

## **Proposed Graduate Curriculum in Public Works Engineering and Public Works Management**

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The Department of Civil and Coastal Engineering at the University of Florida has a graduate level Public Works Division curriculum, one of a kind in the state of Florida. This program's curriculum prepares students to become future public works leaders. Presently the program includes flexible and wide ranging subjects that relate to the facilities managed by public works agencies. The public works function encompasses: government affairs including regulatory/legislative alerts, funding issues; storm water, sewer system management, solid waste management, air quality; transportation system including planning and design, transit, airports, Intelligent Transportation Systems; operations including: fleet, street maintenance, public parks; construction/design engineering, finance, administration, organizational and personnel management. As a way to fulfill the public works functions, it has been a long-standing vision of the public works division to start an International Public Works Center. This center would capitalize on the skills being taught and the experience of returning professionals and students. The mission of the center will be to develop leading edge research and educational programs in public works management and engineering, requiring either a long-term focus, or immediate attention and technology transfer aspects. This paper will present a proposed graduate curriculum that will cover all aspects of the above.

The more advanced a civilization is, or is to become, the more advanced the infrastructure will be. As the infrastructure advances, and expands, the management of these systems becomes increasingly complex. While technology advances within the physical systems of its infrastructure, organizations responsible for this infrastructure have become more complicated. It is essential that those in key positions of responsibility be prepared to resolve problems of a complex nature. Therefore society must assure that managers of these systems are professionally trained to influence and manage the infrastructure that their civilization is based upon. As the foundation of civilization is supported by its infrastructure, the foundation of a profession is supported by education. Education and experience are combined to produce competency. Generally experience will vary from one successful manager to the next, but the education a professional engineer will receive is usually similar. Therefore it is imperative for a society interested in advancing civilization to maintain standards of education for its professionals responsible for its

infrastructure. Most universities offer traditional disciplines and offer traditional degrees that meet traditional requirements. However, some professions, in this case public works managers, need grounding in several disciplines.

A public works manager's responsibilities are so diversified that a background in what we will call the "Four Pillars of Responsibilities" can then be identified. These responsibilities include a background in:

1. Management
2. Planning
3. Finance
4. And of course engineering

The pillars then provided the tools essential to the faithful execution of the public works manager's responsibilities.

If education is the foundation of a profession then advanced/innovative continuing education must be a requirement to assist tomorrow's leaders of Public Works organizations. "Generally universities are hesitant to combine disciplines into a single professional field because faculty resent academic heterogeneity". In addition, "professional colleges are established with a sense of student demand, as well as financial contributions for research in a particular field <sup>1</sup>."

Tailoring an academic curriculum to each responsibility can now satisfy the "Four Pillars of Responsibility". The basis for the proposed curriculum comes from the United States Navy's Educational Skill Requirement's (SR's) for receiving a Facilities Engineering Subspecialty Profession Code (P-Code) <sup>2</sup>. While the Navy does not directly categorize their SR's into the 4 pillars of responsibility as we have delineated, an analysis shows that they do indeed fall into the 4 pillars.

The Navy's Educational Skill Requirements are as follows:

1. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering and facilities support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. (Encompassed in pillars: 1, 2, 3)
2. Familiarity with solid waste management and water/wastewater distribution, treatment, and disposal systems. (Encompassed in pillars: 1, 4)
3. General knowledge of systems analysis problems solving models, network analysis, benefit-cost analysis, and the role of systems analysis in public works decision making. (Encompassed in pillars: 1, 2, 4)
4. Working knowledge of utilities, including generation, distribution, and conservation techniques. (Encompassed in pillars: 4)
5. Understanding of labor relations and collective bargaining. (Encompassed in pillars: 1)
6. Understanding of basic fundamentals of urban planning, effective land use development, and general real estate concepts. (Encompassed in pillars: 2, 4)

7. Basic understanding of facility energy conservation techniques and environmental regulatory concepts. (Encompassed in pillars: 4)
  8. At least one course that extends knowledge in any of the classical engineering disciplines. Course(s) can be in any technical area such as structural engineering, pavement design, environmental engineering, soils analysis or design, hydraulics, hydrology, mechanical engineering or electrical engineering. (Encompassed in pillars: 4)
  9. Basic understanding of data processing and computer techniques for application to engineering problems. (Encompassed in pillars: 1, 4)
  10. Working knowledge of and ability to apply business and financial accounting principles. (Encompassed in pillars: 1, 3)
  11. Proficiency in oral and written communications and ability to identify, research, and recommend alternatives to various engineering problems for presentation to both technical and non-technical managers. (Encompassed in pillars: 1, 4)
  12. If a thesis or major report is required for the degree, the topic selected must be applicable to public works engineering problems found in the Navy facilities business or extends knowledge in a particular technical engineering area. (Encompassed in pillars: 4)
- Note: The requirements for the public works engineering option should be satisfied by courses that emphasize the technical and administrative aspects of public works.

Further basis for the proposed curriculum is from an American Public Works Association (APWA) study which concluded that most of the keys to success of a public works official has little to do with technical issues and are more focused on leadership, management, and administrative skills<sup>3</sup>.

The present University of Florida's Public Works Management curriculum offers a very flexible curriculum, requiring only two core courses. Although a certain amount of flexibility is needed to allow professionals to develop areas of interest, and attract students who prefer the flexibility, there should be a minimum required core (courses) that would most benefit the profession of Public Works Management. Our proposed curriculum will be broken into the four educational pillars with the required classes, the recommended classes, and the optional classes. You will see several of the courses falling under various pillars as some of the courses cover a wide range of topics.

Taking courses from several departments will be very beneficial to the student. Since a manager often deals with problems outside of their department and must interact with other professionals, learning and interacting with the students from other departments on campus can be very beneficial. The wider one's perspective, the better one is able to understand and organize abstract concepts.

The following courses being taught at the University of Florida provide a basis from which to satisfy the "Four Pillars of Responsibility" inherent in the duties of the Public Works Manager. A typical Master's of Engineering degree requires 32 semester hours. The proposed curriculum is divided into the core courses, recommended courses, and electives. Our curriculum proposes 21 credit hours of core courses, allowing the prospective public works manager flexibility in scheduling and interest in the fulfillment of the remaining credit hours.

	<b><u>Course Number</u></b>	<b><u>Course Title</u></b>	<b><u>Credits</u></b>
<b><u>Core</u></b>	CGN 5606	Public Works Management	3
<b><u>Core</u></b>	CGN 5605	Public Works Planning	3
<b><u>Core</u></b>	CGN 6905	Management of Infrastructure Systems	3
<b><u>Core</u></b>	CCE 5035	Construction Planning and Scheduling	4 (with lab)
<b><u>Core</u></b>	CGN 6974	Masters of Engineering Report	2
<b><u>Core</u></b>	CGN 6936	Graduate Seminar	1
<b><u>Core</u></b>	MAN 5245	Organizational Behavior	3
<b><u>Core</u></b>	MAN 6366	Organizational Staffing	2
<b><u>Total</u></b>			<b>21</b>
<b><u>Recommended</u></b>	BCN 5754	Site Planning and Feasibility	3
<b><u>Recommended</u></b>	URP 6880	Defensible Space & Crime Prevention through Environmental Design	3
<b><u>Recommended</u></b>	BUL 6481	Employment Law	2
<b><u>Recommended</u></b>	BCN 5754	Human Factors	3
<b><u>Recommended</u></b>	BCN 5754	Site Planning and Feasibility	3
<b><u>Recommended</u></b>	ACG 5005	Financial Accounting	2
<b><u>Recommended</u></b>	ACG 5075	Managerial Accounting	2
<b><u>Total</u></b>			<b>18</b>
<b><u>Elective</u></b>	CEG 5105	Geotechnical Engineering	3
<b><u>Elective</u></b>	BCN 6641	Construction Value Engineering	3
<b><u>Elective</u></b>	MAR 5620	Introduction to Managerial Statistics	2
<b><u>Elective</u></b>	SUR 6395	Topics in Geographic Information Systems	3
<b><u>Elective</u></b>	ENV 5306	Municipal Refuse Disposal	3
<b><u>Total</u></b>			<b>14</b>

This proposed graduate curriculum addresses the major areas of the “Four Pillars of Responsibilities” that a Public Works Manager can expect to encounter in the execution of their office. With the added flexibility of the recommended courses and electives, student specific vice school specific courses can be selected to tailor the interests as well as the need of the student in a dynamic environment. As the curriculum matures and becomes more universally recognizable, an increasing cadre of prospective public works managers will seek out the proven educational systems, to satisfy the growing requirements being created by our ever more complex infrastructure systems. This will be the impetus that establishes the International Public Works Center’s that will satisfy the complex infrastructure resource requirements (human as well as technological).

## References

1. – Brewer Lucy, editor. Public Works Administration: Current Public Policy Perspectives. Thousand Oaks, CA.: SAGE Publications Inc. 1997.

2. – United States Navy Graduate Education Handbook Internet address:  
<http://www.bupers.navy.mil/pers4413/gradscol/index.htm> (Access date: Jan 2003).

3. – Mr. Denis Ross, American Public Works Association, Director of Professional Development,  
E-Mail Ross/ Ellwood dated 13 Apr 99.

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