Districts in better understanding the budgetary and policy issues associated with utilizing a system manager. It also provides information on the practices followed by other states, based on a questionnaire sent to different transportation agencies that have used a system manager on past ITS projects.

### **1.1 Organization of this Document**

This section provides an outline of the organization of this document as follows:

- *Section 1, Introduction*, provides a general introduction to this *Issue Paper*;
- *Section 2, What is a System Manager?*, provides a definition and general overview of what a system manager is and its role in relationship to others in the deployment process;
- *Section 3, The System Manager Survey*, provides information on a survey that was distributed to transportation agencies
- *Section 4, Implementation Issues with the System Manager Approach*, provides an overview of the federal and state statutes that govern the system manager approach;
- *Section 5, The Florida Work Program and Phases*, cover project funding issues, including a discussion of the Florida-specific concerns and recommended solutions;
- *Section 6, Conclusion*, summarizes the key concerns and recommended solutions in this *Issue Paper*, and
- *Section 7, References*, contains a complete list the references used for this document.

## **1.2 Background**

In the past, the FDOT has used the design-bid-build and design-build approaches for ITS deployment projects, and has provided project oversight and administration with in-house staff. Each of these processes has its advantages and disadvantages, which are briefly highlighted below.

### **1.2.1 Design-Bid-Build Approach**

The advantages of the design-bid-build approach include a traditional approach and the provision of checkpoints along the way.

The disadvantages associated with this approach include a longer project design and implementation time frame, and difficulty adapting to the ever-changing technology.

### **1.2.2 Design-Build Approach**

One advantage of the design-build approach is the fact that it lends itself to a “fast-track approach because design and construction phases overlap, therefore shortening the project schedule.

A disadvantage of this approach is that the design may be influenced by the contractor, or that the project may become “build-design.”

Rapidly advancing ITS technology and the pace at which system deployments are taking place has created a new set of project concerns and the awareness that the FDOT's traditional project delivery methods noted above may not be the best choices in such cases. By its nature, an ITS is a technology-driven transportation management tool, one that requires specialized design knowledge and particular skill at properly integrating all the devices required for a system. Early in the project's development, the design engineer makes many critical decisions about the type of equipment utilized, level of performance desired, and overall system reliability. The design engineer, working as part of the “owner's team”, frames the project by designating specific technology/component requirements that otherwise could be subject to the variability – and even uncertainty – of the competitive bidding process and the pressures of the construction market.

There is also an interest in expanding business opportunities for smaller, specialized technology firms that have the requisite skill in ITS, yet may lack the bid-bond capacity to take on the magnitude of a project that their larger competitors can. By expanding the pool of potential providers, the FDOT will be more likely to avoid situations where a long list of ITS deployments can't be completed on schedule because there aren't enough qualified workers to get the projects installed, integrated, tested, and operating on time.

These and other concerns have become the incentive at various state departments of transportation (DOT) to reexamine project delivery methods. Those DOTs that have instituted the system manager consultant procurement approach are finding it to be an effective means of improving the manageability and efficiency of ITS project deployments. This is accomplished, in part, by assigning a system manager with responsibility for:

- Contract plans;
- Plans, specifications, and estimates (PS&E);
- Construction, engineering, and inspection (CE&I);
- System testing and integration; and
- System burn-in and acceptance.

Beyond these vital tasks, a system manager is in a unique position to help the transportation agency coordinate various project subsystems and their sequencing, obtain needed technical support, and ensure that systems engineering management plan (SEMP) objectives are met. Ultimately, each new ITS deployment then becomes a total operating system that also functions in concert with those of other jurisdictions – to the benefit of the communities they serve.

## **2. What is a System Manager?**

### **2.1 Definition**

To properly discuss the use of a system manager, we must first establish a definition of what a system manager is. Many agencies around the country are using a “system manager,” but calling it different names. Others who have hired a system manager have different definitions and responsibilities for what their manager provides. For discussions herein, we define a system manager as follows.

*The FDOT System Manager is a representative of the FDOT that provides planning and design services to the FDOT, as well as oversight of design, integration, testing, and acceptance activities of other contractors or consultants for a project or series of projects. This includes project administration activities, independent third party assessment(s), and extension(s) of agency staff activities.*

Some system managers for other agencies provide the services defined above, as well as such additional services as construction and systems integration. In addition, some states support two contracts – one with their “system integrator” and one with their “system manager” – allowing them to have both consultants on call, with the system manager providing the administration, oversight, and testing of the system that the system integrator is deploying.

As evident in the definition noted above and how others utilize their system managers, this role is flexible and should be contoured to meet the specific needs of the project or the FDOT District. Below are a few examples of how this role can be configured:

- A system manager can be hired for a specific project during which he oversees the development of the design and specifications; supports the agency through procurement; and then oversees the contractor during the construction, implementation, and integration phases.
- A system manager can administer and oversee the consultant/contractor team(s), which may include a design-build team or a series of firms that have individual contracts, and can perform the entire project from design through integration and testing.
- A system manager can be hired for a multiyear contract and provided task work orders based on the projects and needs of a District. This includes providing third party testing of a contractor's system to ensure it meets the specifications; various design and planning services; and developing prototype systems prior to full deployment.

## **2.2 Advantages and Disadvantages**

As with any type of approach to the development and deployment of a complex system, there are advantages and disadvantages to consider. The following is a summary of those both relating to the utilization of a system manager.

The advantages include:

- The FDOT does not have to directly coordinate with as many consultants or contractors;
- A system manager is responsible for reporting to the FDOT and provides a single point of contact for the whole project, from concept through final acceptance;
- The use of a system manager affords the FDOT greater expertise in monitoring projects, and in modifying or adjusting functional requirements as the project evolves so that specified subsystems are able to be appropriately integrated to form a comprehensive system;
- The FDOT can handle more projects with current staff levels;
- The FDOT can accelerate the deployment of ITS projects; and
- The process is flexible and supports different procurement methods.

The disadvantages include:

- Without proper management, an agency may become overly dependent on a system manager;
- There are a limited number of consultants who are capable of providing system management services for large projects; and
- The FDOT staff does not acquire a knowledge base that would come from direct involvement in the project.

## **2.3 The System Manager Contract**

A system manager is usually selected using competitive negotiations. In this method, the FDOT issues a request for proposal (RFP) and invites submittals from qualified consultants. (To participate on FDOT projects, a consultant should undergo a qualification process as required by the FDOT rules.) Based on the responses, the proposals are ranked. Financial aspects are not discussed in this preliminary stage. The negotiation concerning project cost occurs later. If no contract agreement is reached with the first-ranked proposer, the negotiations are conducted with the next ranked proposer until final consensus is reached.

For a system manager contract, the cost of the professional services obtained would be paid using a lump-sum or cost-plus-a-fixed-fee method. In the cost-plus-a-fixed-fee method, the project scope of work may not be clearly defined and the consultant may be compensated for the payroll cost the firm incurs, plus expenses and a fixed fee.<sup>1</sup>

In the lump-sum fee method, the scope of the work would be clearly defined. According to this fee method, a fee would be paid based on the work conducted and expenses incurred for material purchased during construction. The lump-sum fee contract requires the agency to pay the consultants on a monthly basis during execution of the work.

Cost-plus-a-fixed-fee professional service contracts are desirable on projects where there is risk, uncertainty, or ambiguity in how the ultimate system is supposed to operate. However, if the system is very well defined and there is little risk or ambiguity, a lump-sum method is best.

Under chapter 14-75 of the *Florida Administrative Code (FAC)*,<sup>2</sup> the FDOT is authorized to select professional consultants, under certain provisions and in accordance with section 287.055 of the *Florida Statutes*, when the project has a construction cost in excess of \$250,000, or when the fee for professional services for a fixed capital outlay study or planning activity exceeds the threshold amount of \$25,000. Under these contracts, the professional services may be procured for a specifically identified project, a grouping of assignments for substantially similar activities, or for miscellaneous minor professional services performed on a task assignment basis. This contract form also applies to the professional services of a general consultant, who may be selected by the FDOT to provide engineering administration, support, and management services or other activities. Where specified, total contract fees paid may not exceed a limiting amount for the term of the contract.

At present, the system manager approach is not mature in Florida. Very few projects have been conducted using this method. There is a need to understand the policies and budgetary constraints for this method, and the implementation issues associated with it. Other sections of this *Issue Paper* provide insights into the consultant procurement policy and budgetary information for this method.

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<sup>1</sup> FLA. STAT. § 287.055 (2003).

<sup>2</sup> FLA. ADMIN. CODE ANN. ch. 14-75 (2003).

### **3. The System Manager Survey**

Several states have used a system manager approach for ITS deployment projects and this method has proven successful. The system manager acts as a representative for the owner of an entire program or for certain projects of the program at the owner's discretion. Typically, the ITS deployment projects require a system manager to prepare project plan sets; develop financial and project duration estimates; order the necessary software development; and obtain CE&I for the project.

As part of this investigation, the Federal Highway Administration's (FHWA) regional office was contacted and asked to identify states that have used system managers in the past. The FDOT ITS Office then developed a questionnaire to be used to gain more detailed information about the use of a system manager by the state DOTs. The questionnaire consisted of sections requesting information on the general overview of the project; the duties of the system manager; the system manager's benefit to the project; and specific details on the tasks and subtasks the system manager conducted. Though most of the questions were phrased to elicit objective type responses, there was space provided for respondent comments and more interpretive information. A sample questionnaire is provided in *Appendix A*.

The questionnaire was sent to six states. Responses were received from four of the recipients: Utah, Georgia, the City of Los Angeles, and Arizona. The responses received from these transportation officials are provided in *Appendix B*. Below are some observations based on the surveys:

- All four were multimillion dollar projects and the responders were very satisfied with the implementation of their projects;
- Arizona reported that they used the system manager approach and felt the disadvantage of the process was that the state became very dependent on the system manager;
- After the project is completed, the ITS equipment must undergo burn-in and testing periods. The City of Los Angeles suggested that the testing be conducted by an independent consulting agency because it would be against the project objective to allow the consultant or contractor that installed and integrated the equipment to test the ITS devices for proper function;
- Georgia and Los Angeles emphasized that the system manager approach is a recommended option when there is a lack of in-house personnel with the needed expertise;
- Utah stated that the system manager approach provides better work control for the state and more flexibility on schedule adjustment;

- The responders emphasized the fact that heavy dependence on the system manager could be detrimental to the project if the system manager provides all the aspects of the project, including design, construction, integration, and testing. They stated that at least the review and testing should be conducted either by the state DOT staff or an independent consultant so that checks and balances are provided; and
- Most of the states mentioned that the system manager was procured using either the competitive negotiations bid process or competitive proposal method. In the competitive proposal method, the financial aspects are considered in the selection of the consultant, as opposed to the competitive negotiations method in which the consultant's selection is based on the RFP and cost is negotiated later.

Florida has also used a system manager for a few transportation projects. Some examples are the Tampa Bay SunGuide project, Phases I and II, which consisted of ITS deployments on Interstate 4 (I-4), Interstate 75 (I-75), Interstate 275 (I-275), and State Road (SR) 60; a traffic signal system upgrade in Miami-Dade County; an I-4 surveillance and motorist information system (SMIS); and a freeway management system (FMS) in Orlando. Among those that have been completed, these projects have proven successful and the District engineers partly attributed this to the system manager approach.

## **4. Implementation Issues with the System Manager Approach**

The system manager consultant procurement process has not been used extensively in Florida. Several questions arise about the implementation process. It is not clear how Florida rules and regulations apply to the use of a system manager. The FDOT Office of Work Program allocates funds based on phases or categories of work required during the course of a project. It is also uncertain how the system manager role would be distributed over these phases of work. These issues need to be resolved and clarified before the FDOT Districts can freely utilize system managers for ITS deployment projects with confidence.

Similarly, Florida rules and regulations offer no specific guidance or implementation details for a system manager procurement process. This observation is based on discussions with the FDOT District personnel, as well as a review of state statutes and administrative rules. By comparison, the implementation details for other consultant procurement methods, such as design-build and design-bid-build, are well documented and much better understood, based on many years of project history and experience.

Florida has several FMS projects documented in the *Ten-Year ITS CFP*. The FMS projects are federally funded and require that Districts abide by the applicable federal rules and regulations. This section provides an overview of the policies at the federal and state levels concerning the use of a system manager. It is important to understand the policy implications as they guide the process and help ITS professionals better understand the procedure to be employed while implementing the system manager consultant procurement method.

### **4.1 Federal Laws and Regulations**

According to the federal codes, the freeway ITS deployment projects are categorized under “engineering and design related services.” Section 172 of the *Code of Federal Regulations (CFR)*<sup>3</sup> illustrates the methods of procurement allowed and the approval procedure under this regulation for federal-aid highway contracts. The services that can be performed under the “engineering and design related services” category include consultations, comprehensive planning, program management, conceptual designs, plans and specifications, value engineering (VE), construction phase service, drawing reviews, and other related services. The system manager’s project duties and responsibilities fit within this regulatory framework.

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<sup>3</sup> 23 CFR §172.

The regulation also discusses the three acceptable contract-awarding procedures under this code: competitive negotiation, small purchases, and noncompetitive negotiation.<sup>4</sup> The ITS deployment projects would typically be classified under the competitive negotiation approach, in which qualifications-based procedures are used to select and rank candidate firms with whom the agency seeks to arrive at a contract for work “... properly accomplished in a timely manner, and at fair and reasonable cost.”

The small purchase procedure is a simpler, more informal method in which an adequate number of qualified firms are reviewed for selection and the total contract costs do not exceed \$100,000, or the simplified acquisition threshold.<sup>5</sup> The competitive negotiation is conducted after qualifying the consultant, while on the other hand, if noncompetitive negotiations are used to select the consultant, a written justification should be provided to the FHWA stating why that method was used. The contract awarding procedure also requires the consultant's selection to be performed in accordance with the applicable state statutes and regulations, as discussed in Section 2.3.

The projects under “engineering and design related services” need FHWA division approval. The policies relating to this particular service category are further detailed in sections 541-544 of the *United States Code (USC)*, also referred to as the *Brooks Architect-Engineers Act*.<sup>6</sup> This law defines the related professional services as those that members of the architectural or engineering professions may logically or justifiably perform, including studies, investigations, tests, evaluations, program management, developing plans and specifications, VE, and construction phase services. Figure 4.1 depicts the FHWA federal-aid procurement regulations and contracting options that allow utilization of the system manager approach as defined in section 172 of the *CFR*.

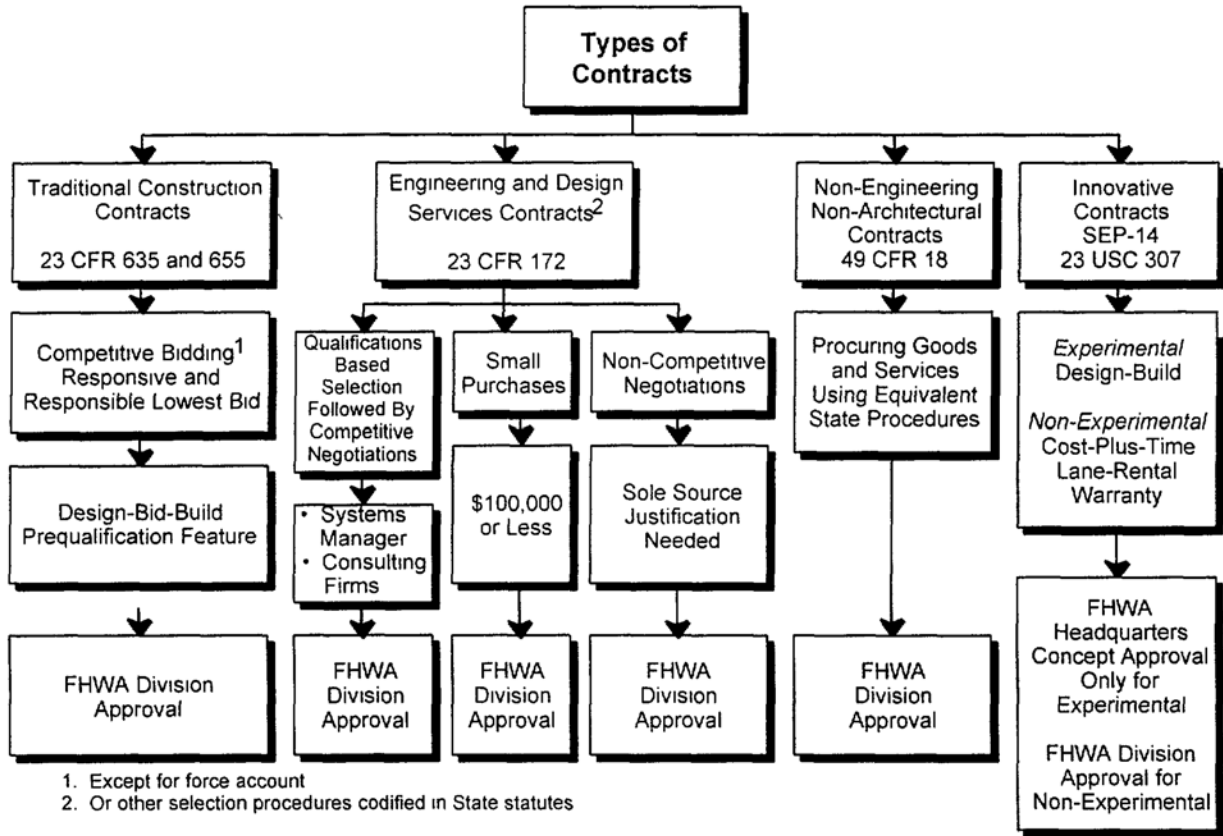
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<sup>4</sup> *Id.*, § 172.5(a)(1-3).

<sup>5</sup> 41 USC § 403(11) (2003).

<sup>6</sup> 40 USC § 541-544 (2003).

**Figure 4.1 – FHWA Federal-Aid Procurement Regulations and Contracting Options<sup>7</sup>**



## 4.2 Florida Code

Sections 287.001-1345<sup>8</sup> and 337.105<sup>9</sup> of the *Florida Statutes*, and chapter 14-75 of the *FAC* guide the consultant procurement process in Florida. Section 287.055 is popularly known as the *Consultants' Competitive Negotiation Act (CCNA)*. These codes require that the consultant procurement for a project be made using competitive negotiations. The process requires that at least three consultants be selected and ranked through a competitive selection process; and then contract prices be negotiated for the desired services to establish a fair, competitive, and reasonable fee.

<sup>7</sup> FHWA Federal-Aid ITS Procurement Regulations and Contracting Options, United States Department of Transportation (USDOT), Publication No. FHWA-RD-97-145 (October 1997).

<sup>8</sup> FLA. STAT. §§ 287.001-1345 (2003).

<sup>9</sup> FLA. STAT. § 337.105 (2003).

The *CCNA* requires that the consultants be prequalified before the agency initiates the competitive selection process. Firms engaged in the lawful practice of their professions are encouraged to submit annual statements of qualifications and performance data. Similarly, agencies must find that firms are indeed qualified to provide the professional services required. Factors considered in making this determination include the capabilities of the firm, adequacy of its personnel, past record on projects, and the experience of the firm or individual seeking consideration.

The *CCNA* also details the processes of competitive selection and competitive negotiation for a consultant. It makes a clear distinction between these two functions. Competitive selection entails the review and evaluation of the firms based on their statements of qualifications (SOQ), which are submitted in response to the agency RFP or published notice, and a review of the performance data that may be on file with the agency. In addition, there may be presentations by no fewer than three finalist firms chosen and ranked by the agency based on respondent qualifications, approach to the project, and their ability to furnish the required services.

Competitive negotiation, a separate process, is intended as a means for the agency to arrive at a contract for services with the top-ranked firm from the competitive selection process. The contract for services includes compensation for the requested services at a price that is “fair, competitive, and reasonable,” either in the form of a lump-sum payment, a project cost-plus-a-fixed-fee arrangement, or a professional services contract with total fees paid not to exceed a limiting amount. If the agency is unable to negotiate a satisfactory contract with the firm, then negotiations may be terminated and the agency may undertake negotiations with the next ranked firm.

The next section provides a detailed discussion on the FDOT Office of Work Program and the financial considerations of a system manager approach.

## 5. Florida's Work Program and Phases

The Project Development Office (PDO) provides the funds for projects listed in the long- and short-range *2020 Florida Transportation Plan* detailed by the FDOT. The PDO's responsibilities include documenting and managing the *Work Program Instructions* on an annual basis, and allocating and adjusting funds to programs and Districts. The PDO staff is also responsible for the progress of the projects listed in the *Five-Year Work Program*.

The *Work Program Instructions (WPI)* is the document revised and updated annually by PDO. The *WPI* has detailed instructions on the use of federal, state, and local funds. It also provides information on Work Program phases that would be used for construction project areas, including preliminary engineering (PE), right-of-way (ROW) support, and CE&I.

### 5.1 Work Program Phase Details

The Work Program phases are defined by a combination of phase groups and phase types. Phase groups are the tasks that would be performed as part of the project. The phase type indicates the entity that performs a particular task, such as a consultant, in-house staff, or another agency.

**Table 5.1 – Listings of Work Program Phase Groups and Phase Types**

PHASE GROUPS
1 - Planning
2 - PD&E
3 - Preliminary Engineering (PE)
4 - Right of Way (ROW)
5 - Construction
6 - Construction Support
7 - Maintenance
8 - Operations
9 - Capital
A - Administration
B - Research
C - Environmental

PHASE TYPES
1 - In-House
2 - Consultant/Contractor
3 - Purchase
4 - Grant
5 - Relocate
6 - Utility
7 - Railroad
8 - Other Agency
9 - Indirect Support
A - Contract Incentive
B - Service Contract

The system manager approach would most likely utilize only some of these phase group/type combinations. For example, Phase 32 refers to “Preliminary Engineering – Consultant / Contractor” and would include responsibilities for design, proof of concept, specification preparation, system/network design, and subconsultant selection (i.e., subconsultant to the system manager); procurement assistance to the District, including the development of subsystem procurement draft documentation; and estimates of both funding and installation time, plus installation schedules and coordination. It would also require the system manager to assist in obtaining all permits for the work.

Phase 52 is referred to as “Construction – Consultant / Contractor” in the *WPI*. Under this phase, the system manager provides administration of the project construction and directs the installation, test, and integration of ITS equipment that the FDOT has procured based on device requirements determined during the project’s design phase.

On the other hand, if the FDOT directs the system manager to purchase the ITS equipment, Phase 53 would be used to support the procurement activity. The system manager would be required to purchase the systems and subsystems called for in the ITS project’s design plans. This arrangement would not be the recommended practice.

Phase 62 is also referred to as “Construction Support – Consultant / Contractor” in the *WPI*. In simple words, this phase allows the system manager to conduct CE&I and would require installation inspection. It authorizes the system manager to receive all the purchased systems and subsystems as a representative of the District. The system manager, under this phase, could be required to test, install in a mock-up test bed, inventory, and catalog the subsystems prior to release to the installer, and perform final acceptance testing of the installed system as defined in the system manager’s contract.

## **5.2 Flexibility of the System Manager Approach**

It is important to note that use of a system manager could afford the FDOT more flexibility in determining the means of project delivery. The above phasing examples apply to instances where the system manager prepares purchasing documents for ITS equipment, draws up the contract for system installation, and then is responsible for system integration and testing prior to the project’s completion. Within this framework, there is latitude for tailoring the project delivery to the FDOT’s needs, even the ability to carry out projects with more than one contracting technique.

The system manager, for example, could prepare design plans, write the RFP for the installation contractor, and prepare equipment purchase documents for the FDOT. The installation contractor could then be picked using the FDOT's existing selection process. Based on the FDOT assessment of his capabilities, the system manager could do systems integration in-house or assist the FDOT in the procurement of integration services by another provider. The following examples present possible options available to the Districts when developing the scope of services for a project. The ITS managers need to be aware of the implications of these variations in the procurement process and their effect on the fund allocation for the project.

- The system manager creates project plan sets, with the remaining project conducted using another procurement method, such as low-bid;
- The system manager develops partial plan sets, which then would form the basis for a design-build contract;
- The ITS equipment may or may not be purchased by the system manager. If the system manager does purchase the ITS equipment, Phase 53 would apply to that activity. If the FDOT purchases the equipment, then Phase 52 would be used for that purpose; or
- An independent consultant could conduct CE&I, or it could be a function carried out by the system manager, provided the same firm did not do the construction. In either case, the CE&I would be supported by Phase 62.

If a system manager is not used throughout the entire project, or a variant of a system manager approach is used, the Work Program phases required as illustrated here could change. Remember that the fund allocation to various Work Program phases can be readily adjusted in the fiscal years prior to deployment.

### **5.3 Comments on System Manager Approach**

While reviewing the system manager approach and Florida's policies that support it, several deficiencies were encountered. In particular, there is a need for more information in the *WPI* about the system manager project delivery method and its utilization. This is essential for ITS project managers to gain a definitive understanding of the Work Program phase issues associated with this approach and their resolution.

Based on the discussion in the previous section, any FDOT use of the system manager approach will affect the phases under which the Office of Work Program allocates project funds. The system manager approach might utilize Phase 53 as opposed to the Phase 52 used in the design-build method. There is a need to have convenient transferability of funds from Phase 52 to Phase 53 if projects involving design-build are to utilize system managers in the future.

## **6. Conclusion**

The system manager concept is a promising approach to support the FDOT in the development and deployment of ITS projects. It has its own advantages and disadvantages, so it is important to wisely evaluate the prospects and consequences before deciding on this consultant procurement method. Use of a system manager provides increased flexibility in consultant services, less burden on the FDOT to coordinate between consultants to provide the final product, and also helps the FDOT conduct projects without requiring additional skilled personnel on staff.

There is a need to be aware of the downside of the system manager approach. There are not many consulting firms with expertise in this approach and the skill sets necessary to handle the responsibilities in big ITS deployment projects. In the system manager approach, the scope of services is not required to be precise. The project scope could expand during the course of the deployment and could result in increased project expenditure.

The FDOT does not have vast experience with the system manager project delivery method. Six states that have used the system manager approach to conduct projects were asked to provide feedback based on their experience with it. The correspondence yielded valuable insights into the use of a system manager and its effectiveness in actual ITS projects. As stated previously, the survey responses are provided in *Appendix B*.

There are definite budgetary issues associated with the FDOT's use of a system manager, and its implementation will require a new perspective on traditional consultant service contracts. The system manager procurement method is different from the other contracting methods, so it needs to be dealt with differently and will require more flexibility under the FDOT Work Program.

Based on discussions with staff in the FDOT Procurements Office and Office of Work Program, it was determined that the system manager can be funded using Work Program Phases 32, 52, 53, and 62. Phase 53 (Construction – Purchase) allows for the project consultant to purchase equipment, while Phase 52 (Construction – Consultant/Contractor) requires the FDOT to purchase the project-related equipment.

The ITS professionals are finding that they need a project delivery method that facilitates the aggressive deployment of ITS and ensures interoperability of systems. During the coming decade, the FDOT would benefit from a proven means of effective project management that will enable the state to reach its own ITS deployment goals. The system manager approach has the potential to efficiently and effectively assist in deploying ITS projects. It is intended that this *Issue Paper* serve as a guide for ITS managers to increase awareness about the system manager method and to equip them to better deal with issues associated with this procurement approach.

## **7. References**

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- FHWA Federal-Aid ITS Procurement Regulations and Contracting Options*, Publication No. FHWA-RD-97-145, Booz Allen & Hamilton, Inc. (October 1997).
- Florida Statewide ITS Strategic Plan - Procurement Issue Paper*, FDOT ITS Office, PB Farradyne Inc. (January 1999).

**Appendix A**

**Questionnaire for the  
System Manager Approach**

<b>Questionnaire on Systems Manager Approach</b>		
<b>Questions</b>	<b>Response (Yes / No)</b>	<b>Comments</b>
<b>Section 1.0 General</b>		
1. Do you have experience with the “Systems Manager” approach for ITS deployment projects?		
2. What was the name, location, commencement year, duration and completion year of the ITS project?		
3. What was the approximate budget of the ITS project?		
4. Rate the success of the project in a scale of 1 - 10. (1.0 indicates very dissatisfied and 10.0 indicates very satisfied)?		
5. How was the Systems Manager selected?		
Sealed bids / 2-step bid process / competitive proposal / competitive negotiations / sole source / unsolicited proposals / other.		
5a. If “Other”, comment?		
6. How was the design consultant selected?		
<b>Section 2.0 Specific Duties of the Systems Manager in the project</b>		
<b>Section 2.1 Design duties</b>		
7. Did Systems Manager prepare the civil design?		
8. Did Systems Manager prepare the structural design?		
9. Did Systems Manager prepare the foundation design?		
10. Did Systems Manager prepare the mechanical design?		
11. Did Systems Manager prepare the electrical design?		
12. Did Systems Manager prepare the systems engineering design?		
13. Did Systems Manager prepare the communication design?		
14. Did Systems Manager prepare the landscaping design?		

15. Did Systems Manager provide surveying service?		
16. Did Systems Manager provide soil and geotechnical service?		
<b>Section 2.2 Duties relating to preparation of plans and cost estimates</b>		
17. Was a regional architecture existing or did Systems Manager create a project architecture?		
18. Did Systems Manager conduct utility investigation?		
19. Did Systems Manager prepare construction plans?		
20. Did Systems Manager prepare cost estimates?		
21. Did Systems Manager prepare procurement plans of ITS equipments for field devices?		
22. Did Systems Manager prepare device specifications for the project?		
23. Was Systems Manager allowed to bid for ITS equipments?		
24. Did DOT provide the scope of the project or did the Systems Manager define the scope of the project?		
24. Did Systems Manager prepare final construction plan to the DOT?		
25. Did Systems Manager prepare the permits for the entire project?		
<b>Section 2.3 Deployment duties</b>		
26. Did Systems Manager perform equipment integration?		
27. Did Systems Manager perform system integration?		
28. Did Systems Manager perform system testing and acceptance?		
29. Did Systems Manager perform construction engineering inspection?		
30. Did Systems Manager provide system documentation?		
31. Did Systems Manager conduct maintenance of the ITS equipments?		
<b>Section 3.0 Post-project Review</b>		
32. Do you expect to use the “Systems Manager” approach for future ITS project?		
33. Based on your experience, what are the advantages of the “Systems Manager” approach over the design/build method and the engineer/contractor method?		
34. Based on your experience, what are the disadvantages of the “Systems Manager” approach over the design/build method and the engineer/contractor method?		
35. Please provide any additional information that you think is relevant and would assist FDOT?		

## **Appendix B**

# **Questionnaire Responses from Four States**

**Response by Mark Demidovich (Georgia)**

Questions	Response (Yes / No)	Comments
<b>Section 1.0 General</b>		
1. Do you have experience with the "Systems Manager" approach for ITS deployment projects?	yes	
2. What was the name, location, commencement year, duration and completion year of the ITS project?	NaviGAtor phase I 1992-1997 (TRW), Phase II 1998-2003 (Transcore) - Atlanta area for both	
3. What was the approximate budget of the ITS project?	Phase I - \$15 mill, Phase II - \$12 mill	
4. Rate the success of the project in a scale of 1 - 10. (1.0 indicates very dissatisfied and 10.0 indicates very satisfied)?	Phase I - 7, Phase II - 8	
5. How was the Systems Manager selected?		
Sealed bids / 2-step bid process / competitive proposal / competitive negotiations / sole source / unsolicited proposals / other.	requested letters of interest, then pre-qualified firms, then sent RFP, received proposals and selected top firm (money not considered - negotiated later)	
5a. If "Other", comment?		
6. How was the design consultant selected?	part of the prime consultant team - not considered individually	
<b>Section 2.0 Specific Duties of the Systems Manager in the project</b>		
<b>Section 2.1 Design duties</b>		
Will answer below questions for Phase I S.M. only		
7. Did Systems Manager prepare the civil design?	yes	architecture sub did TMC design (all aspects
8. Did Systems Manager prepare the structural design?	yes	
9. Did Systems Manager prepare the foundation design?	yes	
10. Did Systems Manager prepare the mechanical design?	yes	
11. Did Systems Manager prepare the electrical design?	yes	
12. Did Systems Manager prepare the systems engineering design?	yes	
13. Did Systems Manager prepare the communication design?	yes	
14. Did Systems Manager prepare the landscaping design?	yes	sub to architecture sub
15. Did Systems Manager provide surveying service?	yes	
16. Did Systems Manager provide soil and geotechnical service?	yes	

<b>Section 2.2 Duties relating to preparation of plans and cost estimates</b>		
17. Was a regional architecture existing or did Systems Manager create a project architecture?		no regional architecture existed back in 1992
18. Did Systems Manager conduct utility investigation?	yes	in coordination with in-house utility office
19. Did Systems Manager prepare construction plans?	yes	yes, still subject to all DOT formatting tho
20. Did Systems Manager prepare cost estimates?	yes	reviewed by our internal engineering service
21. Did Systems Manager prepare procurement plans of ITS equipments for field devices?	N/a	we don't "procure" per se. Field devices are purchased within ITS construction contracts
22. Did Systems Manager prepare device specifications for the project?	yes	
23. Was Systems Manager allowed to bid for ITS equipments?	no	
24. Did DOT provide the scope of the project or did the Systems Manager define the scope of the project?	DOT	
24. Did Systems Manager prepare final construction plan to the DOT?	yes	
25. Did Systems Manager prepare the permits for the entire project?	no	
<b>Section 2.3 Deployment duties</b>		
26. Did Systems Manager perform equipment integration?	yes	
27. Did Systems Manager perform system integration?	yes	
28. Did Systems Manager perform system testing and acceptance?	yes	
inspection?	some	
30. Did Systems Manager provide system documentation?	yes	
31. Did Systems Manager conduct maintenance of the ITS equipments?	no	
<b>Section 3.0 Post-project Review</b>		
32. Do you expect to use the "Systems Manager" approach for future ITS project?	yes	
33. Based on your experience, what are the advantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?		provides experienced staff that DOT does not employ. Unites various aspects of project under one umbrella firm
34. Based on your experience, what are the disadvantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?		none - this is the only way we've done it
35. Please provide any additional information that you think is relevant and would assist FDOT?		

**Response by Alan Hansen (Arizona)**

Questions	Response (Yes / No)	Comments
<b>Section 1.0 General</b>		
1. Do you have experience with the "Systems Manager" approach for ITS deployment projects?	Yes	
2. What was the name, location, commencement year, duration and completion year of the ITS project?	Phoenix Freeway Management System, Design Concept in 1989, Operational 1993, Still under expansion.	
3. What was the approximate budget of the ITS project?	\$60 million during first five years	
4. Rate the success of the project in a scale of 1 - 10. (1.0 indicates very dissatisfied and 10.0 indicates very satisfied)?	7	
5. How was the Systems Manager selected?	Competitive Proposal	
Sealed bids / 2-step bid process / competitive proposal / competitive negotiations / sole source / unsolicited proposals / other.		
5a. If "Other", comment?		
6. How was the design consultant selected?	Competitive Proposal	
<b>Section 2.0 Specific Duties of the Systems Manager in the project</b>		
<b>Section 2.1 Design duties</b>		
7. Did Systems Manager prepare the civil design?	Yes	
8. Did Systems Manager prepare the structural design?	Yes	
9. Did Systems Manager prepare the foundation design?	Yes	
10. Did Systems Manager prepare the mechanical design?	Yes	
11. Did Systems Manager prepare the electrical design?	Yes	
12. Did Systems Manager prepare the systems engineering design?	Not done on this project	
13. Did Systems Manager prepare the communication design?	Yes	
14. Did Systems Manager prepare the landscaping design?	Yes	
15. Did Systems Manager provide surveying service?	Yes	
16. Did Systems Manager provide soil and geotechnical service?	Yes	

<b>Section 2.2 Duties relating to preparation of plans and cost estimates</b>		
17. Was a regional architecture existing or did Systems Manager create a project architecture?	Project was pre-architecture	
18. Did Systems Manager conduct utility investigation?	Yes	
19. Did Systems Manager prepare construction plans?	Yes	
20. Did Systems Manager prepare cost estimates?	Yes	
21. Did Systems Manager prepare procurement plans of ITS equipments for field devices?	Yes	
22. Did Systems Manager prepare device specifications for the project?	Yes	
23. Was Systems Manager allowed to bid for ITS equipments?	No	
24. Did DOT provide the scope of the project or did the Systems Manager define the scope of the project?	Jointly developed scope	
24. Did Systems Manager prepare final construction plan to the DOT?	Yes	
25. Did Systems Manager prepare the permits for the entire project?	No	
<b>Section 2.3 Deployment duties</b>		
26. Did Systems Manager perform equipment integration?	Yes	
27. Did Systems Manager perform system integration?	Yes	
28. Did Systems Manager perform system testing and acceptance inspection?	Yes, or monitored that done by contractor	
30. Did Systems Manager provide system documentation?	Yes	
31. Did Systems Manager conduct maintenance of the ITS equipments?	No	
<b>Section 3.0 Post-project Review</b>		
32. Do you expect to use the "Systems Manager" approach for future ITS project?	Yes	
33. Based on your experience, what are the advantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?	I think it these projects are complex and it helps to have one knowledgeable source to provide an understanding of the overall project.	
34. Based on your experience, what are the disadvantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?	I think the main disadvantage in the DOT relying too heavily on the system manager even if headed in the wrong direction.	
35. Please provide any additional information that you think is relevant and would assist FDOT?	We held peer reviews of the system during the course of the project, I think that helped to keep the system manager on the right	

**Response by Russell Robertson (Utah)**

Questions	Response (Yes / No)	Comments
<b>Section 1.0 General</b>		
1. Do you have experience with the "Systems Manager" approach for ITS deployment projects?	Yes	
2. What was the name, location, commencement year, duration and completion year of the ITS project?	ITS Expansion, Statewide, August 2002, September 2004 with option for extension	Utah has used a system manager/integrator approach since 1999. Our system manager operates on a statewide basis.
3. What was the approximate budget of the ITS project?	3.5 M	These are many different projects/tasks.
4. Rate the success of the project in a scale of 1 - 10. (1.0 indicates very dissatisfied and 10.0 indicates very satisfied)?	9	
5. How was the Systems Manager selected?	RFP	
Sealed bids / 2-step bid process / competitive proposal / competitive negotiations / sole source / unsolicited proposals / other.		
5a. If "Other", comment?		
6. How was the design consultant selected?	RFP	
<b>Section 2.0 Specific Duties of the Systems Manager in the project</b>		
<b>Section 2.1 Design duties</b>		
7. Did Systems Manager prepare the civil design?	yes	
8. Did Systems Manager prepare the structural design?	yes	
9. Did Systems Manager prepare the foundation design?	yes	
10. Did Systems Manager prepare the mechanical design?	yes	
11. Did Systems Manager prepare the electrical design?	yes	
12. Did Systems Manager prepare the systems engineering design?	yes	
13. Did Systems Manager prepare the communication design?	yes	
14. Did Systems Manager prepare the landscaping design?	no	
15. Did Systems Manager provide surveying service?	no	
16. Did Systems Manager provide soil and geotechnical service?	no	

		Some of these projects went out for bid but the system manager prepared plans and did inspections in some cases.
<b>Section 2.2 Duties relating to preparation of plans and cost estimates</b>		
17. Was a regional architecture existing or did Systems Manager create a project architecture?	existing	
18. Did Systems Manager conduct utility investigation?	no	
19. Did Systems Manager prepare construction plans?	yes	
20. Did Systems Manager prepare cost estimates?	yes	
21. Did Systems Manager prepare procurement plans of ITS equipments for field devices?	yes	
22. Did Systems Manager prepare device specifications for the project?	yes	
23. Was Systems Manager allowed to bid for ITS equipments?	no	
24. Did DOT provide the scope of the project or did the Systems Manager define the scope of the project?	both	
24. Did Systems Manager prepare final construction plan to the DOT?	yes	
25. Did Systems Manager prepare the permits for the entire project?	no	
<b>Section 2.3 Deployment duties</b>		
26. Did Systems Manager perform equipment integration?	yes	
27. Did Systems Manager perform system integration?	yes	
28. Did Systems Manager perform system testing and acceptance?	yes	
inspection?	yes	
30. Did Systems Manager provide system documentation?	yes	
31. Did Systems Manager conduct maintenance of the ITS equipments?	no	
<b>Section 3.0 Post-project Review</b>		
32. Do you expect to use the "Systems Manager" approach for future ITS project?	yes	
33. Based on your experience, what are the advantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?	More control and flexibility over the project. Better able to adjust schedules.	
34. Based on your experience, what are the disadvantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?		
35. Please provide any additional information that you think is relevant and would assist FDOT?		

**Response by Verej Janoyan (Los Angels)**

NOTE: LADOT's responses below are limited to a System Manager contract to install software and hardware for a central traffic control system

Questions	Response (Yes / No)	Comments
<b>Section 1.0 General</b>		
1. Do you have experience with the "Systems Manager" approach for ITS deployment projects?	Yes. However, experience is limited to software development and integration only	
2. What was the name, location, commencement year, duration and completion year of the ITS project?	ATSAC Sys. Mgr. Contract I (1981-1991), Contract II (1992-1998)	
3. What was the approximate budget of the ITS project?	Contract I (2 million), Contract II (1.5 million)	
4. Rate the success of the project in a scale of 1 - 10. (1.0 indicates very dissatisfied and 10.0 indicates very satisfied)?	8	
5. How was the Systems Manager selected?	Competitive/negotiated	
Sealed bids / 2-step bid process / competitive proposal / competitive negotiations / sole source / unsolicited proposals / other.		
5a. If "Other", comment?		
6. How was the design consultant selected?	LADOT performs its own design services for ITS elements	
<b>Section 2.0 Specific Duties of the Systems Manager in the project</b>		
<b>Section 2.1 Design duties</b>		
7. Did Systems Manager prepare the civil design?	No	
8. Did Systems Manager prepare the structural design?	No	
9. Did Systems Manager prepare the foundation design?	No	
10. Did Systems Manager prepare the mechanical design?	No	
11. Did Systems Manager prepare the electrical design?	No	
12. Did Systems Manager prepare the systems engineering design?	Yes for computer architecture.	
13. Did Systems Manager prepare the communication design?	No	
14. Did Systems Manager prepare the landscaping design?	No	
15. Did Systems Manager provide surveying service?	No	
16. Did Systems Manager provide soil and geotechnical service?	No	

<b>Section 2.2 Duties relating to preparation of plans and cost estimates</b>		
17. Was a regional architecture existing or did Systems Manager create a project architecture?	System built in 1984. No ITS existed at the time. System Manager developed the project architecture.	
18. Did Systems Manager conduct utility investigation?	No	
19. Did Systems Manager prepare construction plans?	No	
20. Did Systems Manager prepare cost estimates?	No	
21. Did Systems Manager prepare procurement plans of ITS equipments for field devices?	No	
22. Did Systems Manager prepare device specifications for the project?	No	
23. Was Systems Manager allowed to bid for ITS equipments?	N/A	
24. Did DOT provide the scope of the project or did the Systems Manager define the scope of the project?	LADOT Provided scope	
24. Did Systems Manager prepare final construction plan to the DOT?	No	
25. Did Systems Manager prepare the permits for the entire project?	No	
<b>Section 2.3 Deployment duties</b>		
26. Did Systems Manager perform equipment integration?	Yes for computer equip.	
27. Did Systems Manager perform system integration?	Yes	
28. Did Systems Manager perform system testing and acceptance?	Jointly with LADOT	
inspection?	No	
30. Did Systems Manager provide system documentation?	Yes	
31. Did Systems Manager conduct maintenance of the ITS equipments?	No	
<b>Section 3.0 Post-project Review</b>		
32. Do you expect to use the "Systems Manager" approach for future ITS project?	It would depend on the project.	
33. Based on your experience, what are the advantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?	Systems Manager approach works better when you lack in-house expertise.	
34. Based on your experience, what are the disadvantages of the "Systems Manager" approach over the design/build method and the engineer/contractor method?	If you have in-house expertise, des/build, engr/contract gives you more control.	
35. Please provide any additional information that you think is relevant and would assist FDOT?		