CIAPR

MANUAL FOR PROFESSIONAL PRACTICES AND GUIDELINES FOR THE COMPENSATION OF PROFESSIONAL SERVICES

From the Editor

In this revision of "The Manual for Professional Practice and Guidelines for the Compensation of Professional Services", we followed the excellent work of past Editor, Engineer Pedro Ray. In essence, we updated the fee tables to include inflation and other economic factors as recommended by Estudios Técnicos, Inc.

Also, and with the advice of engineer Miguel Torres Díaz, we added a new chapter to define and analyze the engineering side of Construction and Project Management.

Furthermore, with the Institute's recommendations, we expanded the definitions in each of the five different categories used in the Percentage Fee Tabulation, included a general professional services contract guide, as well as redefined the surveying guides.

Thank you to all of you to allow me to contribute once again to my CIAPR, especially to the past President, engineer Roberto Rexach who designated me as the President of the Commission and who started the revision himself and to the actual President, engineer Juan Pérez, who published the hard copy of the Manual.

Sincerely,

Edison Avilés Deliz
Editor

MANUAL FOR PROFESSIONAL PRACTICES AND GUIDELINES FOR THE COMPENSATION OF PROFESSIONAL SERVICES

During the tenure of the former presidents Israel Otero and Roberto L. Rexach Cintrón, The Manual for Professional Practices and Guidelines for the Compensation of Professional Services was submitted to the comprehensive revision to update the manual. The revision had been completed and it's a totally improve manual.

In this manual there're guidelines that are not mandatory but just a fair a reasonable way to selection, compensation and contract of professional services. We're looking forward that this manual will be of great help for all the professional Engineers and Surveyors.

Sincerely,

Juan Antonio Pérez González, P.E.
President

COLEGIO DE INGENIEROS Y AGRIMENSORES DE PUERTO RICO • 1938 •

CHAPTER 1
INTRODUCTION

By its very nature the rendering of professional services must be provided on an ethical basis and calculated to provide adequate representation for the client and remuneration to the professional, commensurate with his ability and experience and the requirements of the project at hand.

Maximum return both to the client and the professional will result only when a complete mutuality of interest is maintained.

1.1 DUTIES AND RELATIONSHIP BETWEEN CLIENT AND THE PROFESSIONAL

The employment of a professional by a client preposes that the service rendered shall be competent and that the knowledge and experience of the professional are adequate for the solution of the problems at hand.

The following is a partial list of professional services that may be required by the client.

1. Surveys, reconnaissance and investigation.

2. Consultation with government agencies. Feasibility studies of the proposed project including schematics.

3. Preliminary reports and opinion of probable cost.

4. Assistance in procuring funds, preparation of bond schedules, and other financial matters.

5. Execution of schematic plans and schematic opinion of probable cost, preliminary plans and preliminary opinion of probable cost and, final design, construction plans and final opinion of probable cost and, construction specifications.

6. Assistance in advertising for canvassing of bids and in selecting the construction contractors.

7. Services during construction.

8. Expert witness, mediation and arbitration services.

9. Certification of the payment(s) due to the contractor.

10. Purchase of equipment.

11. Supervision of test, analysis of test results and recommendations.

12. Inspection of construction.

13. Supervision of the startup and operation of equipment.

14. Construction Management Services.

15. Program Management Services.

Compensation for the above services are based on the character, magnitude and complexity of the work on which the professional is to be engaged, and on the type of services to be rendered.

1.2 RULES OF ETHICS FOR THE ENGINEERS AND LAND SURVEYORS

Principles on which Professional Ethics are Based

In the interest of promoting the integrity, honor and dignity of their professions in accordance with the highest moral standards and the established code of professional ethics, the engineer and the land surveyor:

1. Shall consider the service to humanity as their main function. Their professional-client and professional employee relationship shall be subject to the basic objectives of promoting the general well being of humanity, and protecting the public's interest.

2. Shall be honest, impartial, and loyal in the performance of their professional functions, always maintaining an independent and fair judgment which constitutes the essence of professionalism.

3. Shall endeavor to improve the level of competition and prestige within the fields of engineering and land surveying.

Standards of Professional Ethics

ARTICLE 1. To maintain as the primary consideration in the performance of their professional responsibilities, the safety, environment, health and well being of the community.

ARTICLE 2. To provide professional services only in their areas of competence.

ARTICLE 3. To issue public statements in an objective and truthful maner.

ARTICLE 4. To act in professional matters on behalf of their clients and employees as their loyal or fiduciary agents, avoiding conflicts of interest and maintaining an independent opinion based on purely professional judgments.

ARTICLE 5. To build their professional reputation based on quality of service, refraining from entering into unfair competition with other professionals.

ARTICLE 6. To refrain from imparting deceitful information when applying for employment or offering professional services.

ARTICLE 7. To act with the level of decorum required maintaining and heightening the honor, integrity and dignity of their professions.

ARTICLE 8. To associate only with persons or organizations of upstanding reputation.

ARTICLE 9. To continue to develop professionally throughout their careers, and promote opportunities for the ethical and professional development of other engineers and land - surveyors under their supervision.

ARTICLE 10. To maintain a professional conduct and perform transactions in strict compliance with the applicable laws and regulations as well as with these articles.

REGULATIONS

ARTICLE 1. TO MAINTAIN AS THE PRIMARY CONSIDERATIONS IN THE PERFORMANCE OF THEIR PROFESSIONAL RESPONSIBILITIES, THE SAFETY, ENVIRONMENT, HEALTH AND WELL BEING OF THE COMMUNITY.

The Engineer and Land surveyor:

A. Shall recognize that the community's safety, environment, health and well being depends upon the judgment, decisions and professional practices incorporated into systems, structures, equipment, processes, products and artifacts.

B. Shall approve, sign, seal or certify, as may be the case, only those documents that have been reviewed or prepared by themselves or under their direct supervision and which they know to be safe for the environment as well as for the general health and well being of the community, and comply with accepted standards.

C. Shall inform their clients or employers of possible negative consequences in those cases when their professional judgment have bee revoked due to circumstances in which the safety, of the environment, general health and well being of the community are endangered. In the event the threat to the safety environment, general health and well being of the community were to continue, they shall notify the appropriate authorities.

D. When they have sufficient reason or knowledge to believe that another engineer or land surveyor is in violation of these guidelines, or that another person or firm constitutes a threat to the safety, environment, general health and well being of the community, they shall submit such information in writing in the appropriate authorities and will cooperate with said authorities by providing all the information or assistance required.

E. Shall participate in a constructive manner in civic matters, and shall work towards the improvement of the safety, environment, general health and well being of the community.

F. Shall be committed to the improvement of the environment, and will do everything within their power to improve the quality of life.

ARTICLE 2. TO PROVIDE PROFESSIONAL SERVICES ONLY IN THEIR AREAS OF COMPETENCE.

The Engineer and Land surveyor:

A. Shall perform services for which they are qualified by virtue of training, education, or experience.

B. May accept a project, which requires services outside of their own field of competence, provided their own services are restricted to those phases of the project for which they are duly qualified. All other phases of that project shall be performed by qualified associ
ates, consultants or employees who will approve, sign, seal or certify, as may be the case, the pertinent documents.

C. Shall not approve, sign, seal, or certify any plan or document that relates to a matter in which they are not competent by virtue of their training, education or experience.

ARTICLE 3. TO ISSUE STATEMENTS IN PUBLIC IN AN OBJECTIVE AND TRUTHFUL MANNER.

The Engineer and Land surveyor:

A. Shall be objective and truthful when issuing professional reports, statements or testimony. They shall include all information that may be relevant and pertinent to such reports, statements and testimonies.

B. Shall endeavor to impart to the general public the nature of the scope and practices of their professions, and shall not participate in the dissemination of any false, unjust or exaggerated statements.

C. In those cases when they may serve as technical expert witnesses, they shall express their professional opinion only when it is based on the adequate knowledge of the subject matter in question, and technical knowledge of said subject.

D. Shall not issue statements, criticism or arguments regarding matters pertaining to their professions which are influenced or paid by interested parties, unless these statements indicate the name of the author, interested parties on whose behalf they speak, and any monetary gain or interest they may have in the subject.

E. Shall explain their work or its merits in a serious and measured tone,
and will avoid any act that would tend to promote their own personal interest as the expense of the integrity, honor and dignity of the
professional in this field or any other individual.

F. Shall only express their professional opinion in public regarding technical matters when they are knowledgeable of the subject, and when such opinion is based on factual information.

ARTICLE 4. TO ACT IN PROFESSIONAL MATTERS ON BEHALF OF THEIR CLIENTS AND EMPLOYEES AS THEIR LOYAL OR FIDUCIARY AGENTS, AVOIDING CONFLICTS OF INTEREST- OR EVEN THE MERE APPEARANCE OF SUCH- AND MAINTAINING AN INDEPENDENT OPINION BASED ON PURELY PROFESSIONAL JUDGMENTS.

The Engineer and Land surveyor:

A. Shall avoid all known or potential conflicts of interest with their clients or employers and shall promptly inform of any business relationship, interest or circumstances that could influence their decisions or the quality of their services.

B. Shall not enter into any activity or take any assignments that may knowingly create a potential conflict of interest between them and their clients or employers.

C. Shall not accept any compensation from third parties for services rendered on or pertaining to a project, unless the circumstances surrounding such compensation are completely revealed to and agreed upon by all interested parties.

D. Shall not solicit or accept any gratification of any value, whether directly or indirectly, from contractors, their agents, or other parties related to the work being done on behalf of their clients or employers and for which they are responsible.

E. Shall not solicit or accept compensation or consideration of any sort in exchange for specifying products, materials, or equipment suppliers, without first informing their clients or employers.

F. Those who hold public service positions as members, consultants or employees of a government agency or department shall not

participate in the decision process related to professional services requested or provided by them or by their organizations in private or public practice.

G. Shall not solicit or accept contracts for professional services from any government agency in which a principal or officer of that organization may be a member.

H. When, as a result of their investigation or other information, they believe that a project will not be successful they shall make it known to their employers or clients.

I. All information they may be privy to as a result of their work shall be treated as confidential and may not be used for their own personal gain if this could have a negative impact on the interest of their client or employer, or committees, councils or board to which they may belong.

J. Shall not reveal any confidential information regarding business matters or technical processes of any present or past employer or bidder being evaluated without their previous consent, unless required by law.

K. Shall not copy designs provided to them by clients for his benefit or use of others without the express authorization of the client and from the professional and without taking into consideration all applicable laws and contract clauses.

L. Before performing work for others involving improvements, drawings, inventions or other registered work that may result in obtaining rights of authorship or patents, they will come to an agreement with the respective parties regarding such rights.

M. Shall not participate in or represent an adversary interest relative to a project or specific matter in which they have gained specialized and specific knowledge from having worked for a previous client or employer, without first obtaining consent of the interested parties.

ARTICLE 5. TO BUILD THEIR PROFESSIONAL REPUTATION BASED ON QUALITY OF SERVICE, REFRAINING FROM ENTERING INTO UNFAIR COMPETITION WITH OTHER PROFESSIONALS.

The Engineer and Land surveyor:

A. Shall not offer, give, solicit or receive, directly or indirectly, any monetary or other type of contribution intended to influence the contract of an award on the part of the public sector authority. They shall not offer any gift or any other item or value with the purpose of obtaining work. They shall not pay any commission or percentage, nor grant any rights of representation with the purpose of obtaining work, with the exception of bona fide employees or commercial or marketing agencies established for that purposes.

B. Shall negotiate professional services contracts based on fair professional competition and proven qualifications in the field of professional services required in the particular contract and, later on, on the basis of fair and reasonable fees.

C. Professional commissions shall be solicited, proposed or accepted on a contingency basis only in those cases in which the professional opinions will not compromised.

D. Shall not attempt to recruit someone employed by another employer by way of false or untruthful representations.

E. Shall not maliciously or falsely, directly or indirectly, damage the professional reputation, practice or employment of another engineer or land surveyor, nor indiscreetly criticize the work performed by one.

F. Shall not use any of their employer's equipment, supplies, laboratory or office to perform work related to their own outside private practice without having obtained previous consent from their employer.

G. Shall not take advantage of a salaried position to compete unfairly with those colleagues who are in private practice.

H. Shall not try to substitute or replace another engineer or land surveyor once they have been offered or awarded a position or assignment, nor compete unfairly with him or her.

I. Those professionals who participate in the planning of a project or who use the services of other professionals in any capacity shall not retain he professional fees received for themselves without first having paid his collaborators their corresponding fees in a fair or at least proportionate manner to their own; not shall they deprive their professional colleagues from receiving fair and just payment for their services.

J. They shall not approve, sign, seal or certify, as may be the case, nor authorize presenting drawings, specifications, calculations, decisions,
memoranda or reports which have not been prepared by themselves or by others under their direct supervision and responsibility. They shall also give credit for any engineering, architectural or land surveying work to those professional that performed such work.

ARTICLE 6. TO REFRAIN FROM IMPARTING DECEITFUL INFORMATION WHEN APPLIYING FOR EMPLOYMENT OR OFFERING PROFESSIONAL SERVICES.

The Engineer and Land surveyor:

A. Shall not falsify or misrepresent their academic or professional qualifications nor those of their associates or employees. Shall not misrepresent or exaggerate the degree of responsibility held in previous positions or the matters involved in those projects or positions. Brochures or presentation materials prepared for employment applications shall not twist or misrepresent facts relating to employers, employees, associates, co-workers or past achievements.

B. Shall announce their professional services without self-aggrandizement or fraudulent language, and in such a manner that does not demean the dignity of the profession. Examples of some allowable forms of promotion or advertisement are as follows:

1. Business cards ads placed in well-known publications, and inclusion in lists and directories published by responsible organizations provided the business card ads or listings are of an appropriate size and content, and appear in a section within the publication which is regularly destined for this type of advertisement.

2. Brochures that describe their experience, facilities, personnel a professional capabilities to offer services, provided they are not fraudulent regarding the participation of professionals in the described projects.

3. Advertisement in professional and trade publications provided they make reference to facts, do not contain boastful expressions and are not misleading with regard to the degree of participation of the professionals in the described projects.

4. A statement with the names of the firm's professionals, the name of the firm the type of services provided in those project in which they have been involved.

5. Preparing or authorizing factual articles for the press regarding facts in a serious and not-boastful style. Such articles shall only contain information regarding the direct participation on the part of the professional in the described project.

6. The authorization on the part of professionals for their names to be used in commercial advertisements such as those that may be published by contractors, material suppliers, etc., shall be done only if it involves a serious and restrained statement giving recognition to those professionals who are involved in the described project. Such authorization shall not include publicly promoting a given brand or trademark.

ARTICLE 7. TO ACT WITH THE LEVEL OF DECORUM REQUIRED MAINTAINING AND HEIGHTENING THE HONOR, INTEGRITY AND DIGNITY OF THEIR PROFESSIONS.

The Engineer and Land surveyor:

A. Shall not knowingly act in such a way as to sully the honor, integrity and dignity of their professions.

B. Shall not associate with, employ, or in any other way use any person to render professional engineering, architectural or land surveying services unless such person is authorized as such at the time of providing those services.

C. Shall not associate their names in the practice of their profession with non-professionals or with persons or entities who are not legally authorized to practice engineering, architecture or land surveying projects.

D. Shall not share honors, with the exception of other engineers, architects and land surveyors who have collaborated with them in engineering, architectural or land surveying projects.

E. Shall take responsibility for their mistakes and others under their direct supervision, when they are proven to them, and shall abstain from distorting or altering facts in an effort to justify their decisions.

F. Shall cooperate to enhance the effectiveness of their professions by exchanging information and experiences with other engineers, architects and land surveyors as well as students of these professions.

G. Shall not compromise their professional criteria with any matter o private interest whatsoever.

ARTICLE 8. TO ASSOCIATE ONLY WITH PERSONS OR ORGANIZATIONS OF UPSTANDING REPUTATION.

The Engineer and Land surveyor:

A. Shall not associate with, nor permit his name or firm, knowingly, with professionals or with persons or entities that, they know or have sufficient reason to believe, are involve in fraudulent or dishonest professional practices or business.

B. Shall not use the association with natural or legal persons to hide acts contrary to the ethics.

ARTICLE 9. TO CONTINUE TO DEVELOP PROFESSIONALLY THROUGHOUT THEIR CAREERS, AND PROMOTE OPPORTUNITIES FOR THE ETHICAL AND PROFESSIONAL DEVELOPMENT OF OTHER ENGINEERS AND LAND SURVEYORS UNDER THEIR SUPERVISION.

The Engineer and Land surveyor:

A. Shall keep themselves current with new developments within their respective fields by practicing their professions, participating in continued educational courses, reading technical literature and attending professional meetings and seminars.

B. Shall encourage engineers or land surveyors in their employ to continue to improve their own education.

C. Shall encourage engineers and land surveyors in training in their employ to obtain their professional licenses as soon as possible.

D. Shall encourage engineers or land surveyors in their employ to attend and participate in meetings held by technical and professional
organizations.

E. Shall promote the principles of mutually satisfying relations between employers and employees with regard to employment conditions, including professional job description, salary scales and employee benefits.

ARTICLE 10. TO MAINTAIN A PROFESSIONAL CONDUCT AND PERFORM TRANSACTIONS IN STRICT COMPLIANCE WITH THE APPLICABLE LAWS AND REGULATIONS AS WELL AS WITH THESE ARTICLES.

The Engineer and Land Surveyor:

A. Shall comply with the laws that regulate the certification, licensing and practice of the engineering and land surveying professions, as amended, with the regulations set forth by the Colegio de Ingenieros y Agrimensores de Puerto Rico (CIAPR) (The College of Engineers and Land Surveyors of Puerto Rico), and the Junta Examinadora de Ingenieros y Agrimensores de Puerto Rico (The Examining Board for Engineers and Land Surveyors) as well as the agreements and directives legitimately adopted by the General Assembly and the CIAPR'S Governing Board.

B. Shall attend any interview, administrative investigation, hearing or procedure before the Disciplinary and Professional Ethics Tribunal or before the CIAPR's Committee for the Defense of the Profession to which they may be summoned as a witness, complainant or defendant.

CHAPTER 2

SPECIFIC SERVICES TO BE RENDERED BY THE PROFESSIONAL

The exact services to be rendered will naturally vary depending on the type of the project and contract with the owner.

2.1 SCHEMATIC SERVICES

Out of conferences with the client, studies either graphic or written should be prepared by the professional to determine in a schematic way, the nature and purpose of the project, its size and the relationship of project components and the suitability of the site. The professional shall prepare a schematic opinion of probable cost based on the area, volume or other pertinent data.

The client should cooperate fully and furnish all the information required for the proposed project, including standards, if any, to be, the exact uses and, the manner in which the clients expects its to operate.

If the project is one calling for possible future additions or further extension, the client should inform the Professional of such facts and what the expected ultimate expansions might be.

When the project is of an industrial nature, the schematic work shall include studies, process engineering and planning depicting the nature of the manufacturing process. This will be done in the form of Block or Process Flow Diagrams, Master Plans, Material and Energy Balances and/or Process Descriptions in sufficient detail to define the major components of the project.

The schematic services do not include investigations and determination of the economic feasibility of a proposed project. Also excluded, as parts of the schematic services are the direct cost of test borings, property surveys or, other technical studies that may be needed. All of these excluded services can be contracted as additional services in this stage.

2.2 PRELIMINARY SERVICES

When the schematic design, as a result of conferences and information furnished by the client, have been generally determined and the proposed

scheme approved, then, the professional should proceed with the preliminary drawings of the project. These are drawings, usually at a small scale, showing the location of the project on the site, the general disposition of the principal features, and equipment. At this stage the Professional should determine any limitations of the site such as structure or buildings lines, zoning, set backs, etc., and also limitations of existing applicable laws and regulations.

These drawings are developed with plan, elevations and sections sufficient to fix and illustrate the site and character of the project in all its essential basic particulars including space provision and system layout for data, electrical and mechanical equipment. The professional should also prepare basic outline specifications and include in the same manner other special features or equipment required for the project.

The professional should also at this stage develop such preliminary construction opinion of probable cost pertaining to those preliminary drawings that are the basis of the whole concept of the project. They are important and should be thoroughly studied and understood before proceeding to the next step, the "Working Drawings".

When the project is of an industrial nature, preliminary process engineering shall be included. This will include preparation of preliminary piping and instrumentation diagrams, overall control architecture, and preliminary process piping diagrams. Process equipment specification for budgetary quotes shall be included. Small scale and schematic drawings shall be prepared with sufficient detail to obtain an opinion of probable construction cost.

Feasibility studies, long-range planning and, developmental investigations involve broad considerations, functional investigation studies and, analysis of the conditions as basis for conclusions and recommendations. Opinion of probable cost, comparisons, extensive surveys, financing considerations, and rates or expected revenue may be required for appraisal of the variations which are considered in processes or methods.

These studies of economic feasibility and comparison of plans are essential consulting services preceding many projects. They are, in addition to the preliminary opinion of probable cost and sketches, directly related to the design after the mayor decisions of the project are reached. The basic percentage fee is not intended to cover economic or feasibility studies. The owner and professional should negotiate charges for these additional services or studies.

2.3 WORKING DRAWINGS AND SPECIFICATIONS

These are the logical and final development of the foregoing preliminary work and as a result are the instruments of the professional service from which the project is constructed or assembled. These instruments of service form part of the contract documents and, as such, they must explain in substantial detail the extent of the work included and to be performed under the construction contract, therefore.

a) The working drawings should give explicit information in terms of dimensions, when required. Schedule of interior finishes should accompany the working drawing and mark the location of the respective kinds of materials as specified.

b. The specifications should give information regarding the kind and use of the materials and/or equipment.

c) The professional should furnish as part of the working drawings sufficient information including scaled details to forth the requirements including the following information in general:

2.3.1 "Site Plan" - This is developed from the survey and should show the following:

a) Location of the project on the site.

b) All building or zoning lines and restrictions.

c) Connections to existing utilities.

d) Sewage disposal system if trunk sewers are not available.

e) Drainage systems, including inflows, land and building contributions, and runoff disposal and management works.

f) Roads, walks, utilities, landscaping and other general site improve ments.

g) Normal grading of the proposed structures.

h) All existing foundations or other obstructions.

i) Any other physical characteristics, which might affect the sit improvements of the project.

2.3.2 "Building Plans" -Should be thoroughly dimensioned and include the following information:

a) If the building is of a complicated nature a foundation plan showinall footings, caissons, pilling, drainage pits, etc., occurring below the basement of the lowest levels should be included.

b) Floor plans at an adequate scale. Key drawings may be prepared at a lesser scale.

c) Overall elevations at an adequate scale. Key drawings may be prepared at lesser scale.

d) Sections through the building and sections through stairway particularly those of a special nature, shall be developed at an adequate scale. Sufficient additional sections, as needed, to clearly illustrate the intent shall be developed. Plans, elevations and through sections where complete graphic analysis of the work is required should be drawn to a scale of 1/4" to the foot as working drawings of churches, theaters, hospitals and similar complex buildings including residences and alterations to existing buildings.

e) Roof plans showing roof pitch, drainage outlets, vent housing and other roof top elements.

f) Framing plans (except for simple buildings) showing structural members, well holes and other information to illustrate structural requirements. These will include beam, slab, structural walls, columns and lintel schedules.

g) Floors plans and necessary cross sections showing all plumbing, mechanical, electrical equipment and data communication components to show relationship between architectural and engineering construction. These drawings should show all piping, conduit arrangements and diagrams with the location of all fixtures shown.

h) Detail drawings, at suitable scale, to illustrate adequately special equipment or features.

i) Detail of special architectural or engineering features to illustrate the intent and construction requirements.

j) Schedules showing windows, doors, rooms finishes, corridors, stair, etc, including detail sections of windows, doors and similar basic elements of the building.

2.3.3 Industrial Projects: Should be thoroughly dimensioned and in addition to the requirements of section 2.3.2 shall include the following information:

a) Process Flow Diagrams with Material and Energy Balance Information.

b) Piping and Instrumentation Diagrams.

c) Process Equipment Procurement Specifications.

d) Control Panel Layout Drawings.

e) Detailed Equipment Layout Drawings.

f) Process Piping Plan, Elevations, and Details.

2.3.4 Specifications - The specifications should be written in sufficien detail to describe adequately the materials, construction methods and workmanship. The specification should contain such division of work and are applicable to the specific project, such as the following:

a) General Conditions and Special Conditions when required (clients may furnish these sections).

b) Descriptions for each divisions of the work describing the materials, their quality and, the manner of assembling them.

2.4 SERVICES DURING THE BIDDING PROCESS

Assist the client during the bidding process. Prepare instruction to the bidders, bid form (if not supplied by the client) attend pre-bid meetings, issue necessary addenda to clarify bidders questions, help the client in the selection or negotiation phase (if applicable).

a) The instructions to the bidders should state the conditions surrounding the bidding, how the proposals are taken and by whom, when due, the place and the manner of delivery and whether public or private opening of bids.

b) The Bid Form should contain reference to bid documents, anshould state requirements for liquidated damages, Bid, performance and payment bond or a certified check.

2.5 CONTRACT DOCUMENTS (IF OWNER DOES NOT SUPPLY)

The professional should prepare and have executed all contract forms settings forth contract price, agreed terms, payments, payments list of documents making up the contract documents, verify check and surety bonds when submitted, and complete any contractual procedure between the client and contractor.

2.6 SERVICES DURING THE CONSTRUCTION PHASE

Construction Phase Services involve consulting with and advising the client during construction and are usually those associated with services as the client-representative. This service is limited to determine in general terms if the construction is proceeding according to the contract documents. For an extensive overview of the construction methods and processes a project manager or inspector is required. Services during the construction phase may include the following:

2.6.1 Reviewing for compliance with design concepts, shop and erection drawings submitted by the contractors.

2.6.2 Reviewing laboratory, shop, and mill test reports on materials and equipment.

2.6.3 Visiting the project site at appropriate intervals as construction proceeds to observe and report on the progress and the quality of the executed work.

2.6.4 Issuing instructions from the client to the contractor, issuing necessary interpretations and clarifications of contract documents, preparing change orders requiring special inspections and testing of the work, and making recommendations as to the acceptability of the work.

2.6.5 Preparing sketches to resolve problems due to actual field conditions encountered.

2.6.6 Determining amounts of progress payments due, based on degree of completion of the work, and recommending issuance of such payment by the client.

2.6.7 Observing and assisting performance test and initial operation of the project.

2.6.8 Preparing record drawings to include any design changes approved by the professional during the construction phase.

2.6.9 Making final observation and reporting on completion of the project, including recommendations concerning final payments to constructors and release of retained percentages.

2.7 CONSTRUCTION MANAGEMENT AND PROGRAM MANAGEMENT

Construction Management (CM) Specifically promotes the successful execution of capital projects for owners. These projects can be highly complex. Few Owners maintain the staff resources necessary to pay close, continuing attention to every detail--yet these details can "make or break" a project.

Program Management (PM) is the practice of construction management applied to a capital improvement program of one or more projects from inception to completion. Comprehensive construction management services are used to integrate the different facets of the construction process - planning, design, procurement, construction and activation - for the purpose of providing standardized technical and management expertise on each project.

A CM or PM can complement the owner's staff with pre-planning, design, construction, engineering and management expertise that can assure the best possible project outcome no matter what type of project delivery method used.

"Agency" Construction Manager

This is a fee-based service in which the construction manager is responsible exclusively to the owner and acts in the owner's interests at every stage of the project. The construction manager offers advice, uncolored by any conflicting interest, on such crucial matters as:

A. Optimum use of available funds
B. Control of the scope of the work
C. Project scheduling
D. Optimum use of design and construction firms' skills and talents
E. Avoidance of delays, changes and disputes
F. Enhancing project design and construction quality
G. Optimum flexibility in contracting and procurement

H. Comprehensive management of every stage of the project, beginning with the original concept and project definition, yields the greatest possible benefit to owners from Construction Management.

"At-Risk" Construction Management

This is a delivery method that entails a commitment by the construction manager to deliver the project within a Guaranteed Maximum Price (GMP). The construction manager acts as consultant to the owner in the development and design phases, but as the equivalent of a general contractor during the construction phase. When a construction manager is bound to a GMP, the most fundamental character of the relationship is changed. In addition to acting in the owner's interest, the construction manager also protects him/herself.

BENEFITS OF CONSTRUCTION MANAGEMENT AND PROGRAM MANAGEMENT

Benefits of Construction Manager/Program Manager (CM/PM)

CM/PM can support Owners with a proven strategy to deliver the best possible projects, on time and within budget. Pressure is falling on Owners, who will confront complex issues in every area from site preparation to technology infrastructure, from builder selection to the finishing touches before "opening day." Handling these issues assures on-time delivery, within-budget projects that meet your needs. But it also puts huge demands on the Owner's time and requires skills and expertise
few Owners possess.

The CM/PM strives to give owners more effective control of complex construction, delivering high quality finished projects on time and within budget. The CM/PM is the Owner's advocate, combining detailed technical knowledge with a commitment to meeting the Owner's needs. Not affected by any conflicting interest, the Construction Manager represents Owners in such crucial areas as:

A. Release and use of funds throughout the project.
B. Project scheduling.
C. Control of the scope of work.
D. Optimum use of other firms' talents and resources.
E. Avoiding delays, changes, disputes and cost overruns.
F. Optimum flexibility in contracting and procurement.
G. Assuring the project is built to specification to meet your needs.

CM/PM provide specific expertise for all facets of the delivery process (pre-bond, planning, design, construction, etc.) without having to retain individuals on the payroll for specific tasks. By involving a CM/PM from the earliest stages of your project, you maximize your chances to achieve a smooth and trouble-free construction process and a facility that meets your needs.

When you determine a need for project, a CM/PM can help you reach sound decisions in such areas as:

A. General project characteristics and performance requirements.
B. Site analysis and selection.
C. Lead in forming a collaborative team of professionals.
D. Coordination with ongoing school activities and other public and community concerns.
E. Development of a preliminary budget and comprehensive master schedule.
F. Apportionment of general funding among a number of individual projects according to specific project needs.
G. Establishment of management information and reporting system to meet your requirements.
H. Development of detailed and complete bid documents to assure timely, responsive and comparable bids, while avoiding questions and protests.
I. Assistance in reviewing and analyzing bids and selecting contractors.

Design Phase

In the design phase, a qualified CM/PM should:

A. Ensure that design is both aesthetically successful and responsive to project goals.
B. Review the design documents and make recommendations to the Owner and Designer as to constructability, scheduling, and time of construction
C. Confirm clarity, consistency, and coordination of documentation among Contractors
D. Perform life-cycle cost analyses and other reviews to maximize the return on your construction investment.
E. Develop a detailed design schedule and supervise its implementa tion.
F. Review design in progress to assure constructability with minimal changes and fewer problems in the field.
G. Develop detailed component cost estimates at every design sub mittal

Procurement Phase

During the bid process, the CM/PM should:

A. Conduct pre-bid conferences to clarify the project's needs and assure responsive bids.
B. Assure that all bid documents are clear and all questions are answered.
C. Help you evaluate and compare bids.
D. Recommend bidders for contract award.

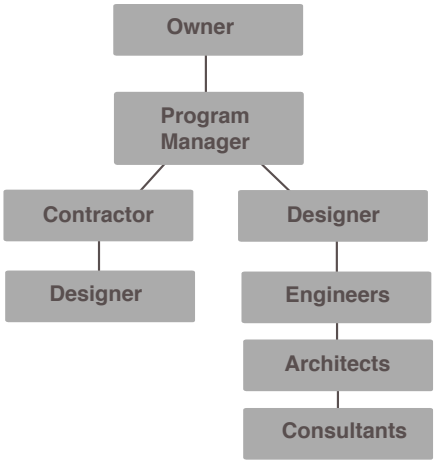
Construction Phase

During construction, the CM/PM will be the Owner's eyes and ears—and most of all, your advocate. A CM/PM should:

A. Assure that all contractors, subcontractors and other participants fully understand the project's design and requirements at every stage.
B. Deliver timely and clear reports to you concerning construction progress, milestones, and other elements.
C. Manage the change order process for maximum effectiveness while minimizing delay and costs.
D. Monitor the construction process to anticipate difficulties, resolve issues early, and keep the work flowing.
E. Administer progress payments to assure that work milestones are being met and that all current expenses are paid in a timely manner.
F. Assure that the contractor provides a safe workplace, both for project workers and, in renovations, for individuals who continue to use the facility during construction.
G. Eliminate the need to retain increased staff after the "burst" of construction activities; thereby reducing future operating and payroll costs when the construction has been completed.
H. Coordinate the final stages of construction, including contractors' punch lists and similar tasks that must be completed, often in a very compressed time period, before your project is closed out.

Benefits of Program Manager

Program management can be performed by any entity. On large, complex projects it is oftentimes performed by large professional service companies with design and construction expertise, although neither is a prerequisite. The program manager, as illustrated on the organizational chart below, serves as an additional layer of management between the owner and other project professionals.

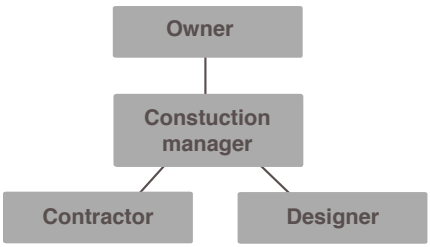


Program management duties may mirror those of project or construction managers, but on larger, more complex projects, program managers may also get involved with project financing, public relations, legislation affecting the project, relocation services, operations and maintenance, and purchasing.

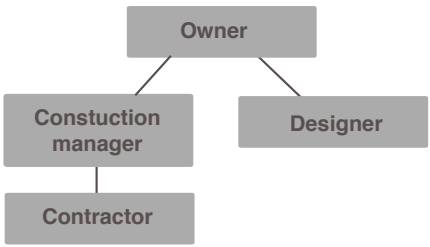
Both construction and program managers sell "extension of staff" services to owners. In other words, if the owner does not have the correct quantity of staff and/or lacks certain expertise, the construction manager and program manager each have the ability to fill that gap. The more removed an entity is from the owner on an organization chart,

the less likely it is looking out for the owner's best interests. The program manager on large and complex projects is closest to the owner. On projects where a program manager is not required, the construction manager may be closest, or equidistant to the architect. Both circumstances are depicted in the following charts.

CM-A/E Dependent



CM-A/E Equidistant



Program managers are also known to provide architectural/engineering, and construction management services. This brings to the forefront a number

of distinctive issues that could negatively affect the project (or program). Program managers can be involved in a number of different ways with the actual design of the project:

A. Provide programming services only.
B. Prepare conceptual plans only.
C. Prepare conceptual and schematic plans only.
D. Serve as the coordinating designer among many designers.
E. Prepare construction documents for the entire project.
F. Provide construction documents for only some project elements.

Additionally, design professionals on the project may contract directly with the program manager and not the owner. Likewise, all design professionals may contract with the owner separately and the program manager will be assigned to coordinate all design efforts. When the program manager actually performs design work, it is considered one of the key players on the project team.

Scope of Work Matrix

The following matrix analyzes the scopes of services that owners typically include in their RFPs for design professionals (architects and engineers), program managers, and construction managers. These services have been subdivided by the design, procurement, and construction phases. The purpose of examining the 'matrix is to identify any duplicative services; discover any "leave-outs"; and detect any unusual services.

Cells that have been highlighted indicate that an owner may have excluded a service customarily provided by that entity or that the owner included a service generally not performed by that entity. Because each

project is different, this should serve to assist the owner in deciding which entity may be best qualified to provide a specific service, depending on the situation.

1 I. Typical Scope of Services for Design Phase included in RFP's

Description of Service	Design Professional	Program Manager	Construction Manager
Architectural design	Yes		
Cash flow analysis		Yes	Yes
Chair project design meetings		Yes	
Civil design	Yes		
Code compliance review	Yes		
Computer-aided drafting	Yes		
Conceptual cost estimate	Yes	Yes	Yes
Conceptual plan development	Yes	Yes	
Condition assessments		Yes	Yes
Conduct executive briefings and/or attend hearings			
Constructibility review		Yes	Yes
Construction documents	Yes	Yes	
Coordination of all design professionals	Yes	Yes	
Coordinate design with property owner		Yes	Yes
Cost modeling and cost-benefit analyses	Yes		
Design development	Yes	Yes	Yes
Design development cost estimate	Yes	Yes	
Design professional selection		Yes	Yes
Determine construction phasing		Yes	Yes
Develop and implement correspondence controls			Yes
Develop and implement cost control system		Yes	
Develop and implement MIS		Yes	
Development of a management plan		Yes	Yes
Electrical design	Yes		
Environmental design	Yes		
Environmental Impact Statement	Yes		
Feasibility study	Yes	Yes	Yes
Fire protection design	Yes		
Geotechnical engineering (Subsurface investigation)	Yes		
Interior design	Yes		
Landscape design	Yes		
Life safety design	Yes		
Long lead equipment/item planning		Yes	Yes
Maintain listing and contact information for Team		Yes	Yes
Master time schedules		Yes	Yes
Mechanical design (Plumbing and HVAC)	Yes		
Monitor design schedule		Yes	
Monitor EOE, DBE, MBE, WBE programs		Yes	
Preparation of grant and loan documents	Yes		
Prepare application for permitting	Yes		Yes

Description of Service	Design Professional	Progam Manager	Constuction Manager
Prepare monthly progress report		Yes	Yes
Programming	Yes		
Project delivery method identification		Yes	Yes
Project design coordination		Yes	
Property appraisals and valuations	Yes		
Provide community/public relations		Yes	
Provide renderings and models	Yes		
Review design development drawings		Yes	
Review design professional cost estimates		Yes	Yes
Review drawings/specifications during preparation		Yes	Yes
Schematic cost estimate	Yes	Yes	Yes
Security design	Yes		
Site planning and assessment	Yes	Yes	Yes
Specification writing	Yes		
Structural design	Yes		
Surveying	Yes		
Systems evaluation	Yes		
Telecommunications design	Yes		
Value engineering review		Yes	Yes

II. Typical Scope of services for Procuremnet Phase included in RFP's

II. Typical Scope of Services for Procurement Phase included in RFP's

Description of Service	Design Professional	Program Manager	Construction Manager
Approve schedule of values	Yes		Yes
Bid evaluations			Yes
Construction market assessment			Yes
Contract document review			Yes
Contract negotiations			Yes
Contract preparation			Yes
Contractor interviews (Pre-award conferences)			Yes
Contractor pre-qualification			Yes
Contractor selection			Yes
Determine breakdown and prepare trade packages	Yes		Yes
Determine qualifications of apparent low bidders		Yes	Yes
Oversee bid advertising		Yes	Yes
Preconstruction conference			Yes
Utility shutdown procedures			

III. Typical scope of Wok and post Construction Phase included in RFP's

Answer contractor questions about documents	Yes	Yes	Yes
Approve samples	Yes	Yes	
Approve schedules	Yes	Yes	Yes
Approve shop drawings	Yes	Yes	
Approve suppliers and manufacturers	Yes	Yes	
Assemble written guarantees of contractors	Yes	Yes	Yes
Certify payment applications	Yes	Yes	
Conduct job meetings	Yes	Yes	Yes
Construction monitoring	Yes	Yes	Yes
Contract administration		Yes	Yes
Contract closeout		Yes	Yes
Coordinate and obtain building permits		Yes	Yes
Coordinate collection of close-out documents		Yes	Yes
Coordinate on-site testing		Yes	Yes
Detailed quantity surveys	Yes	Yes	Yes
Determine if work is in conformance with design	Yes	Yes	Yes
Develop occupancy schedule		Yes	
Development and monitoring of safety program		Yes	Yes
Inspect work for substantial/final completions	Yes	Yes	Yes
Inspections during warranty period	Yes		
Issue non-conformance notices	Yes	Yes	Yes
Maintain job-site project files		Yes	Yes
Manufacturer/supplier site visits/audits	Yes	Yes	Yes
Monitor and get as-builts delivered		Yes	Yes
On-site management of construction		Yes	Yes
Post-occupancy evaluation			
Preparation of operating and maintenance manuals	Yes	Yes	
Prepare and issue change orders	Yes	Yes	Yes
Prepare detailed daily construction log		Yes	Yes
Prepare monthly progress report		Yes	Yes
Provide community/public relations		Yes	
Quality assurance system		Yes	Yes
Review and approve change proposals	Yes	Yes	Yes
Review and respond to RFIs	Yes	Yes	Yes
Review shop drawings, sample and cuts		Yes	Yes
Solve problems during warranty period	Yes		
Witness and report testing results	Yes	Yes	Yes

CHAPTER 3
METHODS FOR SELECTING A PROFESSIONAL OR PROFESSIONAL ENTITY

3.1. QUALIFICATION BASED METHOD

It is suggested to all government agencies and municipalities and clients who have not previously engaged professionals for the type of service under consideration, or do not know which professionals have the qualifications needed, that they adopt this procedure in obtaining such services.

3.1.1 The agency/enterprise will maintain basic information concerning the architectural and/or engineering firms in a information bank. For the development and maintenance of the information. The interested firms public or private will provide the following information.

3.1.1.1 Name of the Firm
3.1.1.2 Name of other associated Firms
3.1.1.3 Name of owner (s) and principal (s)
3.1.1.4 Office location
3.1.1.5 Type of organization
3.1.1.6 Administrative organization
3.1.1.7 Type of services offered
3.1.1.8 Type of projects performed
3.1.1.9 Personnel
g)Total
h)Per discipline
3.1.1.10 Firms experience
3.1.1.11 Personnel experience
3.1.1.12 List of projects accomplished
3.1.1.13 List of actual projects
3.1.1.14 Financial capacity
3.1.1.15 Consultants utilized

3.1.2 If the agency/ enterprise wishes to acquire the service for a specific project or does not have the necessary data, it will request publicity or privately that the interested firms submit the informa tion contained in 3.1.1, also addressing the experience of the firm and personnel in the specific type of project and it's availability to carry out the project.

3.1.3 Within the qualified firms the agency/enterprise will select the three firms that it considers capable to carry out the project. The agency/ enterprise will submit in writing the scope of the project and the

services required of the selected firms. An executive or a committee of the agency /enterprise will meet separately with each firm to discuss the scope of the project and the services, time schedule for the project and the approach to be used in the development of the project.

3.1.4 The agency/enterprise will determine the order of priority to select the most qualified firm. Some of the criteria to take into consideration are:

3.1.4.1 Technical capacity
3.1.4.2 Financial capacity
3.1.4.3 Service history
3.1.4.4 Organization and administration of the Firm
3.1.4.5 Availability to accomplish the job in the desired time
3.1.4.6 Proposed approach to the project
3.1.4.7 Quality control system
3.1.4.8 Cost control systems

3.1.5 The agency/enterprise will provide all the required information of the project to the firm selected as most qualified in order to be able to submit a proposal in which, at least, the following information will be addressed:

3.1.5.1 Project scope
3.1.5.2 Scope of services
3.1.5.3 Schedule
3.1.5.4 Approach
3.1.5.5 Organization chart
3.1.5.6 Personnel
3.1.5.7 Compensation
3.1.5.8 Information that will be provided by the Project Owner

3.1.6 The proposal submitted will be evaluated and will be negotiated to reach an agreement on the project the compensation, time schedule and the contract.

3.1.7 It is recommended that the negotiation be carried out in an at mosphere of good faith ("win-win") including reasonable fees.

3.1.8 If an agreement cannot be reached with the most qualified firm, the negotiation will be terminated and the firm will be notified in writing.

3.1.9 Negotiation will commence with next most qualified firm.

3.1.10 The method of compensation to be used could be one of the following:

3.1.10.1 Lump sum
3.1.10.2 By percentage of the construction cost
3.1.10.3 Per hour or per diem
3.1.10.4 Cost plus
3.1.10.5 Incidental costs will also be paid such as: miles, food, facsimile, telephone special taxes, etc.

3.2 DESIGN BUILD METHOD

This method of construction is gaining popularity with owners, but specia- consideration shall be given on behalf of the professional. Only professionals through their own or associates, or professional's corporations can provide engineering, architectural and land surveying services directly to the owner. Some benefits for the owner are:

a. Singular Responsibility
   From the owner's point of view the Professional and contractor become a singular entity. A singular entity, legally limited to a joint venture between the contractor and the professional that will handle both the design and construction, so there is a single point of responsibility for quality and schedule.

b. Cost Saving and Budget Adherence
   Professionals and Contractors working as a team, evaluate al ternative materials and methods efficiently and accurately. Change orders are minimized, so budgets are easier to maintain.

c. Time saving
   Engineering, architectural, land surveying and construction are overlapped; total design and construction time can be significantly reduced. Design-built is ideal for a "fast-track" method of construction.

3.2.1 Methods of selection (Excerpts from Design-Build Institute of America)

3.2.1.1 Direct Selection

The Design-Builder is selected directly by the Owner on the basis of such factors as reputation technical and managerial qualifications, past performance and prior association. Private sector owners most commonly utilize direct selection.

3.2.1.2 Negotiated Selection

A number of Design-Builders are prequalified or interviewed, with selection based upon the same criteria noted in direct selection plus additional factors such as preliminary design solutions, fees to be charged, recent comparable cost, personnel to be assigned to the project, and scheduling commitments. As with direct selection, the negotiated source selection approach is most commonly utilized by private sector owners; however mayor federal agencies (GSA, Corps of Engineers, U.S. Postal Service) are also adopting this method on certain projects.

3.2.1.3 Cost/Design Competitions

Proposers are short listed on a qualifications basis and requested to submit a qualitative proposal and firm price. The owner establishes an evaluation system for qualitative features and for price. The owner receives the technical proposals with the price submitted simultaneously but separately. The owner reviews each technical proposal, then price, and makes a selection based upon the previously stated selection criteria.A mayor drawback of this method of selection is the high cost of the proposal that could limit the competition. Winning team wins the project, the losing teams lose large amount of money. A well-qualified team that loses a couple of projects will be reluctant to participate in other projects. A way out is for the owner to pay for part of the proposal cost for the losing team, with the owner acquiring the right of using the losing teams ideas for the winning proposal if he so chooses.

3.2.1.4 Cost Competitions

This method evaluation most closely resembles the design-bid-build process. Typically specific design concepts are issued as a part of the criteria package. The selected firms role in design is more that of a detailer than a conceptualizer. Frequently, proposals are solicited only from pre-qualified design-builders. The proposals are evaluated, deemed to meet the base criteria, and award is made to the low bidder. This process eliminates two of the most advantageous features of design-build competitions; multiple design solutions and innovations in materials/
systems.

3.2.2 Competitive Selection/Evaluation Process

The purpose of the selection and evaluation process should be to determine which proposal provides the greatest value to the Owner. A variety of selection/evaluation processes are available to private and public sector Owners. Each has been successfully used and each has its merits. No single process is appropriate for every situation. The Owner must determine, therefore, which of the following available procedures is most appropriate to the project (and also if a public project, which procedures are permitted under applicable federal, state and local statues):

3.2.2.1 Weighted criteria

Proposers are notified of their selection to the short list and given final requirements for the submittal of a qualitative proposal (e.g. management plan, experience, design solution and other qualitative issues) and firm's price. The Owner establishes a point rating for qualitative factors and for price. (For example, qualitative and design factors may weigh 60 points and price 40 points). The Owner receives the qualitative proposal. Price is simultaneously submitted in a separate sealed envelope. The owner reviews each proposal.

The Owner may assign points on a scoring matrix for proposers response to each of the evaluation factors.

After the design and qualitative criteria are evaluated, the price envelopes are opened. Maximum price points are assigned to the lowest dollar bid, and all others are scaled inversely proportional to that amount. High total points then determine the award. The following example illustrates this process:

Proper	Qualitive Score (60 maximum)	Price Propasal (40 maxium)	Price Score (100maxium)	Total Score
Firm "A"	51	$1,629,000	37	88
Firm "B"	53	$1,546,000	39	92
Firm "C"	44	$1,510,000	40	84

3.2.2.2 Adjusted low-bid

A variant of the weighted criteria process is the adjusted low bid. The process follows the same steps through receipt of qualitative proposals. Following the oral presentations qualitative aspects are score and totaled on a 0 to 100 scale expressed as a decimal (e.g., scores of 85 is written 0.85). After the scores have been calculated, each bidder's price envelope is opened. Price is then divided by the score (expressed as decimal) to yield an "adjusted bid". The lowest adjusted bid is recommended for contract award. For example:

Proper	Qualitive Score	Price Propasal	Adjusted Price
Firm "A"	0.85	$1,000,000	$1,176.471 Adjusted low bid
Firm "B"	0.95	1,300,000	$1,368.421
Firm "C"	0.50	800,000	$1,600.000

Note: The adjustment to the bid is for selection only. The firm's price proposal is the actual contract amount.

3.2.2.3 Equivalent Design/Low-Bid

This evaluation procedure parallels the two previous processes up to the receipt of design proposals. All steps of qualifications, short listing, designs and price submittal are the same. Design proposals, however are followed by a critique and given a deadline to respond with specific design changes and corresponding price amendment (either added or deducted). Revised designs are evaluated by the Owner and the price envelopes, both base and amendments, are opened. Award can be made with heavy or sole emphasis on price because the proposal's critique should have created a relatively equivalent designs.

3.2.2.4 Fixed Budget/Best Design

Contract price is established by the Owner and is stated in the RFP. This process uses the initial qualifications steps and short listing. The short listed proposers submit their qualitative proposals. Oral presentations (optional) are made and the Owner uses its evaluation criteria to score the proposal.

Recommendation of award goes to the firm offering the best solution for the given budget.

3.2.2.5 Meets Criteria/Low Bid

This method of evaluation most closely resembles the traditional bid process. Typically the RFP/criteria packages allows for very little creativity in the design. Very specific outline or conceptual designs are issued as a part of the design criteria package. Proposals are solicited from qualified firms. The proposals are evaluated, deemed to meet the base criteria, and award is made to the low bidder. The selected firm's role is more to complete construction documents than to develop a
design for the project.

Note: The "Meets Criteria/Low bid" process eliminates two of the most advantageous features of Design-Build; multiple design solutions and the creativity/innovation of competing design-build teams.

3.2.2.6 Emergency

As implied, when public safety or welfare is threatened, the Owner may authorize negotiations with the best-qualified Design-Build firm available at the time; utilizing references and/or previous Owner experience with the firm as justification for the selection.

4.0 METHOD FOR SELECTION OF A CM OR PM

It is recommended that the selection and use of a CM or PM for projects which are complex by virtue of their nature or size, or for which the Owner does not have an adequate capacity to manage the project effectively.

Typically, professional services of this sort are procured on the basis of an objective evaluation of the qualifications of competing firms. There are accepted practices that are used by both private entities and public bodies to select the best qualified CM/PM for the project.

4.1 Preliminary Decisions and Information

At the outset of the CM/PM selection process, certain information should be documented and certain decisions should be made regarding the concept of the project and the needs of the Owner in realizing project objectives.

A brief, detailed description of the project, including size, purposes, goals and objective parameters, must be developed in order to convey to the CM/PM proposer the activities and approximate level and type of skills that will be necessary. If any studies or other documents are available, they should be called to the attention of the proposers.

The Owner's needs and expectations with respect to scope, schedule and budget should be included in the description. Finalization of schedule should not take place until the selected CM/PM has advised the Owner regarding the achievability of the proposed schedule and associated project cost.

Owner's Internal Delegation and Management.
On all projects, the ability to react to changing circumstances is critically important. The project decision-making process must be designed to deliver informed decisions in the most timely manner possible. It has been said that the most frequent cause of project disruption is delayed decisive action.

It is very important that contractual authority—authority to obligate the Owner to pay money—be delegated to a qualified individual or small group of people so that decisions can be rendered in a timely manner and by those who are most familiar with the project. These decisions may concern change orders, contracts, dispute settlements, minor purchases and contracts in support of the project.

Some Owners' governing bodies may establish budget guidance for parts of a project, with specific decision authority within those budgets delegated to a part of the permanent staff, subject to review. These practices are highly recommended so that the Owner will gain credibility with the Contractor and consultant community.

Decisions with regard to the project organization, as envisioned by the Owner, including the reporting relationships among the Owner and all other parties to the design and construction effort, should be made and summarized for reference in the selection process.

4.1.2 The Selection Committee.

A CM/PM selection committee should be formed from the Owner's staff

early in the selection process so that the committee can learn as much as possible about the project and the Owner's expectations of the CM/PM.

The committee is responsible for one of the most critical decisions in the project—the selection of the CM/PM. The committee will be comparing the approaches offered by several firms, their skill levels and the experience of their personnel, with the expectations and needs of the project and the Owner's organization. Each individual on the committee should understand how the selection process will be structured. The committee should include the individual on the Owner's staff who will be responsible for the project.

While it is not necessary that all members of the committee be familiar with the design and construction process, at least one member should. If the Owner does not have an individual on its staff who can provide this expertise, it may be appropriate to retain a consultant for the selection process. Individuals such as senior members of the engineering or architectural community can be used for this purpose. It is also important that the committee be free from any conflict of interest in the selection of a CM/PM.

Qualification Based Selection of the CM/PM
Laws and regulations generally govern the process of selection for public work. The process, however, generally follows three steps: a statement of qualifications; a technical proposal; and a price proposal and fee negotiation.

4.1.3 Statement of Qualifications.

A request for qualifications (RFQ) should be advertised in local publications that will reach the CM/PM community. The requested statement of qualifications is usually a document that describes in general the qualifications of a firm (or team of firms) to perform the work. It will often include the following types of information:

1. Firm name and address
2. Types of services usually offered
3. Names of principals
4. Numbers of staff, organized by discipline
5. Description of similar work completed including date, size and Owner contact
6. Description of similar work in progress, including date, size and Owner contact
7. Annual volume, backlog and capacity
8. Record of performance; i.e., cost control, quality, schedule, and safety

The selection committee should evaluate the firms' submissions and make a judgment as to which firms appear qualified to perform the work. This will have the effect of reducing the number of competing firms to what is commonly known as a "short list."

4.1.4 Technical Proposal.

Those that are judged to be qualified are requested to submit a technical proposal. This solicitation, issued as a request for proposal (RFP), is a request for information about a firm's qualifications and intentions to perform the services desired. The technical proposals are usually written for a specific project.

The RFP should provide prospective respondents with a description of the project and information regarding the method of compensation. Additionally, the RFP should contain information about the project such as the project budget, major constraints, unusual services that may be required, and particular goals of the Owner.

If the Owner has sufficient understanding of the expected scope of services, it may be advantageous to organize the RFP on that basis. The RFP may also be organized as a series of questions to be answered by the respondents. The RFP should seek the following information from the proposers:

1. The respondent's approach to the project in terms of organization, process, tools and techniques, staff and quality assurance/quality control, etc.
2. The respondent's experience with projects of similar nature, includ ing Owner references
3. Resumes of key staff to be assigned full time and those to be available as resources

Owners should keep in mind that proposals are often a CM/PM's largest nonproject expense. CM/PM's appreciate an RFP that allows them to efficiently present their qualifications. It is appropriate for the RFP to include the criteria for the evaluation of the proposals as well as the weighting to be used.

It is desirable for the selection committee to be involved in the development and organization of the RFP. The RFP should be drafted with the understanding that the selection committee will have to evaluate a number of technical proposals and that the more consistent the presentations by the respondents the easier the evaluation will be. A mandatory outline of the technical proposal is useful in organizing the data for comparison by the selection committee. Additionally, a page limitation is suggested to keep the presentations to a manageable size. The page limitation should not include

data such as resumes and brochures. An experienced person for clarity and internal consistency should examine the RFP.

4.1.5 Evaluation Process.

The evaluation process may be time consuming and difficult. The selection committee should proceed with a logical and methodical evaluation of each proposal and grade each against the evaluation criteria stated in the RFP. Averaging ranks assigned by each panelist rather than averaging the panelists' scores should determine the final ranking of CM/PM's. This serves to reduce the influence of any one member of the panel and to ensure that the relative best of the proposals are identified. The CM/PM's proposal with the best average numerical ranking should be selected as the finalist to proceed to the next steps of submitting a cost proposal and negotiating the work effort.

In some cases, more than one respondent may appear qualified, and interviews or oral presentations may be the only appropriate method to differentiate between the top respondents. Interviews should be scheduled to provide the respondents with the best opportunity to show their capabilities. The selection committee to clarify points in the RFP response and to stimulate contrasting views among the respondents should formulate questions in advance. Since the Owner will be placing the fate of the project into the hands of the CM/PM, the compatibility between the goals and culture of the CM/PM and those of the Owner is a critical consideration. On large or complex projects, where the competition is close, two or more rounds of interviews may be necessary (keeping in mind, however, that preparing for interviews can be extremely costly for a consultant).

4.1.6 Price as a Part of the Proposal.

As is the case with any professional service contract, the issue of price should not enter into the ranking of CM/PM firms based on their qualifications. The selection committee should keep in mind that the CM/PM will be a trusted part of the Owner's project team and that the most important factors are the capabilities of the selected CM/PM.

Some Owners will request a cost proposal as a part of the RFP. This can be useful in evaluating the thought given to the approach to the project and the proposer's organization for it. Price proposals included as part of the RFP response may also save time in the negotiation of the agreement. Unless the RFP is extremely detailed and specific on the issues of cost, the total costs of two proposals will probably not be comparable. Scopes of work as envisioned by each proposer may not be the same, particularly in assumptions about staffing levels. Qualifications of personnel may be sufficiently different to cause significant difference in price as well as level of service. Costs or multipliers (of cost) may be structured so as to appear

lower than they effectively are. One proposer's direct cost may be included in the multiplier or assumed to be furnished by others. In essence, costs in the proposal stage are very soft numbers and should be analyzed in detail and with great care before comparisons are made.

When price proposals are solicited with the RFP, they may be required to be submitted in a separate, sealed and labeled envelope to be opened only when the qualifications-based selection phase has been completed.

4.1.7 Negotiation and Development of Scope of Services and Cost.
Upon evaluation of the responses to the RFP, the firm judged most qualified is requested to provide a proposed scope of services. After thorough discussions designed to assure that both parties are in agreement on the desired level of service, the selected CM/PM prepares a written scope of services proposal.

Decisions made and approaches discussed at this time will ultimately affect the success or failure of the project. Definition of necessary tasks and the application of estimated labor and expense to each task is an efficient way to develop a budget. To be addressed in the scope of services are:

1. Development of a specific project scope statement
2. Development of procurement strategy
3. Development of a project schedule and budget
4. Acquisition of special consultants
5. Acquisition of Designers
6. Acquisition of Contractors and Suppliers
7. Quality, cost and schedule control
8. Testing, startup and turnover

The scope of services should include deliverables or other tangible methods for measuring performance. Where applicable, physical examples of reports or other expected outcomes should be included or referenced. The Owner and the selected CM/PM should jointly, through negotiation, agree on a final scope of services based on the selected CM/PM's scope proposal and designed to support the timely delivery of the project. Development of a CM/PM budget grows out of this scope and is the first step in the detailed planning of the project. If the Owner and the most qualified CM/PM are not able to reach agreement on price and scope, negotiations are commenced with the next qualified firm.

CHAPTER 4

BASES FOR MAKING CHARGES FOR PROFESSIONAL SERVICES

4.1.1 GENERAL DESCRIPTION

In the computation of charges for professional services, any one of the following schemes may be used:

1. Percentage of cost of work. Fee based on a percentage of an opinion of probable cost or actual cost of work contemplated or constructed;

2. Fixed lump-sum fee;

3. Cost-plus a fixed fee;

4. Payroll cost times a factor plus incurred expenses;

5. Personal services on a per-diem or hourly basis;

6. Cost-plus basis when scope of work is difficult to determine;

7. Retainer fee; and

8. Retainer fee plus per-diem rates.

The decision concerning the acceptable method of computing fees on a particular job necessitates consideration of various important items, each of which has a bearing on the agreement for services to be entered into between the professional and his client, as each contract should be drawn to meet specific conditions.

4.1.1 Percentage of Cost of Work

Compensation for professional services based on a percentage of the estimated or final total construction cost of a project is the most common and convenient method of establishing the fees. This method is discussed further in this chapter.

4.1.2 Fixed Lump Sum Fee

Compensation under this method is usually arrived at by negotiation, in which the amount of the fixed lump sum may be determined by either of

two ways. In the first and preferable way, the lump-sum fee is determined by applying a percentage to the estimated construction cost and stating the result as a lump sum.The second may be used when the client desires to develop a lump-sum fee for the professional services required. In this method the lump-sum fee is the sum of the following four items:

a. Estimated direct payroll cost based on the estimated number of drawing, man hours, rates of salaries, etc;

b. Estimated overhead cost as defined hereinafter;

c. Estimated cost of out-pocket expenses such as travel and substence while away from home office, printing and reproduction expenses, telephone, fax, postal expenses, etc;

d. A surcharge on the total of items a, b, and c, representing compensation to the professional for his own service, and profit.

In instances where unusual specialized skill and judgment are required the second plan plus a per diem charge for the principal engineer or architect may be used.

Under this method the agreement should include a stated time limit for the performance of the services, and a provision should be inserted for additional compensation for the time in excess of the stated time and for changes required after the preliminary plans have been approved.

Furthermore, under this method it is essential that a detailed scope of the planned services be agreed upon. Also, provision should be made for equitable adjustment in compensation in case the original project is expanded or reduced in scope.

4.1.3 Cost Plus a Fixed Fee

For many projects the professional is required to start work before the cost project can be estimated. Such an indeterminate project generally results from the requirements for speed, special studies, research or experimental work, preparation of estimates for alternate types of construction, and other requirements. The project, however, should carry a general description or statement of the scope of work contemplated. That is, the number, size and character of buildings and structures, the extent of utilities, and other items.

For this type of project the cost-plus fixed fee method offers a satisfactory basis for performing such service. Under cost-plus fixed fee contracts, the

professional shall be reimbursed for the direct cost of all his services and overhead expenses, including the following:

Time of principals: The principal shall be reimbursed for the time actually dedicated by them to the work at a negotiated fixed rate.

Overhead Expenses are defined as those incurred cost which cannot be allocated as direct cost to a specific project, but which are, never the less essential to the continued operation of a professional office. By way of illustration but not of enumeration, items of overhead expense include the following; rent, including utilities; interest on operating capital; automobile expenses; reproduction cost; administrative costs of conducting business including time of principals and officers not devoted to specific projects, accounting and purchasing; business promotion; clerical, secretarial and stenographic, salaries including time between assignments of engineers draftsman and other technical employees; taxes of various kind connected with the professional office, office supplies and equipment non allocable to specific projects; insurance on officers of the firm; telephone, and fax; legal expenses not pertaining to specific projects, bad-debt provision; depreciation on furniture and equipment; maintenance of property; and library and periodical expenses.

Payroll Cost: Payroll costs are defined as those of engineers, architects, designers, draftsman, inspector, surveyor and other technical employees; auditors, payroll and other accountant's clerks, secretaries, stenographers, and other non-technical employees engaged on the project. In computing payroll cost, the annual salary of each person engaged in the work shall have added to it the annual amount payable in respect to vacation, holiday, severance days, sick leave and military leave pay, bonus and incentive payments, social security, unemployment, workmen's compensation insurance, employer's contribution to group hospitalization and life insurance, and overseas differentials and the resulting amount shall be termed the "payroll cost".

Miscellaneous Expenses: this category contains photo coping drafting clerical ad stenographic expenses and supplies; blue printing, printing and other reproduction cost; telephone, fax and postage expenses; travel and living expenses of principals and others employees on business connected with the project; the cost of offices, garages, automobiles, computing machines, surveying instruments, etc... less salvage values; the cost of financing unless provisions are made for frequent partial payments; and the cost of any other items directly attributed to the project or agreed to be included at the time the contracts is made.

In addition to reimbursement for all direct costs, the professional shall be paid a fixed fee (varying with the size, scope and complexity of the project) of the percentage fee established agreed.

If the scope of the project is increased during its execution, the fixed fee should be proportionality increased.

4.1.4 Payroll Cost Times a Factor Plus Incurred Expense

This method may be used when the scope of the work has not been clearly defined, when no estimate of cost has been made, and when no estimate of cost has been made, and when the client may employ the professional on a series of project of varied size and complexity over a period of months or years. Under this method the professional submits a proposal stating the services and materials to be furnished by the client, and by the professional's office. After the general conditions of such a proposal are agreed upon, a factor of the payroll cost, as defined in paragraph 3 above, to cover payroll cost, overhead expense, and compensation and profit shall be applied.

In addition the professional shall be reimbursed for actual costs of out-of pocket expenses, such as travel and subsistence while away form his home office, printing and reproduction expenses, telephone and fax, and postal expenses.

4.1.5 Personal service on a Per-Diem or Hourly Basis

The per diem basis of compensation is particularly adapted to work in the courts of justice or similar work involving irregular personal services. It may be used as an alternate to the method outlined in the section entitled "payroll cost times a factor plus incurred expenses".

When such consulting or expert services are furnished, the professional is compensated for all time devoted to the work, including travel time. The per-diem fee should be based on the complexity of the work involved and the breath of experience of the professional. In addition to the compensation based on per-diem, the professional is reimbursed for travel, subsistence, and other out-of-pocket expense incurred while away from his home office.

For services in court, or on other engagements in which the professional is to appear as an expert a per-diem fee is considered to have been earned for each day of such appearance, although the professional may not be called to testify, or if called, may finish his testimony in a fraction of the day.

On occasions, the urgency of the engagement requires the professional to work longer hours than normal. In some instances this requirement is a necessary material feature of the services and an understanding with the client should be made a to what constitutes a day. In such cases, the per-diem rate may be based on the normal number of working hours per day, or the per-diem rate may be increased to take into consideration the extended workday.

For certain kinds of work, compensation based on hourly rates is an equitable arrangement. Compensation for engineering services on an hourly basis demands a higher rate per hour than would be represented in a per diem rate. Also, the hourly rates should apply to the time required for the travel involved, plus reimbursement depending on the duration of the services, compensation on an hourly basis my include an agreement on a minimum amount or retainer in addition to the payments based on the hourly rates.

4.1.6 Cost-plus Basis when scope of work is difficult to determine

There are numerous cases when the extent of the professional services required is difficult, if not impossible, to predetermine. Under such circumstances it is impossible to establish fees as a percentage of estimated construction cost.

In of this general type, the payroll cost-times a factor method as outlined under the heading, payroll cost time a factor plus incurred expenses, may provide the best basis for negotiating the fee.

4.1.7 Retainer Fee

The employment of Architects & Engineers on a retainer fee basis is a common practice of clients who want to be assured of always having available the services of a certain individual or professional organization. This method may be used in cases of protracted litigation of work over the years, when the call of the professional is intermittent, or when the proposed client is not well known to the professional. It is also used in the development of undertakings for which the service of a specialist are not required on a full-time basis. Industrial companies may also employ on a retainer fee basis the engineers or architects who prepared the plans and specifications for a facility and who thus are familiar with any problems arising from its operation, from maintenance or plant additions.

The amount of the retainer varies with the character and value or the service to the client and the reputation and standing of the engineers or architect in his profession.

The terms for agreement for services on a retainer-fee basis also vary widely. The compensation may be based on a fixed sum, paid monthly or on some other mutually agreeable basis with per-diem or hourly rates in addition for time spent at the request of the client.

4.1.8 Retainer-fee plus per-diem rates

This method may be used for clients for whom the professional renders service intermittently, and who desire the professional to keep the clients action and responsibilities continuously in mind so that the professional may be called on at any time on routine or complex matters. Such a method can cover true consulting services in this case the total compensation may be divided by agreement between the client and the professional between the retainer and the per-diem charges, as the may agree, in such cases it is customary to fix the retainer on the basis of an estimate of the probable total number of days to be billed at the per-diem rate, and the actual per-diem compensation paid and received which will then be greater or less than the average rate used in fixing the retainer, if the actually required is less or greater then the estimated amount. For example, instead of charging $200 per day for engagement estimated to require 20 days, a retainer of $2,000 or of per month for a period of 4 month may be charged in addition to a per-diem rate of $100 per day. In such a case the actual per-diem compensation will be $200 if the time required is exactly equal the estimate of 20 days; but it will be $180 per day if the actual time is 25 days or $233 per day if the actual time is 15 days.

4.2 CLASSIFICATIONS OF PROJECT FEE BASED ON A PERCENTAGE OF CONSTRUCTION COST AND RELATED NOTES

4.2.1 Explanatory

The following schedules have been development taking into consideration the complexity as well as the relation to the engineering and architectural costs necessary for the preparation of a complete set of plans and specifications, and the performance of proper services during construction. Many projects require studies, detailing, coordination and supervision completely out of proportion to their construction and cost while others have variable degrees of repetitive features within the same project.

The existence of repetitive features, floors and areas within a given structure under a specific contract shall not be subject to deduction as long as those repetitions and other factors have been given their proper weight or consideration in determining the project classification.

The repetitive use of the same identical structure within a given project, as compared to a project of equivalent cost and category but where there

are no repetitive structures, could be recognized and the appropriate reduction made in the fees using as basis for this the table given in section 4.4 of the chapter re-use of plans. In said cases the fee for other non-repetitive structures for foundations and for site engineering work shall be computed separately in accordance with their respective classifications.

Projects of an industrial nature may require engineering services beyond basic design services. These include Process Engineering, Automation, Controls, Instrumentation and Process Piping. The fees computed from Table 4.3 do not include these services. When these services are included as part of the Engineer's agreement, Table 4.5 will be use to adjust the basic fee amount.

4.2.2 General Notes Applicable for all Categories

4.2.2.1 The fee for architectural projects or for engineering projects incorporating architectural work shall be the summation of the fees computed separately for the architectural structural engineering phase as follows:

1. Compute the fee for the "architectural-structure engineering phase "of the work according to the schedule of fees for the category under which the project is classified, adjusted as called for under 4.2.2.2 below, and excepting those items classified as special features.
2. Compute the fee for the engineering phase of the work according to the schedule of fees for the category under which the projects is classified, adjusted as called for under 4.2.2.2 below. The engineering phase shall include the cost for the electrical, data communication, mechanical, civil and sanitary engineering part of the work, excepting those items classified as special features.
3. Compute individually the fee for each of the items listed under

4.2.2.3 below and which comprise the special features phase in accordance with the category under which they are classified. The summation of these individual fees shall be the fees for the special features phase.

4. The total fee shall be the sum of the separate fees computed in paragraphs "a, b and c" above.
5. The above method of computation is applicable to both the design and services during construction phase of the project.

4.2.2.2 In many projects classified as part of the three lower categories, there may be included complex electrical, data communition, mechanics and/or structural systems that actually belong to catego-

ries higher than the project classification. In those cases the fee corresponding to these parts shall be increased proportionately in accordance with the category under which these particular systems are classified.

4.2.2.3 "Special features"

1. The special features phase shall include pumping stations; water or sewage treatment plants, central power plants for the generation of electricity, data centers, heating arid or refrigeration media, gas, transmission or sub-transmission class electric substation; elevated water tanks, central laundries, kitchens; and other similar works generally belonging to the higher categories. These works are usually built separately to serve several independent structures within the project; the complete and/or several projects.
2. In those cases where any of these special features are incorporated as part of one of the project structures but serve other structure within or outside the project, the cost of these special features shall be calculated separate from rest of the project so that proper fee determination can be made.
3. Special features will also be include independent or semi-independent structures of unusual geometrica shapes that necessitate structural design of an elaborate and/or complex nature such as, but not limited to, folded plates, thin shell, space structures, etc.

4.2.2.4 Off-site extensions shall be considered as a separate project and treated accordingly. Fee for this type of project shall be 125% of that established by its category.

4.2.2.5 When the project is of an industrial nature add the fee obtained by multiplying project cost by the corresponding factor in Table 4.5 to the total obtained as described above.

Example:

Project Estimated Cost: $1,000,000.00
Category 3: Industrial Building
Process Category: Solid Dosage

Total Design cost from existing Table 4.3 for $1,000,000.00 = 82,457
Existing Category 3 multiplier = 1.10
Factor from proposed Table 4.5 for Solid Dosage 0.037

Total Fee including Process Engineering:
P=(82,457 x 1.10) + ($1,000,000.00 x 0.037) = 127,703

4.2.2.6 The design fee is composed of the schematic phase (15% of total) preliminary phase (20% of total) and construction documents phase (65% of total). Services during construction shall be computed separately.

4.2.2.7 Sub-consultants trying to determine their fee shall look at the tables for their part of the work in the corresponding category, and after determining the fee shall give a 25% discount for the project coordination, business development and other expenses of the prime architect/engineer.

4.2.2.8 Services covered by the tables are those generally associated as common practice as described in chapter 2 of this Manual.

4.2.3 Basis for Payments

The portion of the percentage fee assigned for the preparation of Schematic, Preliminary, Final plans and Specifications (hereinafter called the project) and Services During Construction shall be based on an agreed fair opinion of probable cost. If the construction cost exceeds 5% of the agreed opinion of probable cost, the fee shall be adjusted against the final construction cost, unless otherwise agreed.

4.2.4 Cost the Project

"Construction cost" is defined as the total cost to the client for the execution of the work authorized at one time and handled in each separate phase of engineering services, excluding fees or other cost for engineering and legal services, the cost of land, rights-of-way, legal and administrative expenses, but including the direct cost to the client of all construction contracts; items of construction including labor, materials and equipment purchased or furnished directly by the client (at the market value as if purchased new) for the project.

4.2.4.1 If the professional determines the characteristics, selects, specifies and makes provisions for installation of an item of equipment, he will include it as part of the cost of the project, irrespective of the fact that the client will purchase supply and/or install said item.

4.2.4.2 In certain rare cases where labor materials and/or equipment are furnished by the client below their marked cost, or where old materials are reused, the estimated cost shall include their equivalent at fair market value.

4.2.4.3 Equipment necessary for the building operation supplied and installed by utility companies shall be included in the estimated cost in those cases where the professional has to perform design work relative to making provisions for their installation.

4.2.4.4 When the client wishes to substantially reduce the scope of the project or of its component parts after the design phase is completed, for reasons not related to the quality of the work Performed by the professional, the fee shall be computed on the basis of the original estimated cost. Adequate additional compensation shall be given for the extra work involved in making the changes, as described in 4.2.6.

4.2.5 Methods of Payment of Professional Fees

The client shall make partial payments to the professional as the work progresses, except for those items to be paid in addition to the percentage in which the professional has to sub-contract the services of another professional, in which case the client shall reimburse the total amount of the fee for sub-contractor services plus a managerial fee upon submission of the work.

Upon entering into a contract for professional services the rendering of said services shall be subdivided into different stages to provide an adequate basis for progress payments and review and acceptance by the client.

Monthly progress payments, during the final working drawing stage, equivalent to the percentage of work completed to the satisfaction of the client (submission to the client of evidence as to the amount of work completed and submitted to each of the government agencies concerned is required) to a total sum not in excess of an amount equivalent to the 90% of the fee for the definite project may be made. The remaining 10% will be due upon approval of the project by the government agencies. Progress payments during the construction services phase will be billed monthly based on an estimated total fee for the phase divided by the months allowed for construction. The estimated fee shall be adjusted to the actual value when the final construction cost estimate of the project is determined during the previous phases.

The client shall guarantee full payments of the fee for professional services when requested by furnishing a payment bond in a sum of at least 100% of the total compensation for professional services as per the agreement.

The professional shall be fully responsible to the client for compliance with all the requirements indicated in the agreement or implied by good professional practice.

A reasonable period shall be established for the full payment of each of the stages satisfactorily completed by the professional and billed to the client.

Billings to the client will accrue a 1% interest if not paid within 60 days after submittal by the professional unless a valid reason for such non-payment is received within this time frame.

4.2.6 Items to be paid in addition to percentage fee

The following items of cost cannot be determined in advance and are not within the sole control of the professional. They shall be paid in addition to the percentage fee, in the manner stated, and the professional should keep separate complete accounts of these items:

4.2.6.1 Items to be paid on the basis of payroll cost times a factor plus incurred expenses.

a) Changes and redesign requested by the client made at any time during the preparation or after the approval by the client of th basic drawing, which cause a substantial change in the size or scope of the work or require any changes in the plans, design or specifications which shall, in any case, require the preparation by the professional of any additional studies preliminary drawing or other documents, or the making of any substantial changes in any working documents already approved or upon which substantial work shall have been done pursuit to instructions to proceed therewith.
b) Extra drafting or other expenses caused by the delinquency or insolvency of the client or Contractor.
c) Record Drawings - preparation of records or as-built drawing when so requested by client.

4.2.6.2 Items to be paid on other basis.

a) Services during re-advertisement for bids for construction a charge based on payroll cost, plus overhead and profit, plus reimbursement for necessarily incurred and subsistence expenses, long distance telephone and fax charges, and payment at recommended rate for needed additional copies of plans and specifications.
b) Service of field staff employees for the project, which may include resident engineers and inspectors a charge based on payroll cost plus overhead and profit, plus reimbursement for necessarily incurred traveling and subsistence expense, long distance telephone and communication charges and supplies.
c) Separate contract- the professional fees apply to all construction work when let under a single contract, or when the customary separate contracts for the major mechanical trades are also let by the client. However, should the client determine to have major divisions of the work executed under separate contracts or when work is let on a cost-plus construction basis thereby increas-

ing the professional's burden of service, expenses and responsibility, the professional is entitled to an increase of 30% of the applicable overall fee on the cost of the respective work so segregated.

d) Special technical services and consultants when authorized by client in the fields of acoustics, Illumination, structural design, landscape and golf course architecture planners, etc... actual cost of service plus 20% managerial fee, plus incurred trav eling and subsistence expenses, fax and telephone charges.

e) Extended service during construction phase when construction time exceeds the time allowed for construction. For every month that the construction phase exceeds the time allowed for construction the professional shall be paid the same monthly payment as computed in 4.2.5 for progress payments for services during construction.

f) Furnishing reproduction of drawing, plans or specifications in excess of six (6) sets. Cost of additional copies to be negotiated.

g) Scale models, special rendering or special reproduction work to be negotiated on a fixed fee basis.

h) When not provided by the client, the professional shall be compensated as follows for obtaining the information listed in paragraph 2 below.

1. When performed by the professional or his staff, payroll cost plus overhead and profit plus incurred traveling and subsistence expenses, telephone and communication charges.

2. When performed on a sub-contractor basis actual cost of service plus managerial fee plus incurred traveling and subsistence expenses, telephone and communication charges.

i. Complete and accurate survey of the project site including grades and street lines, pavements and adjoining properties, right-of way, restrictions, easement, boundaries and topography.

ii. Full information as to sewer, water, gas electrical and telephone services, including top and invert elevations of manholes, pipe or culvert dimensions, etc.

iii. Flow gauging.

iv. Specialized sub-surface investigations and foundation explorations such as boring test pits, soil mechanics laboratory investigations, analysis and interpretation there of.

v. Special tests and research.

vi. Mill and shop inspection of materials and equipment.

vii. Sampling and analysis of water and sewage.

viii. Complete data on existing conditions including architectural, structural, electrical, data communications, mechanical and sanitary system; in building or structures or any of its com-

ponent systems, to be added to, reconstructed or remodeled.

xi) Some projects require consulting services from computers engineers (i.e. software engineering, network design and installation, telecom infrastructure, data center design, electronic security, etc.). Compensation for these tasks shall be considered as personal services on a perdiem or hourly basis (see section 4.1.5) to be agreed as part of the opinion of probable cost or adjusted construction cost.

4.2.6.3 Services during construction phase when performed at a round trip travel distance exceeding twenty (20) miles from the location of the professional's office. The fee assigned in the schedule for services during construction phase should be increased to cover the additional travel time, traveling and subsistence expenses, and long distance telephone and communication charges.

4.3 Services for programming and pre-preliminary investigations including but not limited to, environmental studies (ETS, EA) graphic or written studies and consultations with owners, government and/or loaning agencies that is necessary in a pre-preliminary way to determine the location, nature and scope of the project, site approval, feasibility and other data that will furnish a basis for the development of the preliminary drawings. The fee for above service shall be based on a negotiated amount.

4.3.1 Litigation

Nothing written in the contract shall obligate the professional to prepare for, or appear in litigation in behalf of the client, except if otherwise agreed and in consideration of additional compensation.

4.3.2 CATEGORIES

CATEGORY 1

These are projects of minimum complexity or of a simple utilitarian character involving large duplication of parts or many repetitive elements and where the amount of detailing coordination is a minimum.

Engineering	Architecture
1.Railway on level ground required few structures 2.Small aqueducts 3.Retaining walls 3.Retaining walls (Up to 10'-0" high) 4.Industrial building, typical 5.Warehouses, (simple structural system) 6.Mass concrete retaining walls 7.Air conditioning design performed independent from architectural projects and consisting of self Contained units or split system made of an air-cooled condensed air handling unit having simple ductwork 8.Small diameter reinforced concrete (R/C) pipe culverts 9.Electrical, data communications, me chanical, civil and sanitary engineering services performed in connection to architectural project classified under this schedule. (See notes 4.2.2.2 & 4.2.2.3)	1.Utility structure 2.Garages 3.Lift buildings 4.Warehouses (simple structural system 5.Housing: limited divided 6.Developments, speculative 7.Industrial building, typical independent from architectural projects 8.New public housing (government sponsored)

CATEGORY 2

These are projects of average complexity or of conventional character, requiring usual care in their design and details, which may include repetitive use of elements and where a normal amount of coordination is necessary.

Engineering

1.Railways
2.Industrial building, standard
3.Complex warehouses
4.Short span bridges (span not exceeding (20'-0") (Simply supported)
5.Prestessed concrete of simple design
6.Small airports
7.Water distribution systems
8.Storm or sanitary sewer systems
9.Retaining walls (exceeding 10'-10" height)
10. Primary and secondary power lines
11. Distribution electrical substations (15KV and below)
12. Installation of domestic sewage
13. Street & highway lighting
14. Floodlighting installation and area lighting systems
15. Air conditioning design performed independent from an architectural project consisting of:
  a. Chilled water plants feeding a number of air handing units
  b. Field erect refrigeration plants with several direct expansion air handling units
16. Drainage structures
  a. R/C one cell box culvert
  b. Structural plate-pipe culvert
  c. Structural plate arch culverts
  d. R/C pipe culverts
17. Structural engineering designs for architectural projects from one to five stories high (See notes 4.2.2.2 and 4.2.2.3) Electrical, data communications, mechanical and sanitary engineering
18. Services performed in connectiono an architectural project classified under this category (see notes 4.2.2.2 and 4.2.2.3)
19. Residential developments of public projects(Site improvements)
20. Engineering generators simple, with or withoutautomatic transfer switch
21. Lightning protection
22. Computer Data Centers

Architectural

1.Small airport
2.Armories
3.Stations, bus and rail
4.Expositions
5.Community buildings
6. Industrial buildings
7. Sanitariums
8. Asylums
9. Penal structure
10. Welfare buildings
11. Department stores
12. Retail shops
13. Stadiums
14. Apartments hotels
15. Hotels (below 100 rooms)
16. Motels
17. Resort structures
18. Apartments hotels
19.Housing, private
20. Schools, public & private
21. Office building
22. Administration building

23. Shopping centers
24. Markets
25. Residential condominiums
26. Office condominium
27. Modernization, rehabilitation of public housing projects (local, state or federal sponsored)
28. Bowling alleys
29. Gas stations

CATEGORY 3

These are project of above complexity or individual character that require above average study in their design and details and which may include some repetitive elements and/or where a large amount of coordination is necessary.

Engineering

1. Underground industrial installation
2. Siphons
3. Pneumatic foundations & cofferdams
4. Simple sewage treatment plants
5. Power plant structures
6. Transmission lines (38 KV and above)
7. Transmission centers switchyards (38 KV and above)
8. Electrical substations (38 KV and above)
9. Simple dams or hydraulic structures
10. Pumping stations
11. Water treatment plants
12. Medium sized airports with extensive
13. Research & data centers facilities
14. Floodgates & port structures
15. Canalization of rivers
16. Intercepting and relief sewers
17. Industrial building, special
18. Special building foundations
19. Air conditioning design performed independent of architectural work and consisting of:
    a. Systems incorporating primary air treatment combined with chilled water air handling units.
    b. High velocity, high pressure single duct system
20. Medium-span bridges (20'-0"to 44'-0)
    a. R/C continues bridges (3 span con stant moment
    b. High velocity, high pressure single duct system
20. Medium-span bridges (20'-0"to 44'-0)
    a. R/C continues bridges (3 span con stant moment of inertia)
    b. Rigid frames (one span)
    c. Simple-span composite
    d. Continuous I-bean (3-span)
    e. Single-span composite
    f. R/C multiple box culvert
    g. R/C bridges
21. Circular concrete tanks (not covered)
22. Underground rectangular concrete tanks
23. Structural engineering design for architectural projects from six to twelve stories (see notes 2 & 3)
24. Electric, data communications, me chanical, civil and sanitary engineer ing services performed in connection with an architectural project classified under this category (see notes 2 & 3)
25. Drainage systems
26. Modernization or rehabilitation of Public Housing Projects

Architectural

1. Band shells
2. Gateways
3. Park & recreation structures
4. Playgrounds
5. Swimming pools
6. College & university buildings
7. Dormitories
8. Libraries
9. Hospitals
10. Clinics
11. Medical & health centers
12. Laboratories
13. Research & data centers
14. Convention halls

15. Communications structures
16. Hotels (100 rooms and above
17. Professional condominium with special facilities
18. Indoors sports
19. Industrial buildings, special
20.Coliseum, sport, and other uses
21. Movie theaters
22. Firehouses
23. Gyms

CATEGORY 4

These are projects of a complex nature that require extensive study in development and skill in design, which may include a few repetitive elements and/or where an unusual amount of coordination is required.

Engineering

1. Complex pumping stations
2. Incinerators
3. Large airports with extensive facilities
4. Intercepting and relief sewers in large cities
5. Air-pressure or short free-air tunnels
6. Long complicated bridges (span 45'-0" and over)
   a. R/C continuous bridges
   b. Rigid frames
   c. Arch bridges
   e. R/C continuous hollow girder bridges
   f. R/C Concrete bridges
   g. Plate-girder bridges
   h. Cantilever bridges
   i. Steel continuous bridges (beam or built up girder with or without compos ite action)
7. Air conditioning design work performed independently of architectural project and consisting of:
   a. Industrial applications including design of air washer and close tempera ture and humidity control
   b. Steam turbine drive centrifugal refrig eration systems
   c. Combinations involving absorption plants and/or turbine drive equipment
8. R/C silos, bins and bunkers
9. R/C chimneys
10. Covered circular tanks
11. Elevated tanks
12. Prestressed concrete structures
13. Electrical, radio & television structures
   a. Transmission line towers
   b. Radio & T.V. towers
   c. Radio & T.V. masts
   d. Turbine foundations
14. Structural engineering design for architectural projects over twelve stories, or incorporating folded plates, thin shells, space structures and other; verycomplex structural shapes (see note 3).
15. Electrical, data communications, mechanical civil and sanitary engineering services performed in conjunction with an architecturalproject classified under this category (see note 3).

Architectural

1. Large airports with extensive facilities
2. Banks
3. Exchanges
4. Theaters
5. City & town halls
6. Police stations
7. Religions building
8. Court houses
9. Art galleries
10. Restaurants and cocktail lounges
11. Country clubs
12. Farm buildings

CATEGORY 5

These are project of a very complex nature or of an exceptional character and/or unusual artistic importance that requires prolonged study in development and the greatest skill in design and which may include a minimum of repetitive elements, and/or requires an extreme degree of coordination.

Engineering

1. Power plants
2. Complex sewage and industrial waste treatment plants
3. Complicated waterfront and marine terminal improvements, including piers.
4. Arched and other complicated dams.
5. Additions to rehabilitation, or reconstruction of projects including electrical, data communication, mechanical and sanitary systems.
6. Co-generation projects.
7. Paralleling switchgear and generations
8. Electrical and mechanical design of gas
9. Landmark projects requiring extensive insulating substations
10. Solid Waste Treatment Plans

Architectural

1. Clubs-civil and fraternal
2. Funeral structures
3. State capitols
4.Museums
5. Memorials
6. Residences customs
7. Remodeling and additions to existing structures including electrical, mechanical and sanitary systems
8. Historical restoration interior and displays fixtures and furniture
9. Landmark projects requiring extensive specialized consultants

Category 2
Percentage Fee Tabulation

Category 1 - Multiply Value for Category 2 by 0.80
Category 3 - Multiply Value for Category 2 by 1.10
Category 4 - Multiply Value for Category 2 by 1.20
Category 5 - Multiply Value for Category 2 by 1.30

Projecto Cost in Dollars		Schematic		Preliminary		Working Drawings		Total Design Fee		Services During Construction	
		I. Factor	Fee	I. Factor	Fee	I. Factor	Fee	I. Factor	Fee	I. Factor	Fee
Less $100,000		0.0183		0.0243		0.0791		0.1217		0.0397	
Up to	$100,000		$1,826		$2,435		$7,913		$12,174		$3,970
	$110,000		$1,978		$2,637		$8,570		$13,184		$4,270
The following	$10,000	0.0155		0.0207		0.0673		0.1036		0.0322	
	$120,000		$2,133		$2,844		$9,243		$14,220		$4,592
The following	$10,000	0.0153		0.0204		0.0662		0.1019		0.0322	
	$130,000		$2,286		$3,048		$9,905		$15,239		$4,915
The following	$10,000	0.0153		0.0204		0.0662		0.1018		0.0322	
	$140,000		$2,439		$3,251		$10,567		$16,257		$5,237
The following	$10,000	0.0147		0.0197		0.0639		0.0983		0.0303	
	$150,000		$2,586		$3,448		$11,206		$17,240		$5,540
The following	$10,000	0.0147		0.0197		0.0639		0.0983		0.0286	
	$160,000		$2,734		$3,645		$11,845		$18,224		$5,826
The following	$10,000	0.0147		0.0197		0.0639		0.0983		0.0286	
	$170,000		$2,881		$3,841		$12,484		$19,207		$6,112
The following	$10,000	0.0145		0.0193		0.0627		0.0965		0.0286	
	$180,000		$3,026		$4,034		$13,112		$20,172		$6,398
The following	$10,000	0.0142		0.0189		0.0615		0.0946		0.0286	
	$190,000		$3,168		$4,224		$13,727		$21,118		$6,684
The following	$10,000	0.0142		0.0189		0.0613		0.0944		0.0269	
	$200,000		$3,309		$4,412		$14,340		$22,062		$6,953
The following	$25,000	0.0142		0.0189		0.0616		0.0947		0.0247	
	$225,000		$3,664		$4,886		$15,879		$24,429		$7,569
The following	$25,000	0.0142		0.0189		0.0615		0.0946		0.0247	
	$250,000		$4,019		$5,359		$17,416		$26,794		$8,186
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0221	
	$275,000		$4,368		$5,823		$18,926		$29,117		$8,738
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0206	
	$300,000		$4,716		$6,288		$20,436		$31,440		$9,253
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0194	
	$325,000		$5,064		$6,752		$21,946		$33,762		$9,737
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0179	
	$350,000		$5,413		$7,217		$23,455		$36,085		$10,185
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0161	
	$375,000		$5,761		$7,682		$24,965		$38,408		$9,461
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0161	
	$400,000		$6,110		$8,146		$26,475		$40,730		$10,990
The following	$25,000	0.0139		0.0186		0.0604		0.0929		0.0161	
	$425,000		$6,458		$8,611		$27,985		$43,053		$11,392
The following	$25,000	0.0137		0.0182		0.0592		0.0911		0.0143	
	$450,000		$6,800		$9,066		$29,465		$45,331		$11,750
The following	$25,000	0.0137		0.0182		0.0592		0.0911		0.0143	
	$475,000		$7,141		$9,522		$30,946		$47,609		$12,107
The following	$25,000	0.0137		0.0182		0.0592		0.0911		0.0143	
	$500,000		$7,483		$9,977		$32,426		$49,886		$12,465
The following	$50,000	0.0135		0.0180		0.0586		0.0902		0.0134	
	$550,000		$8,159		$10,879		$35,358		$54,396		$13,136
The following	$50,000	0.0134		0.0179		0.0580		0.0893		0.0143	
	$600,000		$8,829		$11,772		$38,260		$58,862		$13,851
The following	$50,000	0.0134		0.0179		0.0580		0.0893		0.0143	
	$650,000		$9,499		$12,665		$41,163		$63,327		$14,566
The following	$50,000	0.0129		0.0171		0.0557		0.0857		0.0170	
	$700,000		$10,142		$13,522		$43,948		$67,612		$15,416
The following	$50,000	0.0129		0.0171		0.0557		0.0857		0.0170	
	$750,000		$10,785		$14,379		$46,733		$71,897		$16,266
The following	$50,000	0.0126		0.0168		0.0545		0.0839		0.0179	
	$800,000		$11,414		$15,218		$49,460		$76,092		$17,162
The following	$50,000	0.0126		0.0168		0.0546		0.0840		0.0161	
	$850,000		$12,044		$16,059		$52,190		$80,293		$17,967
The following	$50,000	0.0123		0.0164		0.0534		0.0822		0.0179	
	$900,000		$12,660		$16,881		$54,862		$84,403		$18,862
The following	$50,000	0.0123		0.0164		0.0534		0.0822		0.0179	
	$950,000		$13,277		$17,703		$57,534		$88,514		$19,757
The following	$50,000	0.0130		0.0174		0.0565		0.0869		0.0196	
	$1,000,000		$13,929		$18,572		$60,359		$92,861		$20,737
The following	$100,000	0.0129		0.0172		0.0559		0.0860		0.0214	
	$1,100,000		$15,220		$20,293		$65,952		$101,464		$22,877
The following	$100,000	0.0128		0.0170		0.0553		0.0851		0.0214	
	$1,200,000		$16,497		$21,996		$71,486		$109,978		$25,017
The following	$100,000	0.0126		0.0168		0.0548		0.0842		0.0196	
	$1,300,000		$17,760		$23,680		$76,961		$118,402		$26,976
The following	$100,000	0.0125		0.0167		0.0543		0.0836		0.0179	
	$1,400,000		$19,014		$25,352		$82,393		$126,758		$28,767
The following	$100,000	0.0124		0.0166		0.0538		0.0828		0.0179	
	$1,500,000		$20,255		$27,007		$87,773		$135,035		$30,557
The following	$100,000	0.0123		0.0164		0.0534		0.0821		0.0179	
	$1,600,000		$21,487		$28,649		$93,109		$143,245		$32,348
The following	$100,000	0.0122		0.0163		0.0529		0.0814		0.0179	
	$1,700,000		$22,708		$30,277		$98,402		$151,387		$34,138
The following	$100,000	0.0121		0.0162		0.0526		0.0809		0.0161	
	$1,800,000		$23,921		$31,895		$103,657		$159,473		$35,749
The following	$100,000	0.0121		0.0161		0.0523		0.0804		0.0161	
	$1,900,000		$25,127		$33,503		$108,884		$167,514		$37,359

Continuation of diagram on pg. 65

4.3 FEES FROM TABLES - 2004

Category 2
Percentage Fee Tabulation

Category 1 - Multiply Value for Category 2 by 0.80
Category 3 - Multiply Value for Category 2 by 1.10
Category 4 - Multiply Value for Category 2 by 1.20
Category 5 - Multiply Value for Category 2 by 1.30

Projecto Cost in Dollars			Schematic		Preliminary		Working Drawings		Total Design Fee		Services During Construction	
			I. Factor	Fee	I. Factor	Fee	I. Factor	Fee	I. Factor	Fee	I. Factor	Fee
The following	$100,000		0.0120		0.0160		0.0520		0.0801		0.0161	
		$2,000,000		$26,328		$35,104		$114,089		$175,521		$38,970
The following	$1,000,000		0.0120		0.0160		0.0519		0.0798		0.0125	
		$3,000,000		$38,305		$51,073		$165,988		$255,366		$51,470
The following	$1,000,000		0.0117		0.0155		0.0505		0.0777		0.0152	
		$4,000,000		$49,961		$66,614		$216,496		$333,071		$66,673
The following	$1,000,000		0.0114		0.0152		0.0495		0.0761		0.0150	
		$5,000,000		$61,380		$81,840		$265,980		$409,200		$81,651
The following	$1,000,000		0.0114		0.0152		0.0493		0.0759		0.0152	
		$6,000,000		$72,765		$97,021		$315,317		$485,103		$96,854
The following	$1,000,000		0.0114		0.0152		0.0493		0.0759		0.0134	
		$7,000,000		$84,151		$112,201		$364,654		$561,006		$110,256
The following	$1,000,000		0.0114		0.0151		0.0492		0.0757		0.0118	
		$8,000,000		$95,503		$127,337		$413,845		$636,684		$122,081
The following	$1,000,000		0.0114		0.0151		0.0492		0.0757		0.0100	
		$9,000,000		$106,854		$142,472		$463,036		$712,362		$132,103
The following	$1,000,000		0.0114		0.0151		0.0492		0.0757		0.0082	
		$10,000,000		$118,206		$157,608		$512,226		$788,041		$140,324
The following	$10,000,000		0.0113		0.0150		0.0488		0.0751		0.0132	
		$20,000,000		$230,879		$307,838		$1,000,474		$1,539,191		$272,085
The following	$10,000,000		0.0108		0.0144		0.0468		0.0721		0.0127	
		$30,000,000		$338,990		$451,987		$1,468,958		$2,259,935		$399,342
The following	$10,000,000		0.0104		0.0138		0.0449		0.0690		0.0122	
		$40,000,000		$442,541		$590,054		$1,917,677		$2,950,272		$520,967
Above	$40,000,000		0.0110		0.0147		0.0479		0.0737		0.0130	

4.4 RE-USE OF PLANS

Professional's plans represent the product of training, experience and professional skill, and belong to and remain the property of the producer unless specifically agreed as one of the contract requirements. The plans sketches and designs prepared by the professional must be protected against piracy.

While direct copying of engineering design is infrequent, in submitting novel designs or plans solving difficult problems in construction, the professional may protect them either by copyright or by requiring the recognition of ownership through a proper provision in the contract for services, or by both.

When a client proposes to re-use the drawing for a particular structure under one contract in the same or in other projects, the client shall pay the professional an additional fee as a ratio of the fee of the original structure.

Total of identical stucture	1	2	3	4	5	6	7	8	9	10
Total fee as multiple of first	1.00	1.50	2	2.4	2.8	3.2	3.6	4.0	4.4	5.0
Total of identical stuctures	15	20	30	40	50	60	70	80-90	100	200
Total fee as multiple of first	6.5	8.5	12	15	18	20.5	23	25-27	28.5	33.5

Note:

1. Interpolate for intermediate values.
2. After the first 200 repetitions increase the multiple by 5.0 points for every 100 repetitions there after.

4.5 FACTORS FOR INDUSTRIAL PROJECTS REQUIRING PROCESS DESIGN

Note: These factors were obtained from empirical data provided by local process designers and other published factors.

	≤S2MM	$MM to $4MM	≥ $4 MM
Project Type			
API Plans	**0.07**	**0.042**	**0.03**
Solid Dosage	**0.05**	**0.025**	**0.025**
Parenterals	**0.06**	**0.028**	**0.028**
Biotechnology	**0.09**	**0.06**	**0.035**
Electronic	**0.06**	**0.03**	**0.03**
Petrochemical	**0.07**	**0.042**	**0.03**

Notes: 1. These factors are for new facilities only, where all Process Engineering, Automation and Process Piping is to be included.

2- Retrofit Projects- Multiply the values in Table 4.5 by a factor of 1.5.(API plants equation-

Y= 9.617 * 10-6* X 4 -0.00032 * X3 + 0.00379 * X 2- 0.02011 * X + 0.06988

Y- factor

X- Plant Cost in millions of $

Solid Dosage-

Y= 9.501 * 10-6 * X 4 -0.000304 * X3 +

0.003352 * X2 – 0.015 * X+ 0.049

Parenterals-

Y= 9.501 * 10 – 6 * X 4 – 0.000304 * X 3 + 0.003352 * X2 – 0.015 * X + 0.049

Biotechnology

Y= 2.738 * 10- 6 * X 4 – 0.0001395 8* X 3 + 0.002516 * X2 – 0.019 * X+ 0.09

Electronic

Y= 9.501 * 10-6 * X 4 -0.000304 * X3 + 0.003352 * X 2 – 0.015 * X + 0.049

Petrochemical

Y= 9.617 * 10-6 * X 4 – 0.00032 8* X 3 + 0.00379 * X 2 – 0.02011 * X+ 0.06988

CHAPTER 5
CONTRACTS FOR PROFESSIONAL SERVICES

The relationship of a professional with his client should be clearly defined by written documents before commencement of actual work. Whether this is expressed by an exchange of letters, such as a proposal by the professional and an acceptance thereof by the client or by a more formal legal agreement, is immaterial a long as all the conditions of the project are understood and all the terms are set forth clearly. The document should name the parties to the contract and, in general should define the extent and character of the services to be performed by the professional and the obligations to be assumed by the client as well as the conditions relating to any time limitations which may be involved. There should then follow the terms and payments for the services and partial payments to be made at various stages; such as: The planning report, preliminary design, final design, preparation of plans and specifications, award of contract, services during construction and completion of construction.

If the right to termination of services by either party prior to the completion of the undertaking is contemplated, this should be clearly stated with the conditions under which it may be exercised specified. Otherwise the continuation of services to such completion applies.

PROVISION FOR MODIFICATION-Frequently projects are modified after the originals study to such an extent that the amount and duration of the professional services are greatly extended involving increased expenses to the professional. If the fee is based on a percentage of construction, the increased cost due to enlarged scope is automatically paid. However the professional may not obtain adequate remuneration on account of this extension of time of the work, in the case of a fixed lump sum fee for services, the professional is penalized with respect both to addition to the work and its longer duration, unless a specific provision is made in his contract, such as monthly or per diem charges for time in excess of the agreed total.

CHECK LIST OF CONTRACT PROVISIONS

The following items represent the essential provisions to be considered in preparing any agreement for services, whether executed in precise legal form or by exchange letters. They may be helpful as a checklist in determining the adequacy of a contract:

1. Date of execution of the agreement is given.

2. Names and descriptions of the two parties of the agreement with their addresses and, in the case of a corporate body the legal description of the corporation. If the client is a commission or public body, the authority under which it acts.
3. Statement of knowledge of the existing condition of the project site.
4. Definition of nature, extent, character of the projects and the location thereof, in addition to time limitations.
5. The obligations assumed by the client and provision of various basic data, by him or by other professional that may include the following:
   A. Existing maps, drawing, reports, traffic studies, as built drawing, and other information on the project.
   B. Surveys, aerial photographs, etc.
   C. Existing data, on structures in the vicinity, subsurface investigations, borings and sounding.
   D. Land plots or rights of way.
   E. Negotiations for and purchasing of necessary lands.
   F. Standard tracing sheets, proposal forms, standard specifications, etc.
   G. All necessary legal services.
   H. Subsurface explorations with analysis and interpretations thereof.
   I. Mill and shop inspection, and testing of materials and equipment.
   J. Lotting construction contracts; and
   K. Inspection of construction
   L. Providing traffic studies
   M. Hydrological and hydraulic studies.
6. The service to be rendered by the professional that may include the following:
   A. Surveys, reconnaissance or investigations.
   B. Feasibility studies and reports, owning and operating cost studies and reports, preliminary and final investigations and reports.
   C. Design: schematic drawings, preliminary drawings, and cost estimate, final drawings and specifications.
   D. Services during construction: Assisting in the letting of contracts; checking shop drawing; rendering consultation during construction; advising client on laboratory, shop, and mill test of material and equipment for compliance with specifications; assisting in tune-up and test of equipment; preparing records drawings and making final inspection and report.
   E. Operation: assisting in the operation of the completed structures, plans and building, and providing system operating and maintenance manuals; and

   F. Transfer of services: performing any or all services outlined in item

5, above, on the determination that the professional, and not the client, shall provide for such service.

7. The number of copies of documents to be furnished to the client related to the above mentioned services should be stipulated.
8. As to the re-use of the plans, design drawings are instruments of service and remain the property of the professional unless specifically agreed to the contrary.
9. That provision is made for termination on the professional service before final completion of his work, and for proper compensation for such termination to be paid by the client.
10. Fees to be paid for services rendered by the professional including time and the method for the payment of invoices, partial payments (both for professional services and for expenses), and the final payment. If certain cost and expenses are involved, such as the professional's overhead these should be clearly defined. Fees may be based on percentage of estimated or actual constructions cost; fixed lump sum, cost plus a fixed amount, per diem rates, hourly rates, technical salary cost plus a percentage of such cost plus expenses at cost; retainer fee, or other methods. It is desirable to explain in detail the method of compensation, including a sample computation of the professional's fee.
11. Additional compensation to be awarded for redesign after receiving approval of the previous design stage, for changes in scope of projects and for delays causing expenses to the professional.
12. That a statement is given as to when the professional services are to be commenced and concluded.
13. Concluding statement, familiarity with the proposed project and its site, personnel to be used in the project and availability are included.
14. Special provisions for overtime work requested by the client.

We strongly suggest discussing the following general terms and conditions with the Client in order to include them as part of the contract.

General Terms & Conditions

1. Access: Client grants or shall obtain for the Professional and his/her Consultants authority to enter the property upon which the professional's services are to the performed.
2. Client Information: Client understands that the Professional is relying upon the completeness and accuracy of information supplied

to him by the client and others in connection with the Services with out independent verification. Client agrees to immediately warn the professional of any inaccuracy in the information furnished and/or supplied and also of the existence of any conditions affecting the site.

3. Standard of Services: The professional agrees to perform the services in accordance with generally accepted practices in Puerto Rico at the time the services are rendered.

4. Confidentiality: "Confidential Information" means all technical, economic, financial, pricing marketing or other information that has not been published and/or is not otherwise available to members of the public and includes, without limitation, trades secrets, proprietary information, customer lists, scientific, technical and business studies, analysis, processes methods procedures, policies and information. In the event that either party discloses confidential information to the other party in connection with this contract (excluding the professional's work product that is delivered to client or others hereunder), the party receiving such confidential information agrees to hold as confidential and do not disclose to others the confidential information for a period of ten (10) years from the date of disclosure. These restrictions shall not apply to information that (1) the parties had in their possession prior to disclosure, (it) becomes public knowledge through no fault of the receiving party; (in) the receiving lawfully requires from a third party not under an obligation of confidentiality to the disclosing party; is independently developed by the receiving party; or (v) is required to be disclosed by law or order. Client agrees that the professional may use and publish client's name and a general description of the services provided to the client in describing the professional's experience and qualification to other potential clients.

5. Work product: "Work product" consist of all reports, notes laboratory test data and other information prepared by the Professional for delivery to Client. Client shall have the right to make and retain copies and shall use all Work Product; provided, however, that such use shall be limited to the particular site and project for which the Work Product is provided, clients may release the Work Product to third parties at its sole risk and discretion provided, however, that the Professional shall not be liable for any claims or damages resulting from or connected with such release or any third party's use of the Work Product, and Client shall indemnify defend and hold the Professional harmless from any and all such claims of damages.

6. Insurances: The Professional shall maintain Worker's Compensation, -Employer's Liability and Automobile Liability insurance including owned and hired vehicles in accordance with the requirements of the Commonwealth of Puerto Rico.
7. Indemnity by the Professional: The Professional shall indemnify defend and hold harmless client, its officers directors, agents employee and affiliated and parent companies against claims, demands and causes of action of third parties (including attorney's fees and cost of defense) for personal injury, disease or death and damage's of property arising during the performance of service to the extent caused by negligence or willful misconduct. The professional's aggregate liability under the above indemnity shall not exceed the recoveries under the type and limits of insurance set forth in this General Terms and Conditions, the Client agrees to release, defend and indemnify the Professional from and against all further liability under the above indemnity arising from such service.
8. Indemnity by Client. Clients indemnify, defend and hold harmless the Professional, its officers directors, agents and employees from all claims, demands and causes of action, including Attorney's fees and cost of defense, for personal injury, disease or death, and loss or damages that have been caused by the negligence or willful misconduct of the Client.
9. Remedies. Either party shall be liable to the other for any series or claims for incidental indirect, special, collateral, consequential, and
exemplary or punitive damages arising out of or related to the services, including without limitation loss of profits, loss of opportunity, loss of production, loss of use. Any protection or limitation against liability for any losses or damages afforded any individual or entry by these general conditions and terms shall apply whether the section in which recovery of damages is sought is based upon contract, cost (including to the greatest extent permitted by law, the sole, concurrent or negligence, whether active or passive and other liability of any protected individual or entity), statue or otherwise.
10. Subsurface Operations. Client shall provide the Professional with the identity, and location of all subsurface facilities and obstruction on the site. Client agrees to waive any claims against the Professional and to indemnify, defend and hold the Professional harmless from any claims, demands of causes of action for damages to subsurface facilities or obstructions that are not accurately located by the client or others.
11. Independent Contractor: The professional's Services are performed as an independent contractor. The Professional at its sole

discretion may hire subcontractors in the performance of its services.

12. Force Majeure: The professional shall not be liable for any failure perform the services when such failure is caused by circumstances beyond his responsible control, including, but not limited to strikes, riots, wars, flood, fires, explosion, labor disturbances, delay in transportation or inability to obtain material or equipment.

13. Limitations of Liability: Except as provide in this General Terms and Conditions and to the greatest extent allowed by law, client agrees that the Professional's aggregate liability to client and other for any and all injuries, claims., demands of whatever kind or character arising out of or in any way related to this agreement, shall be limited to the total amount of compensation received by the Professional hereunder. In the event that claims involving this agreement the services on the site are sought to be resolve through litigations, the prevailing party shall be entitled to collect from the other party all litigation cost and expenses, including attorney's fees and expert fees, incurred in successfully prosecuting or defending such action. All claims against the Professional arising under or in connection with this agreement, the services or the site (excluding the client's payment obligations hereunder) must be filed in a Puerto Rico Court within the applicable statue of limitation.

14. Entire Agreement. The terms of this agreement shall be deemed accepted by client at the earlier of (1) The professional's initiation of services at the verbal or written direction of client or (2) client's
written agreement to be bound by these terms. This agreement constitutes the entire understanding between the parties. Any waiver modifications or amendment of this contract shall be effective only if in writing and signed by an authorized representative of the Professional. The Professional hereby objects to any terms contained in any prior or subsequent purchase order, work orders, invoice, acknowledgement forms, manifest, request for proposals or other documents received from the clients that would otherwise have the effect or modifying or abrogating these general conditions and commercial terms in whole or in part. If any portion of this contract is held invalid or unenforceable, any remaining portion shall continue in full force and effect. Nothing herein shall be construed to give

any rights or benefits hereunder to anyone other than Client or the Professional. There shall be no assignment of the rights of obligations contained in this contract by either party or any such assignment shall be full and void. Either party may terminate this agreement by giving the other party seven (7) days written notice. Termination of this service for any reason shall not affect or mini-

mize the respective rights, obligations and limitations or liability contained herein. The construction, interpretation and performance of this agreement and all transaction relating thereto shall transactions relating thereto shall be governed by the laws of the Commonwealth of Puerto Rico.

CHARTER 6

RECOMMENDED PRACTICE FOR CONTRACTING ENGINEERING SERVICES FOR THE DESIGN OF HIGHWAY WORK

6.1 INTRODUCTION

The purpose of this recommended practice is to provide guidance for the contract of professional services related to studies and the design of highways. It shall not be construed as a mandatory practice or schedule of fees.

The Phases of the Work section provides a proposed subdivision of the services into phases, and a description of the services to be provided at each phase.

The Engineer's Compensation section provides several methods to establish the compensation to be paid by the client for the services rendered by the Engineer.

The method to be selected depends to a great extent on factors such as; accuracy in establishing detailed definition of the scope of services; complexity of the work; time available for negotiating the contract for the services; extent of services; preference of the client and the engineer; etc.

The material contained in this Recommended Practice is the compilation of the experience gathered in numerous projects, and provides to both parties, the Client and the Engineer, a convenient base on which to establish the compensation to be paid for these services for a project of average complexity. Each particular project has its
inherent characteristics that may warrant deviations from this Recomended Practice. Therefore negotiations shall be held between the Client and the Professional to evaluate the project characteristics and the scope of services and to arrive to a mutually satisfactory fair
compensation.

6.2 PHASES OF THE WORK

6.2.1 Route location and reconnaissance studies

6.2.1.1 Compile existing information relative to the project including but no limited to:

A. Aerial photographs of the area
B. Topographic maps of the area
C. Geological maps
D. Information regarding major utility lines, existing and/or proposed.
E. Data on existing land use.
F. Historic or other cultural features which should be preserved.
G. Location of schools, parks, churches, graveyards and hospitals.
H. Proposed projects within the area to be studied.

6.2.1.2 With the proper information conduct location studies for a number of alternate routes between the point limits of the study. The CONSULTANT in coordination with the CLIENT and upon request by the CLIENT will conduct public information meetings.

A. Identification and selection of alternatives to be studied should be done with the CLIENT designated representative.
B. Prepare plan and profile studies of possible alternate routes for the project considering for each alternate route:
    i. The established geometric standards.
    ii. Cross-sections.
    iii. Approximate earthwork movement.
C. Determine opinions of probable cost for each alternate.
D. Determine benefit cost ratios for each alternate.
E. Compare the alternate routes on the basis of:
    i. Environmental impacts
    ii. The evaluation of traffic service provided.
    iii. Future highways and roadways affected.
    iv. Disturbance of property and utilities lines.
    v. Conformity of plans with future land use.
    vi. Benefits-cost ratios.

6.2.1.3 The approval by the client of the finding of no significant impact (FONSI) or final environmental impact statement (EIS) will constitute the approval of the route location.

A. The required environmental documents shall be furnished by the CLIENT unless, by written instructions from the CLIENT: The CONSULTANT is requested to obtain proposals from qualified firms for the performance of this work in accordance with the applicable provisions hereunder included in this ITEM. If the

client determines that the consultant qualifies to do the work, he shall be permitted to submit a separate proposal.

B. The tasks to be undertaken by the consultant in fulfilling the objectives of the environmental process are described bellow. All environmental reports (EA, FONSI, DEIS, FEIS) shall be prepared in compliance with one 1) National Environmental Policy Act (NEPA) of 1969 as amended, 42 USCA selection 102, 2) the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of the National Environmental Policy Act, 40 CFR 1500, 3) the FHWA's Federal Highway Program Manual, volume 7, chapter 7, as applicable, 4) the 4-F section of the U.S. Department of Transportation Act of 1966, 49 USCA section 303, as applicable, 5) The FHWA's environmental guidebook, as applicable. 6) The Puerto Rico Environmental Policy Act (act number 9 of June 18, 1970) and 6) the regulations of the Environmental Quality Board (EQB) of Puerto Rico for the preparation of EIS's.

Phase 1. Preliminary environmental assessment

Task 1.a Data Gathering

For this initial stage, data from the client, other agencies and field reconnaissance is collected, including available reports, U.S. geological survey topographic maps, flood maps, U.S. soil conservation service important farm land maps, existing and future traffic volumes and information on utility lines, endangered species, sole source aquifers, natural caves and sinkholes, wetlands, other projects proposed in the project area, and sites of historic, archeological or architectural value.

Task 1.b Technical studies

Data obtained by the CONSULTANT under task 1.a as well as any other data gathered or supplied by the CLIENT will be used by the CONSULTANT in conducting pertinent technical studies on different matters to be included in the environments documents such as traffic analysis, air quality, noise, energy, economy (cost-benefits analysis of alternatives using as a base index the no build alternative), wetlands (wetland assessment), floodplains (preliminary hydrological-hydraulic studies) ecology (flora-fauna inventory and biological assessment) historic and archaeological resources (historic and archaeological assessment) geology and soils (preliminary geotechnical studies), and prime and unique farmlands (land evaluation ands site assessment LESA).

Task 1.c Preparation of a preliminary environmental assessment (EA) Based on the information gathered and the results of technical studies conducted, the CONSULTANT will prepare and submit an environmental assessment. Emphasis will be given to the evaluation of the alternatives to

the proposed action selected for an in depth study.

A discussion on other alternatives and why they were not selected shall be included. Such an action will not only serve to place the proposed action in it's environmental perspective but will also insure a public demonstration of the CLIENT overview of developments and awareness of alternative actions.

Task 1.d Delivery of copies of the preliminary (EA)

The preliminary EA shall be written in the Spanish language unless federal funds will be used for the construction of the project, when it shall be written in the English language. Whenever the CONSULTANT submits the preliminary EA to the CLIENT for review, seven (7) copies in the original language will be submitted.

Task 1.e Meeting and Hearings.

The CONSULTANT shall attend all meetings and hearings (scoping meetings, informative hearing public hearings) that are held during this phase concerning the project, its alternatives and the environmental issues. In those meetings and hearings the consultants shall present the necessary exhibits and documents to make a presentation of the proposed project, its alternatives and environmental concerns to the public and officials of federal and commonwealth agencies and concerned municipalities.

Phase 2 Finding of No Significant Impact

The task under this phase will not be undertaken if an environmental impact statement is required.

Task 2.a Preparation of the final EA

If the CLIENT decides that the impact of the project is not significant the CONSULTANT shall prepare a final EA, implementing comments to the preliminary EA, which is submitted to the authorities for approval.

Task 2.b preparation for Finding Of No Significant Impact (FONSI)

After the EA circulation and public hearing process, the CONSULTANT shall be preparing a FONSI. All the comments received from agencies and the public shall be implemented in the FONSI, which is submitted to the CLIENT for approval.

Task 2.c Delivery of copies of the final EA and FONSI

The final EA and FONSI shall be written in the Spanish language unless federal funds will be used for the construction of the project, when they shall be written in the English language and translated into Spanish. After approval of the EA, the CONSULTANT shall deliver twenty (20)

copies to the CLIENT. If the EAand FONSI were written in the English language, half of those copies shall be submitted in the Spanish language.

Whenever the CONSULTANT submits the final EA or FONSI for review, seven (7) copies in theOriginal language shall be delivered.

Task 2.d Meeting and Public Hearings

The CONSULTANT shall attend all meetings and hearings (scoping meetings, informative hearing public hearings) that are held during this phase concerning the project, its alternatives and the environmental issues. In those meetings and hearings the consultants shall present the necessary exhibits and documents to make a presentation of the proposed project, its alternatives and environmental concerns to the public and officials of federal and commonwealth agencies and concerned municipalities.

Phase 3 Environmental Impact Statements

The tasks under this phase will not be undertaken if an environmental impact statement is not required.

Task 3.a Preparation of Draft Environmental Impact Statements (DEIS)

If the CLIENT decides that the impacts of the project are significant, the CONSULTANT shall prepare a DEIS and submit it to the CLIENT for approval.

Task3.b Preparation of Final Environmental Impact Statement (FEIS)

After the DEIS circulation and public hearing process, the CONSULTANT shall prepare an FEIS. All the comments received from the agencies and the public shall be implemented in the FEIS, which is submitted to the CLIENT for approval.

Task 3.c delivery of copies of EIS

The DEIS and FEIS shall be written in the Spanish language unless federal funds will be used for the construction of the project, when they shall be written in the English language and translated into Spanish.

After approval of the DEIS, the CONSULTANT shall deliver fifty (50) copies to the CLIENT. If the DEIS and FEIS where written in the English language, half of those copies shall be submitted in the Spanish language.

Whenever the CONSULTANT submits the DEIS or FEIS for review, seven (7) copies in the original languages shall be delivered.

Task 3.d Meeting and public hearing

The CONSULTANT shall attend all meetings and hearings (scoping meetings, informative hearing public hearings) that are held during this phase concerning the project, its alternatives and the environmental issues. In those meetings and hearings the consultants shall present the necessary exhibits and documents to make a presentation of the proposed project, its alternatives and environmental concerns to the public and officials of federal and commonwealth agencies and concerned.

6.2.2 Preliminary Studies and Plans

The CONSULTANT, in coordination with the CLIENT, will conduct public information meeting, at the request of the CLIENT.

The environmental commitment established in the Finding Of No Significant Impact or Environmental Impact Statement shall be implemented during the design phase of the project.

6.2.2.1 Preliminary Plans

The CONSULTANTS shall coordinate with the CLIENT for the follow up of the project.

A. Phase 1, Schematic Plans

For phase 1 the consultant shall:

1. Review existing data. Review and evaluate the existing data and base maps if available. Base maps shall be prepared covering the corridor of the project, with sufficient elevation information for preliminary profiles and approximate limits of construction and shall show all existing structures, roads, and other features controlling the alignment. Base maps scales shall be as indicated by the CLIENT.

2. Review evaluate and analyze traffic data.

3. Prepare schematic plans and profiles showing the location of proposed intersections and major structures. Locate approximate right of way limits and existing utilities.

B. Phase 2, Engineering Design Report

for phase 2 the CONSULTANT shall prepare:

Draft engineering design report showing the recommended highway alignment and logical alternatives, structures locations, related construction, utilities of record and the approximate limits of construction. Alternative studies shall be prepared for major interchanges. A preliminary estimate including an economical analysis of the various alternative designs shall be

made of roadways, structures, right of way and other projects cost. Stage construction limits and priorities shall recommended. The plans, profiles and cross sections drawings shall be supplemented with such other drawing, illustrations, and descriptive matter as may be necessary.

Formal printed Engineering Report.
Upon approval of item 2-A, above, if a formal printed engineering design report is required by the client said report shall be prepared containing recommendations and all supporting data. The alternate interchange schemes for each intersection as presented in the draft report, are to be included as an appendix at the end of the final report. Individual studies of the principal structures of the recommended alternatives shall be made showing the general plan, elevation, and cross section in sufficient detail to assure the feasibility of location, design and construction.

Coordination with local agencies Necessary conferences shall be held with the CLIENT and other pertinent agencies for the proper coordination of the project.

6.2.2.2 Design Surveys

Field surveys

All required survey data for design and plan preparation shall be furnished by the CLIENT unless, by written instructions from the CLIENT:

i. The CONSULTANT is requested to obtain proposals from qualified firms for the performance of this work in accordance with the applicable provisions of the Highway Design Manual or other established requirements. The CONSULTANT shall award a contract for said services to the selected firm. The contract shall be between the CONSULTANT and the firm.

ii. If the CLIENT determines that the CONSULTANT qualifies to do the work, he shall be permitted to submit a separate proposal.

B. Photogrammetry

All photogrammetric work performed under the agreement shall be furnished by the CLIENT unless, by written instructions from the CLIENT:

i. The CONSULTANT is requested to obtain proposals from qualified firms for the performance of this work in accordance with the applicable provisions of the Highway Design Manual or other established requirements. The CONSULTANT shall award a contract for said services

to the selected firm. The contract shall be between the CONSULTANT and the firm.

ii. If the CLIENT determines that the CONSULTANT qualifies to do the work, he shall be permitted to submit a separate proposal.

C Field survey and photogrammetric Requirements

Horizontal field survey by photogrammetric basic or supplementary control shall be referred to the second order of the Puerto Rico Lambert projection triangulation system. All other field survey work shall conform to second order degree of accuracy or better, subject to the approval of the CLIENT. Surveys shall include field referenced traverses or base lines, complete topographic information and a series of referenced bench marks. Cross sections shall be obtained by field and/or photogrammetric methods. The geometric relationship shall

be determined between traverses and the grid system for the area. The survey shall include stakeout of then base line used in determining the calculated center lines and where physically possible, prior to clearing of the right of way, the location of P.I's and other important points along the calculated lines.

D. Drainage courses.

The field survey shall include the referencing of all defined drainage courses to the traverse system or base lines. Sufficient cross sections and profiles of drainage courses shall be taken to describe these accurately. Drainage areas high water data at all waterways or streams shall be determined. The size, type and conditions of existing drainage structures adjacent to or affected by the project shall be located and identified. The field survey shall also include data on the functioning of existing drainage and irrigation installations as determined by inspections and interviews with local residents and agencies.

E Utilities

The field survey shall include the location of all telephone, communication, power poles and lines or underground conduits for telephone, electric power, gas, water, oil, etc, by field surveys and compilation from record drawing if available. Minimum vertical clearance to major overhead transmission lines crossing the route corridor shall also be determined. The owners shall be identified and evaluations of underground utility lines shall be determined by any reasonable available method.

F. Surveys for property acquisition plans for right of way. The CONSULTANT shall perform all other field survey necessary for the preparation of property acquisition plans for right of way.

6.2.2.3 Foundation Investigations

A. The required subsurface investigation for design shall be furnished by the CLIENT unless, by written instructions from the CLIENT:

i. The CONSULTANT is required to obtain at less two (2) proposals from qualified firms for the performance of this work in accordance with the applicable provisions of the Highway Design Manual or other acceptable document.

ii. The CONSULTANT shall award a contract for said service to the selected firm. The contract shall be between the consultant and the firm.

iii. If the CLIENT determines that the CONSULTANT qualifies to do the work, he shall be permitted or submit a proposal together with the proposals requested above in paragraph A.

B. If subsurface soil investigations by the CLIENT.
The CLIENT shall furnish the CONSULTANT with subsurface soil investigation and recommendations necessary for the economical design of the project. In this case, the CONSULTANT and the CLIENT'S geotechnician shall prepare a program jointly.

C. If subsurface soil investigation by CONSULTANT.
The CONSULTANT shall prepare jointly with the selected geotechnical firm the subsurface soil investigation and boring program including necessary plans, for soils exploration for the project as required to secure the subsurface information for the economical design of the project in accordance with the applicable provisions of the Highway Design Manual or other agreed document.

The CONSULTANT shall furnish the CLIENT three (3) copies of the preliminary soils and final soils report with the submission of the schematic plans and the draft engineering design report respectively.

6.2.2.4 Hydrological and Hydraulic studies
The required hydrological and hydraulic studies for design shall be furnish by the CLIENT unless, by the written instructions from the

CLIENT:

A. The CONSULTANT is required to obtain proposals from qualified firms for the performance of this work in accordance with the applicable provisions of the highway design manual or other agreed document.

The CONSULTANT shall award a contract for said services to the selected firm. The contract shall be between the CONSULTANT and the firm.

B. If the CLIENT determines that the CONSULTANT qualifies to do the work, he shall be permitted to submit a separate proposal.

6.2.2.5 Payments for approved subcontracted work.

A. Payments for design surveys foundations investigations, hydrological and hydraulic studies will be based on the approved respective proposal.

B. Payments for awarding and managing these subcontracted services shall be in accordance with the following formula Y=15-0 X-10/2.

6.2.3 Construction plans and specifications

Upon approval of the Engineering Design Report and receipt of written notice to proceed with the final design of the project, sections, as may be required by the CLIENT, the CONSULTANT shall proceed with the construction plans specification and opinions of probable cost as follows:

6.2.3.1 Size and scales

As specified in the Highway Design Manual or as agreed.

6.2.3.2 Roadway plans

Prepare complete roadway plans including geometric layout, interchange details, all roadway profiles, description and location of proposed drainage structures, signing location and details, pavement markings, light pole location and details, survey references, typical and standard roadway cross section, grading plans at intersection, details for frontage roads and connections, fencing and sufficient details of remaining miscellaneous appurtenances and information necessary for the construction of the project.

6.2.3.3 Bridge and structural drawings

Prepare complete structural drawing for all structures. Bridges plans shall include general plan and elevations drawing and complete

substructure, superstructure and drainage details and other pertinent details.

The CONSULTANT shall check shop and erection drawing prepared by fabricators or contractors during the construction of the project. The checking of shop details for structural steel and prestessed concrete numbers is to be considered a separate item of payments and shall be compensated as specified in methods of payment section; the actual preparation of these shop details is not included in the services to be provided by the CONSULTANT.

In the event that the construction contract for the project, or project section, is not awarded within one (1) years after the approval of the final plans by the CLIENT, the CONSULTANT will not be obligated to check the shop and erection drawings.

6.2.3.4 Cross section

Prepare cross section showing existing ground and proposed roadway templates. Also, indicating the area of cut or fill and the volume computed there from between sections. In no case the separation between sections shall be more than twenty (20) meters.

6.2.3.5 Coordination with agencies

Coordinate with corresponding agencies the relocation of all public and private utilities and perform all necessary adjustments on the plans for any appurtenance affected; all in accordance with the latest policy adopted by the CLIENT for the accommodation of utilities on highways.

6.2.3.6 Special provisions

Compile special provisions applicable to standard specifications and supplementary special specifications as necessary.

6.2.3.7 Estimates

Prepare quantity estimates and opinions of probable cost based on the construction plans for all items of work as required.

6.2.3.8 Contract documents

Prepare contract documents for the project sections according to the standard practices in use by the CLIENT.

6.2.3.9 Final review

Copies of complete roadway and structural plans, special provisions, estimates and contract documents, shall be submit ted to the CLIENT for their final review and approval.

6.2.4 Land acquisition plans for right or way

6.2.4.1 Preliminary land acquisition plans

The CONSULTANT shall prepare preliminary land acquisition plans, which shall show property lines and owner's name as obtained in the field, the right of way limits and approximate areas of the parcels to be acquired for the construction of the project.

6.2.4.2 Ownership of records

The CLIENT shall corroborate the names of the affected property owners by performing ownership title searches and obtaining the corresponding certificates from the property registry.

6.2.4.3 Final property acquisition plans for right of way The CONSULTANT shall prepare final property acquisition plans, which shall show corroborate property limits, owner's name and exact area of each parcel to be acquired and remnant areas. These plans shall become the property of the CLIENT.

6.2.5 Conferences, visits to site, inspections of works

6.2.5.1 Conferences

Conferences for discussion of the work shall be held at the request of either party. The CONSULTANT is requested to submit minutes of the meeting or conference for approval by the CLIENT.

6.2.5.2 Visits to the site

Request for visits to the site may be made by the CLIENT or the CONSULTANT together with any other party or parties. The CONSULTANT shall submit a field inspection report.

6.2.5.3 Clarifications or interpretation

The services of the CONSULTANT shall not be required in any construction operation on the project, but his services shall be made available at any time for clarification or interpretation of the plans, specifications and for extra work orders or change orders if the CLIENT needs his participation.

6.2.6 Meetings and pubic hearing

The CONSULTANT shall be present at meetings, public hearings and pre-bidding meetings and prepare the necessary exhibits, back ground and supporting data, opinions of probable cost and other documentation as may be needed for clarification and explanation of the proposed project to the public.

The CONSULTANT also shall be represented at al meetings with representatives of other agencies or the CLIENT when required.

6.2.7 Additional services, major changes in scope and/or complete work

In the event future urgent additional services, major changes in scope and/or completed work not provided herein, be required to accelerate any activity related with the design or the construction stage of this project, the CONSULTANT will become available to provide them as the CLIENT may request.

In that case, a complementary agreement, will be signed without following additional proceedings in order to assure a real economy of time and efforts

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COMPENSATION FOR DESIGN OF URBAN HIGHWAYS (2204)

TABLE II

Project Cost in Dollars			Preliminary		Final		Total	
			I. Factor	Fee	I. Factor	Fee	I. Factor	Fee
Less $100,000			0.06253		0.11612		0.17864	
		$100,000		$6,253		$11,612		$17,864
The following	$25,000		0.05660		0.10511		0.16170	
		$125,000		$7,667		$14,239		$21,907
The following	$25,000		0.05425		0.10074		0.15499	
		$150,000		$9,024		$16,758		$25,782
The following	$25,000		0.05189		0.09636		0.14825	
		$175,000		$10,321		$19,167		$29,488
The following	$25,000		0.04953		0.09198		0.14150	
		$200,000		$11,559		$21,466		$33,025
The following	$25,000		0.04717		0.08760		0.13476	
		$225,000		$12,738		$23,656		$36,394
The following	$25,000		0.04484		0.08328		0.12812	
		$250,000		$13,859		$25,738		$39,597
The following	$25,000		0.04247		0.07886		0.12133	
		$275,000		$14,921		$27,710		$42,631
The following	$25,000		0.04009		0.07445		0.11454	
		$300,000		$15,923		$29,571		$45,494
The following	$50,000		0.04498		0.08353		0.12851	
		$350,000		$18,172		$33,748		$51,920
The following	$50,000		0.04269		0.07928		0.12197	
		$400,000		$20,306		$37,712		$58,018
The following	$50,000		0.04034		0.07492		0.11526	
		$450,000		$22,323		$41,458		$63,781
The following	$50,000		0.03805		0.07067		0.10872	
		$500,000		$24,226		$44,991		$69,217
The following	$50,000		0.04205		0.07810		0.12015	
		$550,000		$26,329		$48,896		$75,225
The following	$50,000		0.04090		0.07596		0.11686	
		$600,000		$28,374		$52,694		$81,068
The following	$50,000		0.03973		0.07378		0.11351	
		$650,000		$30,360		$56,383		$86,743
The following	$50,000		0.03858		0.07164		0.11022	
		$700,000		$32,289		$59,965		$92,254
The following	$50,000		0.03741		0.06948		0.10690	
		$750,000		$34,160		$63,439		$97,599
The following	$50,000		0.03624		0.06730		0.10354	
		$800,000		$35,972		$66,804		$102,776
The following	$50,000		0.03508		0.06514		0.10022	
		$850,000		$37,725		$70,061		$107,787

The following	$50,000		0.03393		0.06300		0.09693	
		$900,000		$39,422		$73,212		$112,633
The following	$50,000		0.03275		0.06082		0.09357	
		$950,000		$41,059		$76,253		$117,312
The following	$50,000		0.03161		0.05871		0.09032	
		$1,000,000		$42,640		$79,188		$121,828
The following	$50,000		0.03738		0.06941		0.10679	
		$1,050,000		$44,509		$82,659		$127,167
The following	$50,000		0.03690		0.06853		0.10543	
		$1,100,000		$46,354		$86,085		$132,439
The following	$50,000		0.03638		0.06756		0.10393	
		$1,150,000		$48,172		$89,463		$137,635
The following	$50,000		0.03590		0.06667		0.10257	
		$1,200,000		$49,967		$92,797		$142,764
The following	$50,000		0.03538		0.06570		0.10107	
		$1,250,000		$51,736		$96,081		$147,818
The following	$50,000		0.03490		0.06481		0.09971	
		$1,300,000		$53,481		$99,322		$152,803
The following	$50,000		0.03438		0.06384		0.09821	
		$1,350,000		$55,200		$102,514		$157,714
The following	$50,000		0.03390		0.06296		0.09686	
		$1,400,000		$56,895		$105,662		$162,557
The following	$50,000		0.03337		0.06198		0.09536	
		$1,450,000		$58,564		$108,761		$167,325
The following	$50,000		0.03290		0.06110		0.09400	
		$1,500,000		$60,209		$111,816		$172,025
The following	$50,000		0.03237		0.06012		0.09250	
		$1,550,000		$61,827		$114,822		$176,650
The following	$50,000		0.03190		0.05924		0.09114	
		$1,600,000		$63,422		$117,784		$181,207
The following	$50,000		0.03137		0.05827		0.08964	
		$1,650,000		$64,991		$120,698		$185,689
The following	$50,000		0.03090		0.05738		0.08828	
		$1,700,000		$66,536		$123,567		$190,103
The following	$50,000		0.03037		0.05641		0.08678	
		$1,750,000		$68,055		$126,387		$194,442
The following	$50,000		0.02990		0.05553		0.08542	
		$1,800,000		$69,550		$129,164		$198,713
The following	$50,000		0.02937		0.05455		0.08392	
		$1,850,000		$71,018		$131,891		$202,909
The following	$50,000		0.02890		0.05367		0.08257	
		$1,900,000		$72,463		$134,574		$207,038
The following	$50,000		0.02837		0.05269		0.08107	
		$1,950,000		$73,882		$137,209		$211,091
The following	$50,000		0.02790		0.05181		0.07971	
		$2,000,000		$75,277		$139,800		$215,076
The following	$50,000		0.03287		0.06105		0.09393	
		$2,050,000		$76,920		$142,852		$219,773
The following	$50,000		0.03267		0.06068		0.09336	
		$2,100,000		$78,554		$145,886		$224,440
The following	$50,000		0.03242		0.06022		0.09264	
		$2,150,000		$80,175		$148,897		$229,073
The following	$50,000		0.03221		0.05982		0.09203	
		$2,200,000		$81,786		$151,888		$233,674
The following	$50,000		0.03197		0.05938		0.09136	
		$2,250,000		$83,385		$154,857		$238,242
The following	$50,000		0.03174		0.05894		0.09068	
		$2,300,000		$84,972		$157,804		$242,776
The following	$50,000		0.03151		0.05852		0.09003	
		$2,350,000		$86,547		$160,730		$247,277
The following	$50,000		0.03127		0.05808		0.08935	

		$2,400,000		$88,111		$163,634		$251,745
The following	$50,000		0.03104		0.05764		0.08868	
		$2,450,000		$89,663		$166,516		$256,179
The following	$50,000		0.03082		0.05724		0.08807	
		$2,500,000		$91,204		$169,379		$260,582
The following	$50,000		0.03059		0.05680		0.08739	
		$2,550,000		$92,733		$172,219		$264,952
The following	$50,000		0.03035		0.05636		0.08671	
		$2,600,000		$94,251		$175,037		$269,287
The following	$50,000		0.03011		0.05592		0.08603	
		$2,650,000		$95,756		$177,833		$273,589
The following	$50,000		0.02990		0.05553		0.08542	
		$2,700,000		$97,251		$180,609		$277,860
The following	$50,000		0.02966		0.05508		0.08475	
		$2,750,000		$98,734		$183,363		$282,097
The following	$50,000		0.02942		0.05464		0.08407	
		$2,800,000		$100,205		$186,096		$286,301
The following	$50,000		0.02920		0.05423		0.08342	
		$2,850,000		$101,665		$188,807		$290,472
The following	$50,000		0.02896		0.05378		0.08274	
		$2,900,000		$103,113		$191,496		$294,609
The following	$50,000		0.02874		0.05337		0.08210	
		$2,950,000		$104,550		$194,164		$298,714
The following	$50,000		0.02851		0.05295		0.08146	
		$3,000,000		$105,976		$196,812		$302,787
The following	$50,000		0.03216		0.05973		0.09189	
		$3,050,000		$107,584		$199,798		$307,382
The following	$50,000		0.03209		0.05959		0.09168	
		$3,100,000		$109,188		$202,778		$311,966
The following	$50,000		0.03196		0.05936		0.09132	
		$3,150,000		$110,786		$205,746		$316,532
The following	$50,000		0.03187		0.05920		0.09107	
		$3,200,000		$112,380		$208,705		$321,085
The following	$50,000		0.03176		0.05899		0.09075	
		$3,250,000		$113,968		$211,655		$325,623
The following	$50,000		0.03166		0.05880		0.09046	
		$3,300,000		$115,551		$214,595		$330,146
The following	$50,000		0.03157		0.05864		0.09021	
		$3,350,000		$117,130		$217,527		$334,656
The following	$50,000		0.03145		0.05841		0.08985	
		$3,400,000		$118,702		$220,447		$339,149
The following	$50,000		0.03136		0.05824		0.08960	
		$3,450,000		$120,270		$223,359		$343,629
The following	$50,000		0.03124		0.05801		0.08925	
		$3,500,000		$121,832		$226,260		$348,092
The following	$50,000		0.03115		0.05785		0.08900	
		$3,550,000		$123,389		$229,152		$352,541
The following	$50,000		0.03105		0.05766		0.08871	
		$3,600,000		$124,942		$232,035		$356,977
The following	$50,000		0.03094		0.05745		0.08839	
		$3,650,000		$126,489		$234,908		$361,396
The following	$50,000		0.03084		0.05727		0.08810	
		$3,700,000		$128,031		$237,771		$365,802
The following	$50,000		0.03075		0.05711		0.08785	
		$3,750,000		$129,568		$240,626		$370,194
The following	$50,000		0.03062		0.05687		0.08750	
		$3,800,000		$131,099		$243,470		$374,569
The following	$50,000		0.03052		0.05669		0.08721	
		$3,850,000		$132,625		$246,304		$378,930
The following	$50,000		0.03044		0.05652		0.08696	
		$3,900,000		$134,147		$249,131		$383,278
The following	$50,000		0.03032		0.05632		0.08664	
		$3,950,000		$135,663		$251,946		$387,610

The following	$50,000		0.03022		0.05613		0.08635	
		$4,000,000		$137,175		$254,753		$391,927
The following	$50,000		0.03010		0.05590		0.08600	
		$4,050,000		$138,680		$257,548		$396,227
The following	$50,000		0.03001		0.05573		0.08575	
		$4,100,000		$140,180		$260,334		$400,515
The following	$50,000		0.02992		0.05557		0.08550	
		$4,150,000		$141,676		$263,113		$404,789
The following	$50,000		0.02980		0.05534		0.08514	
		$4,200,000		$143,166		$265,880		$409,046
The following	$50,000		0.02970		0.05515		0.08485	
		$4,250,000		$144,651		$268,638		$413,289
The following	$50,000		0.02961		0.05499		0.08460	
		$4,300,000		$146,132		$271,387		$417,519
The following	$50,000		0.02949		0.05476		0.08425	
		$4,350,000		$147,606		$274,125		$421,731
The following	$50,000		0.02940		0.05460		0.08399	
		$4,400,000		$149,076		$276,855		$425,931
The following	$50,000		0.02929		0.05439		0.08367	
		$4,450,000		$150,540		$279,575		$430,115
The following	$50,000		0.02920		0.05423		0.08342	
		$4,500,000		$152,000		$282,286		$434,286
The following	$50,000		0.02907		0.05399		0.08307	
		$4,550,000		$153,454		$284,986		$438,439
The following	$50,000		0.02899		0.05383		0.08282	
		$4,600,000		$154,903		$287,677		$442,580
The following	$50,000		0.02888		0.05363		0.08251	
		$4,650,000		$156,347		$290,359		$446,706
The following	$50,000		0.02877		0.05343		0.08220	
		$4,700,000		$157,785		$293,030		$450,815
The following	$50,000		0.02866		0.05323		0.08189	
		$4,750,000		$159,218		$295,691		$454,910
The following	$50,000		0.02857		0.05306		0.08164	
		$4,800,000		$160,647		$298,345		$458,992
The following	$50,000		0.02847		0.05288		0.08135	
		$4,850,000		$162,071		$300,989		$463,059
The following	$50,000		0.02835		0.05265		0.08099	
		$4,900,000		$163,488		$303,621		$467,109
The following	$50,000		0.02826		0.05248		0.08074	
		$4,950,000		$164,901		$306,245		$471,146
The following	$50,000		0.02817		0.05232		0.08049	
		$5,000,000		$166,310		$308,861		$475,171
The following	$500,000		0.03120		0.05794		0.08914	
		$5,500,000		$181,909		$337,830		$519,739
The following	$500,000		0.03082		0.05725		0.08807	
		$6,000,000		$197,321		$366,453		$563,774
The following	$500,000		0.03045		0.05655		0.08699	
		$6,500,000		$212,545		$394,726		$607,270
The following	$500,000		0.03007		0.05585		0.08593	
		$7,000,000		$227,582		$422,652		$650,234
The following	$500,000		0.02970		0.05515		0.08485	
		$7,500,000		$242,430		$450,228		$692,658
The following	$500,000		0.02932		0.05446		0.08378	
		$8,000,000		$257,092		$477,457		$734,550
The following	$500,000		0.02895		0.05376		0.08271	
		$8,500,000		$271,566		$504,337		$775,902
The following	$500,000		0.02857		0.05307		0.08164	
		$9,000,000		$285,853		$530,870		$816,722
The following	$500,000		0.02820		0.05236		0.08056	
		$9,500,000		$299,951		$557,052		$857,003
The following	$500,000		0.02782		0.05167		0.07950	
		$10,000,000		$313,863		$582,888		$896,751
The following	$1,000,000		0.03056		0.05676		0.08732	

		$11,000,000		$344,424		$639,645		$984,069
The following	$1,000,000		0.03041		0.05648		0.08689	
		$12,000,000		$374,835		$696,123		$1,070,958
The following	$1,000,000		0.03026		0.05620		0.08646	
		$13,000,000		$405,096		$752,322		$1,157,418
The following	$1,000,000		0.03011		0.05592		0.08603	
		$14,000,000		$435,208		$808,243		$1,243,450
The following	$1,000,000		0.02996		0.05564		0.08560	
		$15,000,000		$465,169		$863,885		$1,329,053
The following	$1,000,000		0.02981		0.05536		0.08517	
		$16,000,000		$494,979		$919,248		$1,414,227
The following	$1,000,000		0.02966		0.05508		0.08475	
		$17,000,000		$524,641		$974,332		$1,498,973
The following	$1,000,000		0.02951		0.05481		0.08432	
		$18,000,000		$554,151		$1,029,138		$1,583,290
The following	$1,000,000		0.02936		0.05453		0.08389	
		$19,000,000		$583,512		$1,083,666		$1,667,178
The following	$1,000,000		0.02921		0.05425		0.08346	
		$20,000,000		$612,723		$1,137,915		$1,750,638
The following	$1,000,000		0.02998		0.05568		0.08565	
		$21,000,000		$642,702		$1,193,590		$1,836,292
The following	$1,000,000		0.02992		0.05556		0.08548	
		$22,000,000		$672,620		$1,249,152		$1,921,772
The following	$1,000,000		0.02985		0.05544		0.08530	
		$23,000,000		$702,474		$1,304,595		$2,007,069
The following	$1,000,000		0.02979		0.05533		0.08512	
		$24,000,000		$732,267		$1,359,924		$2,092,190
The following	$1,000,000		0.02973		0.05521		0.08494	
		$25,000,000		$761,996		$1,415,135		$2,177,130
The following	$1,000,000		0.02967		0.05510		0.08476	
		$26,000,000		$791,663		$1,470,231		$2,261,894
The following	$1,000,000		0.02960		0.05498		0.08458	
		$27,000,000		$821,267		$1,525,210		$2,346,477
The following	$1,000,000		0.02954		0.05486		0.08441	
		$28,000,000		$850,809		$1,580,074		$2,430,884
The following	$1,000,000		0.02948		0.05475		0.08423	
		$29,000,000		$880,288		$1,634,821		$2,515,109
The following	$1,000,000		0.02942		0.05463		0.08405	
		$30,000,000		$909,706		$1,689,454		$2,599,159
The following	$1,000,000		0.02935		0.05451		0.08387	
		$31,000,000		$939,060		$1,743,968		$2,683,028
The following	$1,000,000		0.02929		0.05440		0.08369	
		$32,000,000		$968,352		$1,798,368		$2,766,720
The following	$1,000,000		0.02923		0.05428		0.08351	
		$33,000,000		$997,581		$1,852,650		$2,850,231
The following	$1,000,000		0.02917		0.05417		0.08333	
		$34,000,000		$1,026,748		$1,906,818		$2,933,565
The following	$1,000,000		0.02910		0.05405		0.08316	
		$35,000,000		$1,055,852		$1,960,869		$3,016,721
The following	$1,000,000		0.02904		0.05393		0.08298	
		$36,000,000		$1,084,894		$2,014,804		$3,099,698
The following	$1,000,000		0.02898		0.05382		0.08280	
		$37,000,000		$1,113,873		$2,068,622		$3,182,495
The following	$1,000,000		0.02892		0.05370		0.08262	
		$38,000,000		$1,142,790		$2,122,325		$3,265,116
The following	$1,000,000		0.02885		0.05359		0.08244	
		$39,000,000		$1,171,644		$2,175,911		$3,347,555
The following	$1,000,000		0.02879		0.05347		0.08226	
		$40,000,000		$1,200,436		$2,229,382		$3,429,818
The following	$1,000,000		0.02873		0.05335		0.08208	
		$41,000,000		$1,229,165		$2,282,735		$3,511,899
The following	$1,000,000		0.02867		0.05324		0.08191	
		$42,000,000		$1,257,832		$2,335,973		$3,593,805

The following	$1,000,000		0.02860		0.05312		0.08172	
		$43,000,000		$1,286,435		$2,389,094		$3,675,530
The following	$1,000,000		0.02854		0.05301		0.08155	
		$44,000,000		$1,314,977		$2,442,101		$3,757,078
The following	$1,000,000		0.02848		0.05289		0.08137	
		$45,000,000		$1,343,456		$2,494,990		$3,838,446
The following	$1,000,000		0.02842		0.05277		0.08119	
		$46,000,000		$1,371,873		$2,547,765		$3,919,638
The following	$1,000,000		0.02835		0.05266		0.08101	
		$47,000,000		$1,400,227		$2,600,421		$4,000,648
The following	$1,000,000		0.02829		0.05254		0.08083	
		$48,000,000		$1,428,519		$2,652,963		$4,081,482
The following	$1,000,000		0.02823		0.05242		0.08065	
		$49,000,000		$1,456,747		$2,705,387		$4,162,134
The following	$1,000,000		0.02817		0.05231		0.08048	
		$50,000,000		$1,484,914		$2,757,697		$4,242,611
The following	$10,000,000		0.02782		0.05167		0.07949	
		$60,000,000		$1,763,141		$3,274,405		$5,037,547
The following	$10,000,000		0.02720		0.05051		0.07771	
		$70,000,000		$2,035,117		$3,779,504		$5,814,621
The following	$10,000,000		0.02657		0.04935		0.07592	
		$80,000,000		$2,300,842		$4,272,993		$6,573,835
The following	$10,000,000		0.02595		0.04819		0.07413	
		$90,000,000		$2,560,312		$4,754,865		$7,315,176
The following	$10,000,000		0.02532		0.04703		0.07235	
		$100,000,000		$2,813,530		$5,225,127		$8,038,657
Over	$100,000,000		0.02814		0.05225		0.08039	

CHAPTER 7

Standards for the Practice of Land Surveying Prepared by: The Institute of Land Surveyors of the Puerto Rico

College of Engineers and Land Surveyors (IA/CIAPR: For Spanish Acronym)

These standards are based upon a variety of standards, regulations, specifications and guidelines from a variety of sources. These sources are and not limited to:

- National Society of Professional Surveyors Model Standards of Practice, February 8, 2003, www.acsm.net\nsps.
- Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, 1999, www.acsm.net.
- Professional College of Engineers and Land Surveyors of Puerto Rico Manual for Professional Practice and Guidelines for the Compensation of Professional Services, 1996, www.ciapr.org.
- Puerto Rico Law # 264, approved on November 16, 2002, for the adoption the Puerto Rico State Plane Coordinate System (NAD 83).
- Standards and Guidelines for Cadastral Surveys using Global Positioning System Methods, US Forest Service and Bureau of Land Management. April 28, 2000.
- Standards and Specifications for Cadastral Control Surveys, Bureau of Land Management, March 1989.
- Geospatial Positioning Accuracy Standards, Federal Geographic Data Committee, (FGDC), 1998, www.fgdc.gov.
- National Standard for Spatial Data Accuracy, FGDC, 1998, www.fgdc.gov.
- American Society of Photogrammetry and Remote Sensing, Specifications & Standards, 1990, www.asprs.org.
- International Federation of Surveyors, (FIG), www.fig.net.

These standards are to be used as guidelines by the professional legally authorized to practice the profession of Land Surveying in the Commonwealth of Puerto Rico and are intended to foster uniformity in the professional practice of Surveying. Standards are not intended to be used in place of professional judgment. From hereon the words Surveyor or Professional apply to any person legally authorized to practice the profession of Land Surveying in the Commonwealth of Puerto Rico.

I. BOUNDARY OR AREA DETERMINATION SURVEYS STANDARDS (IA/CIAPR).

1. RESEARCH, IDENTIFICATION, MEASUREMENTS AND COMPUTATIONS

The professional with the legal authority to practice the profession of Land Surveying in the Commonwealth of Puerto Rico, in conducting a Boundary or Area Determination Survey shall:

A. Execute a survey based on the legal description of the parcel or tract taken from the last deed of record as provided by the client.
B. Search pertinent documents that could include, but are not limited to: maps, deeds, title reports, title opinions, and government agencies' records.
C. Diligently search for and identify monuments and other physical evidence that could affect the Boundary locations.
D. Perform field measurements to correlate all found evidence.
E. Perform all measurements to a precision compatible with the accuracy desired for the geometric shape of the parcel, and consistent with the accuracy desired for the type of property being surveyed.
F. Compare and analyze all of the data gathered and reach a professional opinion as to the most probable location of the property boundary and accurately determine the area within.

2. IDENTIFICACION AND RESOLUTION OF CONFLICTS

If a Surveyor has a material disagreement with the measurements or monumented boundary positions of another surveyor, the Surveyor shall contact the other party in order to resolve the disagreement. If the other party is no longer available, the Surveyor shall advise the client of discrepancies concerning the integrity of the surveyed boundary line.

3. IDENTIFICATION AND DESCRIPTION OF MONUMENTS

A. Land lot owners shall notify all adjoining property owners including government agencies or institutions to be present at a time and date on the tract of land to be surveyed in order to identify all lot corners and their location.
B. In the event that none of them show up and evidence is provided that all interested parties were notified in advance, it shall be the client, owner or his authorized representative who will identify which are the boundary points, assuming the responsibility for such action, and they shall be those indicated on the site plan in cases where boundary points are not physically defined, the property owner shall establish these by parol agreement or by way of permanent monuments.

C. All the field data shall remain in the custody of the Land Surveyor.
D. The property owner will provide the professional with the results of the title search indicating all rights of way(s), easements, liens or grants that may affect the tract, or will otherwise authorize the professional to conduct such an investigation.
E. All monuments must be thoroughly described and specifically identified as set, found or to be established, whenever shown on maps or referred to in documents prepared by the Surveyor. Descriptions of monuments must be sufficient in detail to readily facilitate future recovery by other surveyors and to enable positive identification.

4. SURVEY PLAT OR MAP CERTIFICATION

The Land Surveyor shall prepare a drawing of the survey at an appropriate scale. The survey drawing shall include, at a minimum whenever available, the following items:

A. Address or location of the surveyed property.
B. Clients' name.
C. North seeking arrow, indicating the reference meridian used.
D. Scale
E. Bearings, azimuth, or interior angles.
F. The distances for all courses and the resulting area.
G. Monuments identified as per Section 3 above.
H. Information regarding the coordinate system and map grid used.
I. Name, registration number, address and phone number of the Surveyor.
J. Date of survey.
K. Surveyor's certification, signed and sealed.
L. Other information relevant to the survey tract (cadastre number, inscription data, etc.).

5. CLASSIFICATION AND ACCURACY STANDARDS

The various classifications of property surveys and the positional accuracy of these classes are described in I 8.9 of these standards.

6. LEGAL DESCRIPTIONS OF PROPERTY

If a Surveyor is called upon to prepare a legal description of a property the following items shall be included:

A. Metes and Bounds descriptions shall include azimuths, bearings or angles and distances in order to allow for the mathematical computation closure.

B. Calls of the recording information or other identifying documentation for any maps, plats and other documents referenced.

C. Detailed description of any natural, legal, or artificial monument referenced.
D. Correct name or number of any adjacent highway or man mad structure when describing the boundaries by cardinal directions.
E. Existing right(s) of way(s) that affect the property.

7. ELECTRONIC DATA DISTRIBUTION

The client may request the Professional to provide the survey data in an electronic format. These formats include, but are not limited to, such files as CAD drawing files, digital terrain model (DTM) files, or digital elevation model (DEM) files. The Land Surveyor shall provide a signed and sealed hard copy drawing or representation of the survey. This drawing shall be the official plat or map and shall be deemed to be correct and superior to the electronic data. The electronic data file shall also contain a statement that the file is not a certified document and that the official document was issued and sealed by (name and registration number of the Professional) on (date). The Land Surveyor may also need to address additional liability issues in an appropriate contract language.

8. ACCURACY STANDARDS FOR BOUNDARY AND OR AREA DETERMINATION SURVEYS

The purpose of this standard is to establish accuracy standards to be used by a Professional, legally authorized to practice Land Surveying in the Commonwealth of Puerto Rico, for the execution of boundary and or area determination surveys.

A. Relative Positional Accuracy: Relative Positional Accuracy of a survey is a value expressed in meters that represents the uncertainty of the location of any point in a survey relative to any other point in the same survey at the 95 percent confidence level. Therefore, it is also the accuracy of the distance between all points on the same survey. Relative Positional Accuracy may be tested by comparing the relative location of points in a survey as measured by an independent survey of higher accuracy. The test should include both distances and directions. Relative Positional Accuracy may also be tested by the results from a minimally, or if possible a fully, constrained, correctly weighted, least squares adjustment of the survey.

B. Procedure: The Surveyor shall select the proper equipment and methods necessary to achieve the Acceptable Relative Positional Accuracy required of this standard after an analysis of the expected uncertainties for the job. The survey work shall be executed in a

professional manner by the Surveyor or by personnel under the direct personal supervision of the Surveyor. The Surveyor shall conduct check measurements to insure that the intended accuracy of the survey is achieved.

C. Classification of Surveys by Land Use: The degree of precision and accuracy necessary for a particular property survey shall be based upon the intended use of the land. If the client does not include information regarding the intended use, the classification of the survey shall be based upon the current use of the land. The classification(s) of surveys are as follows:

1. Urban Surveys - Urban surveys are performed on land lying within or adjoining a city or town, and include commercial and industrial properties, condominiums, town houses, apartments, and other multi-unit developments, regardless of geographic location. All ALTA/ACSM Land Title Surveys are included in this classification.
2. Suburban Surveys - Suburban surveys are performed on land lying outside of urban areas and developed for single-family residential use.
3. Rural Surveys - Rural surveys are performed on undeveloped land lying outside of urban and suburban areas such as farms.

9. RELATIVE POSITIONAL ACCURACY

Classification of Survey	Acceptable Relative Positional Accuracy
Urban	(0.021 m) plus 50 ppm
Suburban	(0.040 m) plus 100 ppm
Rural	(0.079 m) plus 200 ppm

*Accuracy is given at the 95 percent confidence level, (see section V.2.D).

II. CONSTRUCTION LAYOUT SURVEYS STANDARDS (IA/CIAPR)

1. INTRODUCTION

A professional, with the legal authority to practice the profession of Land Surveying in the Commonwealth of Puerto Rico, shall approach the task of

construction staking in precisely the same manner as any survey in which a high degree of competence is required. The public welfare shall be paramount in the Surveyor's decision to take on such a task. Surveyors shall only concern themselves with the direct interpretation of an approved set of plans. It is not the responsibility of the Surveyor or the Surveyor's Staff to correct or revise erroneous architectural or engineering plans. If the approved design plans are found to lack sufficient information for a proper layout, the Surveyor shall immediately notify his/her client, the owner, the engineer and/or architect responsible for the project. Proper field procedures shall be employed to insure correct placement of construction stakes or any other control. Appropriate precautionary measures shall be taken to protect the Surveyor's employees and others from undue physical risks associated with construction projects.

2. STANDARDS

A. Preliminary Research and Planning

The Surveyor shall:

1) Obtain from the client, or other appropriate sources, the approved contract documents (plans and specifications) setting forth the project for which the layout survey is to be performed.
2) Determine the appropriate number of horizontal and vertical monuments to be established and the relationship of those monuments to construction lines, grades, and offsets.

B. Analysis of Research and Preliminary Conclusions

1) Examine and analyze the data
2) Test the consistency of the data and bring any inconsis tencies to the attention of the client.
3) Plan the necessary methods and procedures for conducting the construction survey.

C. Field Investigation and Layout

The Surveyor shall, in coordination with the client:

1) Search for, and identify, monuments, lines or objects indicated by the construction documents as the intended references for the horizontal and vertical project datums.
2) When necessary, establish, adjust, and monument the primary control points and lines needed to perform the layout survey.
3) Establish the final layout control monuments in the proper relationship to construction lines and grades.
4) Obtain sufficient check measurements.
5) Record all information in an appropriate form.
6) Immediately bring to the attention of the client or his/her designated representative any inconsistencies disclosed by the survey or by examination of the plans.

3. TECHNICAL MINIMUM REQUIREMENTS

1. Measurements shall be obtained with accuracy compatible with I.8-9 standards or as required in a written agreement with the client or within the construction documents.
2. Monumentation
    1) Construction layout monuments shall be of a type and character consistent with intended use.
    2) Monuments shall be set in a manner providing a degree of permanency consistent with the terrain, physical features and intended use.
    3) Sufficient monuments and offset information shall be provided to enable the user to check the accuracy of any point or line established therefrom.
    4) Monuments shall be witnessed in a manner that will allow them to be easily found by the user for a reasonable period of time as required by the construction schedule. Any witness stakes or laths that show offset and/or cut-and-fill data shall be labeled with sufficient information to identify the position of the point being referenced.
3. Field Notes
   All pertinent information, measurements, and observations made in the field during the course of the survey shall be recorded on an appropriate form and in a manner that is clear and legible, and subject to only one interpretation.
4. Data Presentation
   When requested, the client shall be furnished with the results of the survey on an appropriate form, such as plats, maps, grade sheets, etc. In order to be effective and useful, any document depicting completed fieldwork must be prepared in a timely manner and reviewed by the client prior to construction taking place. The form selected should show the following:
    1) The client's name, fieldwork date, file(s) numbers and the Surveyor's name, address, signature and registration number.
    2) A description of the project (location description of the project) referenced to the title description, or to the geographic location, and, when appropriate, the specific description of the constructed facility surveyed.
    3) The identification of the construction documents used for the survey, a statement as to whether or not they were marked as "approved" for this stage, and the date of their latest revision.
    4) Sufficient information to reference the layout to the costruction documents.
    5) Identification of the horizontal and vertical datums on which

the survey was based and the specific descriptions of the monuments that were used.

6) North arrow and scale of drawing, stating the referenced meridian used.
7) Horizontal dimensions and directions with sufficient notation to indicate their source, such as per plans or calculated from data shown on plans.
8) All pertinent monuments with a notation indicating which were found and which were set, and identified as to their nature. Monuments found should be accompanied by a reference as to their origin, when (it is) known. Where there is no available documented reference, this shall be so stated.
9) Sufficient information for all layout control lines and points to allow re-establishment of the work with minimal difficulty.
10) An index and cross-reference when the presentation consists of more than a single document.
11) When requested, a certificate stating the final date of the field layout and that the survey was conducted either by or under the direction the Surveyor. The certificate shall bear the signature, registration number and seal of the Surveyor and the date of certification.

4. RELATIVE POSITIONAL ACCURACY

The following relative positional accuracies are provided as a guideline for the stakes or other materials used to mark the location of proposed fixed works:

	Horizontal Positional Accuracy, mm	Vertical Positional Accuracy, mm
Rough Grading Stakes	± 300 mm	± 60 mm
Sub grade Stakes	± 150mm	± 15 mm
Finished Grade Stakes	± 150 mm	± 15 mm
Building Offset Stakes	± 10 mm	± 10 mm
Sewer Offset Stakes	± 30 mm	± 10 mm
Waterline Offset Stakes	± 30 mm	± 30 mm

*Accuracy is given at the 95 percent confidence level, (see section V.2.D).

ELECTRONIC DATA DISTRIBUTION

The client may request the Professional to provide the survey data in an electronic format. These formats include, but are not limited to, such files as CAD drawing files, digital terrain model (DTM) files, or digital elevation

model (DEM) files. These files, only benefit(s) the client for the specific survey. In every case the Professional shall also provide a signed and sealed hard copy drawing or representation of the survey. This drawing shall be the official plat or map and shall be deemed to be correct and superior to the electronic data. The electronic data file shall also contain a statement that the file is not a certified document and that the official document was issued and sealed by (name and registration number of the Professional) on (date). The Professional may also need to address additional liability issues in an appropriate contract language.

III. TOPOGRAPHIC SURVEYS STANDARDS (IA/CIAPR)

1. INTRODUCTION

This standard is written to provide the professional, with the legal authority to practice the profession of Land Surveying in the Commonwealth of Puerto Rico, with (a) guidelines for producing an adequate topographic survey.

2. STANDARD'S APPLICATION

This standard applies to topographic surveys that are intended to show the shape of the earth's surface and/or the position of fixed objects thereon. In the performance of Topographic Surveys, Terrestrial, Lidar or Kinematic GPS Surveying Methods are accepted. This standard does not apply to topographic surveys using photogrammetric methods. Topographic surveys that additionally depict the location of boundary lines must also be in compliance with the current standard for boundary and/or area determination surveys.

3. DEFINITIONS

A. Bench Mark is a relatively permanent material object, natural or artificial, bearing a marked point whose elevation above or below an adopted datum is known.
B. A Contour is an imaginary line on the ground, all of whose points are of the same elevation above or below a specified datum.
C. The Parcel is the area designated by the client and is usually, but not necessarily, given by a legal description of the property.
D. Utilities are services provided by governmental and private entities that provide the following: electric power, telephone, water, sanitary and storm sewer, gas, etc.
E. Spot elevations are elevations at strategic locations without con tour lines..

4. RESEARCH AND INVESTIGATION

The Surveyor shall acquire the elevation and datum of all bench marks to be used in the survey. The elevation used shall be based on a nationally

accepted datum whenever practical or unless otherwise instructed by the client. The client shall specifically describe the parcel to be surveyed.

5. THE SURVEY

The topographic survey shall be performed on the ground to obtain the information required in this standard and any additional information requested by the client. The Surveyor shall select the equipment and procedures necessary to obtain the horizontal and vertical positional accuracies required by these standards.

6. THE PUBLISHED RESULT

A topographic map or plat shall be accurately prepared at a scale, and size to show the results of the survey.

7. DATA

The surveyor shall locate and show on the topographic survey map or plan the following information:

A. Existing contours lines indicating the shape and elevation of the land over the entire parcel in accordance with the following table, unless specifically excluded in the contract with the client:

B. Map or Plat Scale	Contour Interval
1:100 @ 1:500	0.25 m
1:600 @ 1: 1,000	0.50 m
1:1,500 @ 1: 5,000	1.0 m
1:6,000 @ 1:20,000	5 or 10 m

C. The location of permanent features such as, but not limited to, retaining walls, bridges, and culverts.

D. The locations of street or road paving, driveways and sidewalks.
E. Elevations on the top of curbs, gutters, and sidewalks.
F. The official street or road names and address numbers assigned to the parcel.
G. North arrow and scale of drawing, stating the reference meridian used.
H. Legend depicting the symbols and abbreviations used on the drawing.
I. Spot elevations covering the entire survey limits showing high points, low points, grade changes, (and) at appropriate intervals.
J. Provide main floor elevations of buildings.
K. Location and elevation of lakes, rivers, streams, or drainage courses on or near the surveyed parcel.

L. Description, location, and elevation of bench marks used in the survey.
M. All optional items required in Section 9.

8. POSITIONAL ACCURACY

The following relative positional accuracies are provided as a guideline for topographic surveys.

Contour Interval/	Vertical Pos. Accuracy, m	Horizontal Pos. Accuracy, m
Spot elevations		
(Contour line) 0.25m (interval)	+0.10 m	± 0.30 m
(Contour line) 0.50m (interval)	± 0.40 m	± 0.60 m
(Contour line) 1.0m (interval)	± 0.80 m	± 1.20 m
(Contour line) 5.0m (interval)	± 1.00 m	± 1.20 m
(Contour line) 10.0m (interval)	± 2.00 m	± 2.50 m
Floor elevations	± 1.25 cm	± 0.30 m
Spot paving elevations	± 1.25 cm	± 0.30 m
Spot ground elevations	± 6.00 cm	± 0.60 m
Sewers invert elevations	± 1.25 cm	± 0.30 m
Well defined planimetric features	± 2.50 cm	± 0.30 m

*Accuracy is given at the 95 percent confidence level, (see section V.2.D).

9. OPTIONAL ITEMS

The following items may be included in the requirements to be shown on a topographic survey if specifically and mutually agreed upon by the client and surveyor:

A. Boundary survey of the parcel. (Must comply with boundary survey standards)
B. Plot the location of easements and rights-of-way physically pres ent or evidenced by a recorded document provided by the client. The reference document number of each of these shall be shown.
C. Neighborhood map with subject property highlighted.
D. Observable evidence of site use as a solid waste dump, sump, or sanitary landfill.
E. Observable evidence of recent earthwork, borrow, or fill.
F. Location and the top elevation of soil borings or monitoring wells if ascertainable. (Performed by others)

G. Location and elevation of at least one bench mark within the lim

its of the survey.

H. Elevations at the inside of sidewalks, top of curbs, and gutters at appropriate intervals at the final map scale.
I. Dimensions of curb, sidewalk, and gutter lines, or ditch lines and centerline of all streets, alleys or roads adjoining the parcel. Indi cate type of paving surface and condition.
J. Perimeter outline only of thickly wooded areas unless otherwise directed.
K. Electric utilities – the location of power poles, guy wires, anchors, vaults, etc., on the parcel or on the streets, roads, alleys, or railroad right of way adjoining the parcel.
L. Storm, sanitary or combined sewers – the location of all observ able manholes and other structures such as culverts, headwalls, catch basins and clean-outs on the parcel or on streets, roads alleys or railroad right of way adjoining the parcel. Include elevations of the top and bottom of manholes and catch basins. Show type, size, material, direction of flow, and invert elevation of all pipes or culverts.
M. Water – the location of any water valves, standpipes, regulators, fire hydrants, etc. that are visible on the parcel.
N. Gas – the location of all valves, meters, and gas line markers that are visible on the parcel. Show elevation on top of any valves.
O. Telephone – the location of all poles, manholes, boxes, etc that are visible on the parcel.
P. Street lighting – the location of all lighting poles, boxes etc
Q. Location and dimensions of any existing buildings, tanks, fences, miscellaneous structures, driveways, or other constructions within the parcel.
R. Location and elevation of the 100 year flood boundary, if applicable for the surveyed parcel.
S. Location and elevation of swamps, or wetland limits as determined by qualified experts .
T. Location of visible rock formations, or outcrops.

10. ELECTRONIC DATA DISTRIBUTION

The client may request the Professional to provide the survey data in an electronic format. These formats include, but are not limited to, such files as CAD drawing files, digital terrain model (DTM) files, or digital elevation model (DEM) files. These files, only benefit(s) the client for the specific survey. In every case the Professional shall also provide a signed and sealed hard copy drawing or representation of the survey. This drawing shall be the official plat or map and shall be deemed to be correct and superior to the electronic data. The electronic data file shall also contain a statement that the file is not a certified document and that the official document was issued and sealed by (name and registration number of the Professional)

on (date). The Professional may also need to address additional liability issues in an appropriate contract language.

IV. LAND INFORMATION OR GEOGRAPHIC INFORMATION SYSTEM SURVEYS STANTARDS

1. INTRODUCTION:

This standard is written to provide the professional, with the legal authority to practice the profession of Land Surveying in the Commonwealth of Puerto Rico, with (a) guidelines for producing (an) adequate surveys that provide the location of infrastructure information used in a Land Information System (LIS) or a Geographic Information System (GIS). The primary objective of this standard is to insure that surveyed information in LIS/GIS is reliable and can be used to make definitive decisions. These standards are not to be used in place of professional judgment.

2. THE SURVEY:

The Professional shall select the proper equipment and methods necessary to achieve at least the Minimum Horizontal and Vertical Accuracy required in Sections IV.6 and IV.7 of these standards. The survey work will be executed in a professional manner by the Surveyor or by personnel under the direct personal supervision of the Surveyor.

3. COORDINATE SYSTEM AND DATUM:

Horizontal coordinate values should be in the North American Datum of 1983 (NAD 83) latest revision. Vertical coordinate values shall be in the National Geodetic Vertical Datum of 1929 (NGVD 29) or (the) mean sea level, (MSL). If coordinates are not referenced to the above-mentioned coordinate systems, the parameters needed to transform the local datum to the above-mentioned coordinate systems must be given. Coordinates shall be given in metric units. Unless otherwise defined, the preferred unit is the meter.

4. THE SURVEY REPORT:

The results of the survey shall be given to the client in either the form of a plan (drawing) or in digital format, or both, as established in the contract. The following information shall be included in the plan (drawing) and/or in the Metadata:

A. The accuracy classification to which the data was gathered and positional accuracy obtained.
B. The methods used to obtain the data (such as EDM, GPS, etc.)
C. Date of the survey work.
D. Datum(')s used for the survey.

5. ACCURACY STANDARD:

The minimum positional accuracy of the survey data is a Geospatial Positional Accuracy that is relative to the mapping scale, and therefore it is the accuracy of the base map on which the GIS/LIS is based. The reporting methodology shall be in accordance with the Federal Geographic Data Committee, Geospatial Positioning Accuracy Standards, and Part 1 Reporting Methodology. The Geospatial Position Accuracy shall be reported by positional accuracy as defined in two components: horizontal and vertical. Horizontal Positional Accuracy is the radius of the circle of uncertainty, such that the true or theoretical location of the point falls within that circle 95-percent of the time. Horizontal Accuracy may be tested by comparing the planimetric coordinates of surveyed ground points with the coordinates of the same points from an independent source of higher order. Vertical Positional Accuracy is a linear uncertainty value, such that the true or theoretical location of the point falls within +/-of that linear uncertainty value 95-per cent of the time. Vertical Accuracy may be tested by comparing the elevation of surveyed ground points with the elevations of the same point determined from a source of higher accuracy.

6. MINIMUM HORIZONTAL ACCURACY

The horizontal accuracy is based upon the American Society of Photogrammetry and Remote Sensing (ASPRS) Standards for Class 2 and reported in agreement with the National Standard for Spatial Data Accuracy. The NSSDA Horizontal Positional Accuracy Statistic at the 95% confidence level is determined by multiplying the Root Mean Square Error (RMSE) of the data set by 1.7308.

Acceptable

Base Mapping Scale of LIS/GIS	Positional Accuracy Statistic of Survey Data
1:250	0.20 m
1:600	0.50 m
1:1,000	1.10 m
1:2,500	2.10 m
1:5,000	4.20 m
1:6,000	5.25 m
1:12,000	10.50 m
1:25,000	21.0 m

7. MINIMUM VERTICAL ACCURACY

The vertical accuracy is based upon the ASPRS Standard for Class 1 and reported in agreement with the National Standard for Spatial Data Accuracy. The NSSDA Vertical Positional Accuracy Statistic at the 95% confidence level is determined by multiplying the Root Mean Square Error (RMSE) of the data set by 1.9600.

Acceptable

Base Mapping Contour Interval	Positional Accuracy Statistic of Survey Data
0.25 m	0.21 m
0.50 m	0.40 m
5.00 m	3.00 m

V. POSITIONAL ACCURACY DEFINITIONS AND PROCEDURES STANDARDS

1. INTRODUCTION

Modern surveying standards use the concept of positional accuracy instead of error of closure. Although the concepts of positional accuracy are well known and completely discussed in surveying textbooks, it is important that the concepts and procedures be discussed as part of

these standards. The surveying methods used by the professional, with the legal authority to practice the profession of Land Surveying in the Commonwealth of Puerto Rico, vary with the purpose of survey to be made and the equipment to be used. Also, surveying technology is constantly changing, therefore a standard for a particular type or class of survey cannot specify blanket-type methods or equipment unless it becomes obsolete even before it is adopted. A modern standard must be limited to a general description of the survey along with reporting and accuracy requirements. A survey standard should tell (1) what the survey is to accomplish and what items are to be investigated, (2) how the results are to be reported, and (3) how accurate the results are to be. It is the responsibility of the Professional to select the appropriate procedures and equipment to obtain the accuracy required by the standard using the methods provided by the theory of observations. In other words, the Professional is expected to design a survey measurement specification that will obtain the required accuracy. A standard should not specify surveying procedures but only results. The Standards use two types of accuracy standards. Relative Positional Accuracy is used in property surveys, construction surveys and topographic surveys. Geospatial Positional Accuracy is used in mapping, geographic in-

formation systems (GIS), and geodetic control surveys.

2. RELATIVE POSITIONAL ACCURACY

A. Definitions

Relative Positional Accuracy is a value expressed in meters that represents the uncertainty of the location of any point in a survey relative to any other point in the same survey at the 95 percent confidence level. Therefore it is also the accuracy of the distance between all points on the same survey. Relative Positional Accuracy may be tested by comparing the relative location of points in a survey as measured by an independent survey of higher accuracy. The comparison should include the measurement of both distances and directions. Relative Positional Accuracy may also be tested by the results from a minimally constrained, correctly weighted least squares adjustment of the GPS survey data. Note that sufficient redundancy in the survey measurements is required, if accuracy is to be tested this way, so as to make the application of the least squares adjustment a valid process. For traverses and other surveys, relative positional accuracy, may be gained from an analysis of the adjustment residuals together with the cofactor matrices.

B. Design of a measurement specification

The IA/CIAPR Standards define the level of accuracy that should be obtained in the survey and not survey procedures. Accuracy is the deviation of survey measurement of quantities such as distances, angles or elevations from the "correct" values. The Surveyor has two responsibilities with regard to the accuracy of a survey. First, the Surveyor must use his or her judgment and experience, and the theory of observations to determine what procedures and equipment are necessary to obtain the required accuracy. Second, the Surveyor must test the accuracy of the completed survey measurements. The Surveyor is the expert in land measurements and this expertise is used to develop a measurement specification for the survey. This specification describes the equipment and procedures to be used in the field survey. The equipment to be used will, to a large extent, determine the methods that are to be followed. The surveyor should be guided by experience, computations and the recommendations of the equipment manufacturer and the ISO standards in the development of these specifications. Theory of observation analysis computations can be used to determine what accuracy can be expected with the procedures and equipment prescribed in the specifications, as determined by the surveyor. The Surveyor is not expected to make these computations for every survey. The scope,

extent, requirements and objectives of many surveys are of a repetitive nature and therefore the same specifications can be used on similar surveys. The theory of observations analysis computations are fully discussed, and examples are given, in many surveying textbooks and printed articles. The measurement specifications should be designed so that the accuracy of the measurements meet or exceed the positional accuracy required in IA/CIAPR the Standards. It is very likely that each Surveyor will have a specification for various sizes and types of surveys. In any event the Surveyor should know what accuracy he or she can expect with the procedures and equipment selected. Survey measurement specifications must cover some of following items:

1) Periodic testing of EDM equipment over an approved base line such as specified by the FGCC.
2) Accurately taking into account atmospheric conditions.
3) Periodic testing of the optical plummet
4) Using the correct prism constant for the equipment chosen.
5) Calibration and testing of steel tapes.
6) Examination and testing of the adjustment and performance characteristics of survey equipment and accessories to verify that the errors resulting from using them according to the Surveyor's procedures are within the error that the specifications allow.
7) Periodic adjustment of equipment by the surveyor (or workshops specializing in such work,) when examination and testing indicates a need for such adjustment or when good practice indicates that sufficient time has elapsed since the last adjustment.

C. Testing the completed survey

The Surveyor must check the survey work to insure that the intended acuracy is being achieved. Most standards in the past used relative error of closure as a measure of the quality of the survey. That was because many surveys were based upon traverse procedures and systematic effects were not always taken into consideration. Many standards were issued by federal and other agencies for the same reasons, even though these took systematic effects into consideration and therefore an absolute accuracy was obtained. The Surveyor in private practice today performs many surveys that contain measurements that do not result in a closed traverse. This is a result of new equipment and changes in the computing capability available today. Relative error of closure is primarily a measure of the consistency of measurements because systematic effects are not taken into account, but it also can be a valuable tool in testing for accuracy. Relative Positional Accuracy does not pertain to the location of a particular point or corner in the world but to the relative accuracy of

the measurements used in the survey. Therefore a good test of the relative positional accuracy is to take check measurements of some of the distances or angles in the survey. The Surveyor should check his or her survey fieldwork by taking redundant measurements whenever possible. This is not a new concept. It has always been (one of) the best way(s) to make sure that the fieldwork has met the quality that was expected. This does not mean that every survey must have a series of detailed checks. The Surveyor must realize that when a statement is made or inferred that the survey meets a specific standard, the Surveyor has the responsibility to be certain that it actually does meet that standard. There are many opportunities to check the quality of the survey. For example, in laying out a rectangle (stake out of a building), one of the final checks the Surveyor will probably use before concluding that the work meets the accepted standards to measure and compare the length of the diagonals of that rectangle. The Surveyor can easily compute this length (of the diagonals) and this can be compared with what was measured. In fact just comparing each of the diagonal measurements against each other is important. The allowable variation between the computed diagonal and the measured diagonal or the allowable variation between the two diagonals is a measure of the accuracy of the survey work. The variation should be less than the positional accuracy specified in the standard. The surveyor will also know from developing the measurement specification and from experience what variation can be expected, and anything that is greater than that value would cause the original measurements to be suspect. There are many instances when distances are obtained by indirect measurements. For example a radial survey used to lay out the lot corners in a lot subdivision. The actual distance between the exterior corners and the lot corners are not directly measured in the field. The Surveyor can check the quality of work by directly measuring some of the lines that were indirectly determined. When radial survey procedures are used the Surveyor recognizes that the distances to be shown on the plat are indirectly determined. As many as possible of those indirect distances should be directly measured to check that the procedures have produced the required accuracy. The positional accuracy standard is a yardstick by which the Surveyor can judge the quality of the work. The result of the Surveyor's comparison between the computed (measurement) and (the) actual measurement must be within the guidelines given in the standards. This comparison not only checks the quality of the distance measurements but also the quality of the angles.

D. Confidence levels

Most standards in use today are specified at the 95 percent confidence level. This means that if we have a measured distance of 300m with stated reliability of plus or minus 0.03m at 95 percent confidence level we can be confident that a measurement of that line will be between

299.97m and 300.03m 95 times out of 100. As a practical matter a Surveyor does not measure a line 100 times. The Surveyor makes one high quality check measurement. The Surveyor makes the assumption that this check measurement is the "correct" value. The difference between the "correct" distance and the calculated distance is assumed to be an approximation of the standard deviation. The 95 percent confidence interval value will be approximately 2 times the approximate standard deviation. This double value is the value that is compared to the Standard. It must be pointed out again that the check measurements should be a very reliable measurement based upon a specification that will provide accuracies better than those being checked.

3. GEOSPATIAL POSITIONAL ACCURACY FOR SPATIAL DATA

A. Definitions

The Geospatial Position Accuracy shall be reported by positional accuracy as defined in two components: horizontal and vertical. Horizontal Positional Accuracy is the radius of the circle of uncertainty, such that the true or the theoretical location of the point falls within that circle 95-percent of the time. Horizontal Accuracy may be tested by comparing the planimetric coordinates of surveyed ground points with the coordinates of the same points from an independent source of higher accuracy. Vertical Positional Accuracy is a linear uncertainty value, such that the true or theoretical location of the point falls within the sum of the positive and negative ranges of that linear uncertainty value 95-per cent of the time. Vertical Accuracy may be tested by comparing the elevation of surveyed ground points with the elevations of the same point determined from a source of higher accuracy. The development of geographic information systems (GIS) and global positing systems (GPS) has created the need for the development of the National Standard for Spatial Data Accuracy. These national standards speak to the quality of data developed in and for GIS applications. The standards apply to both geographic data developed from map products (photogrammetry) and from survey data to be used in a GIS.

B. Design of (a) measurement specifications

The design of survey measurement specifications is the responsibility of the Surveyor. The equipment and methods in this area of professional surveying is new and ever changing. The Surveyor should be guided by the latest published methodologies and the recommendations of the equipment manufacturer and the ISO. The Surveyor should develop methods to test procedures before they are used in an actual survey situation.

C. Testing the completed survey

The geospatial data set is tested by comparing the coordinates of several points within the data set to the coordinates of the same points from a control data set of greater accuracy. The points used in the test must be well defined and easy to measure both in the field and on the digital data product. The control data set must be of a higher quality than the data being tested. It is best that the quality of the control data set be at least twice as accurate as the expected accuracy of the data set being tested. The control data set should uniformly cover the area of the data being tested and there should be a sufficient number of points to determine statistically valid results. The positional accuracy statistic is computed for the data being reviewed. This statistic is a value for all the data, not for individual data. It is actually the Root Mean Square Error (RMSE) for the data. The value of the statistic is compared with the positional accuracy value in the standards.

4. GEOSPATIAL POSITIONAL ACCURACY FOR GEODETIC NETWORKS

A. Definitions

The national standard is published by the FGDC as the Draft Geospatial Positioning Accuracy Standards, Part 2: Standards for Geodetic Neworks – December 1996. These standards define the accuracy that is to be evaluated. They are as follows:

The local accuracy of a control point is a value expressed in centimeters that represents the uncertainty in the coordinates of the control point relative to the coordinates of other directly connected, adjacent control points at the 95- percent confidence level.

The network accuracy of a control point is a value expressed in centimeters that represents the uncertainty in the coordinates of the control point with respect to the geodetic datum at the 95- percent confidence level.

B. Design of a measurement specificationFor a detailed description of this standard please refer to the FGDC standards.

C. Testing the completed survey

Relative accuracies of geodetic control surveys are tested by the results of a minimally constrained, least squares adjustment of the survey measurements. Both the local accuracy and the network accuracy should be reported for horizontal control, ellipsoidal height, and orthometric height. For details see the FGDC standard.

VI. RECOMMENDED PRACTICE FOR CONTRACTING PROFESSIONAL LAND SURVEYING SERVICES

1. Introduction

Before performing any professional services, authorized professionals shall coordinate with their clients and provide them with detailed information in writing with regard to:

- **Nature or purpose of the survey and scope of the work**
- **Information to be exchanged between both parties**
- **Expected final delivery, quantity, quality, and format.**
- **Approximate time of execution**
- **Applicable regulations**
- **Services not included**
- **Client responsibilities**
- **Estimated professional fees**
- **Terms of payment**

A typical model contract follows, it should be used as a template and modified to suit a specific survey needs:

Contract for Professional Land Surveying Services

Date: _____

Contracting Client
Name:_____
Address:_____
_____
Phone: _____E-mail Address:_____

Authorized Professional

Name: _____License Number: _____
Address: _____
_____
Phone: _____E-mail Address: _____

Scope of Work

Project or parcel name: _____
Location: _____
General Description of existing conditions: _____
_____

I. Type of Survey

(choose the ones that apply)

_____ 1. Boundary or area determination survey of a tract of land with an area of _____(unit of area), according to provided documents.

_____ 2. Sub-division of ___ lots.

A._____Sub-division and inscription plans.
B._____Lot corners and lot sub-division layout.
C._____Preparation of related documents.
a._____Sub-Division
b._____Preliminary Development

c. _____Puerto Rico Planning Board Consultation

D. Procurement of permits and endorsements from Government agencies

a._____PRASA
b._____PREPA
c._____EQB

d._____DNER
e._____PRHTA
f._____ other:_____

_____3. Topographic survey of a tract of land _____sq. mts.
_____4. Hydrographic survey of an area of approximately _____ sq mts.
_____5. Photogrammetric survey of an area of approximately_____ _____sq mts.
_____6. GIS/LIS Survey of an area of approximately_____ sq.mts.
_____7. Construction Layout Survey_____
_____8. Other type of survey_____

II. Specific Requirements

_____
_____
_____

III. Special Instructions

1. Expected product or delivery and format. _____
_____
2. Client responsibilities:_____
_____
_____
3. Services not included:_____
_____

IV. Remarks

1. Estimated starting date for the survey: _____
2. Estimated completion date for the survey: _____
3. Estimated date for the final delivery. _____
4. Estimated fee or agreed price: $ _____

5. Payment Method: _____

6. Schedule of Payments: _____

ACCEPTANCE OF CONTRACT OR AGREEMENT

This contract has been property and thoroughly explained to the signing contracting client. The contracting client, as well as the authorized professional agree upon and accept this contract, so stating with their signatures.

_____	_____
Date:___/___/_____	Date:__/__/_____
Contracting Client	Authorized Professional

2. FEES

The fees described herein are based upon the premise of reimbursing the Professional for all expenses he/she may have incurred into in the performance of these services and allowing an adequate profit, which is air and reasonable for both parties.To this effect, three methods of compensation have been established:

A. By Unit (of) Work; this method shall be used exclusively for surveying and topography services related lots and land property, in roadway studies or in any type of work where specific guidelines exist. Fees for any other type of service shall be established based on methods B. and C that follow.
B. Reimbursement of all expenses plus a fair and reasonable profit.
C. Salary reimbursement (Payroll Costs) for those costs incurred into in carrying out the work, multiplied by a factor, plus direct costs.
D. The end result of negotiations carried out based upon methods “B” or “C”(of this section) shall never be less than the (per unit of) work) guidelines.

EXHIBIT 1

BOUNDARY OR AREA DETERMINATION SURVEYS

I. FIXED FEE:
FOR *HORIZONTALLY REFERRING THE SURVEY TO THE STATE PLANE COORDINATE(S) SYSTEM, LAMBERT CONFORMAL CONIC PROJECTION, NORTH AMERICAN DATUM OF 1983 (NAD 83 latest revision).(NAD83)

$1,900.00

FOR ESTABLISHING A HORIZONTAL CONTROL BASE LINE WITH A MINIMUM HORIZONTAL POSITION ACCURACY IN COMPLIANCEWITH IA/CIAPR STANDARDS OF PRACTICE, FORLAND SURVEYS.

*IN COMPLIANCE WITH PR LAW # 264, NOVEMBER 16, 2002, ALL SURVEY PROJECTS THAT ARE SUBMITTED TO GOVERNMENT AGEN-CIES MUST BE TIED TO THE ABOVE MENTIONED COORDINATE SYSTEM.

II. VARIABLE FEE
VARIABLE FEE, FOR A BOUNDARY OR AREA DETERMINATION SURVEY,SHALL BE CALCULATED IN TERMS OF PERIMETER LENGTH USING THE BASE (Suburban Surveys) COST OF $5.50 PER LINEAR METER OF THE PERIMETER TO BE SURVEYED.

Urban Surveys (Constant K = 1.2) - Urban Surveys are performed on land lying or adjoining a city or town, and include commercial and industrial properties condominiums, townhouses, apartments and other multi-unit developments, regardless of geographic location. All ALTA/ACSM Land Title Surveys are included in this classification.

Suburban Surveys (Constant K = 1.0) - Suburban Surveys are performed on land lying outside of urban areas and developed for single family residential use.

Rural Surveys (Constant K = 0.8) - Rural Surveys are performed on undeveloped land lying outside of urban and suburban areas such as farms.

1) WHEN PERIMETER LENGTH IS KNOWN:

a) Fee = PERIMETER LENGTH (IN METERS) X $ 5.50

2) WHEN AREA IS KNOWN:

a) AREA IN CUERDAS

Fee = ([√ (CUERDAS x 3930.3956)] x 4) x $5.50

b) AREA IN SQUARE METERS

Fee = ([√ (SQUARE METERS)] x 4) x $5.50

TOTAL FEE:

Fixed Fee + (Variable Fee x Constant K)

EXHIBIT 2

TOPOGRAPHIC SURVEYS

I. FIXED FEE:

TO GEODETICALLY REFER THE SURVEY TO STATE PLANE COORDINATE(S) SYSTEM, LAMBERT CONFORMAL CONIC PROJECTION, AND NORTH AMERICAN DATUM OF 1983 (NAD 83 latest revision) (NAD 83). IN ADDITION RERERRING VERTICALLY TO MEAN SEA LEVEL, (MSL), NATIONAL GEODETIC(AL) VERTICAL DATUM OF 1929 OR BETTER.

$2,500.00

TO ESTABLISH A GEODETIC(AL) CONTROL BASELINE WITH AMINIMUMHORIZONTAL AND VERTICAL POSITIONAL ACCURACY IN COMPLIANCE WITH IA/CIAPR STANDARDS OF PRACTICE, FOR LAND SURVEYING.

*IN COMPLIANCE WITH PR LAW # 264, NOVEMBER 16, 2002, ALL SURVEY PROJECTS SUBMITTED TO GOVERNMENT AGENCIES MUST BE TIED TO THE ABOVE MENTIONED COORDINATE SYSTEM.

II. VARIABLE FEE:

VARIABLE FEE, FOR A TOPOGRAPHIC SURVEY, SHALL BE CALCULATED IN TERMS OF THE AREA TO BE SURVEYED IN *CUERDAS.

AREA (CUERDAS)	**FEE**
THE FIRST "CUERDA":	**$900.00**
ADDITIONAL "CUERDA" OR FRACTION THERE OF:	**$450.00 EACH**

TOTAL FEE:
Fixed Fee + (Variable Fee x Constant K)

Urban Surveys (Constant K = 1.2) - Urban Surveys are performed on land lying or adjoining a city or town, and include commercial and industrial properties condominiums, townhouses, apartments and other multi-unit developments, regardless of geographic location. All ALTA/ACSM Land Title Surveys are included in this classification.

Suburban Surveys (Constant K = 1.0) - Suburban Surveys are performed on land lying outside of urban areas and developed for single family residential use.

Rural Surveys (Constant K = 0.8) - Rural Surveys are performed on undeveloped land lying outside of urban and suburban areas such as farms.

EXHIBIT 3

BOUNDARY OR AREA DETERMINATION SURVEY AND TOPOGRAPHIC SURVEY, PERFORMED SIMULTANEOUSLY

NOTE:
ALSO APPLIES TO AS BUILT AND H-H SURVEY STUDIES.

I. FIXED FEE:

TO GEODETICALY REFER THE SURVEY TO STATE PLANE COORDINATE(S) SYSTEM, LAMBERT CONFORMAL CONIC PROJECTION, AND NORTH AMERICAN DATUM OF 1983 (NAD 83 latest revision) NAD 83,). IN ADDITION RE-

RERRING VERTICALLY TO MEAN SEA LEVEL (MSL), NATIONAL GEODETIC(AL) VERTICAL DATUM OF 1929 OR BETTER.

$2,500.00

TO ESTABLISH A GEODETIC(AL) CONTROL BASELINE WITH A MINIMUN HORIZONTAL AND VERTICAL POSITIONAL ACCURACY IN COMPLIANCE WITH IA/CIAPR STANDARDS OF PRACTICE, FOR LAND SURVEYS.

*IN COMPLIANCE WITH PR LAW # 264, NOVEMBER 16, 2002, ALL SURVEY PROJECTS SUBMITTED TO GOVERNMENT AGENCIES MUST BE TIED TO THE ABOVE MENTIONED COORDINATE SYSTEM.

II. VARIABLE FEE:
VARIABLE FEE, FOR A BOUNDARY OR AREA DETERMINATION SURVEY(S)AND TOPOGRAPHIC SURVEY(S), PERFORMED SIMULTANEOUSLY, SHALL BECALCULATED BY ADDING THE RESULTS OF PART II EXHIBIT 1 AND PART II EXHIBIT 2.

TOTAL FEE:
Fixed Fee + (Variable Fee x Constant K)

Urban Surveys (Constant K = 1.2) - Urban Surveys areperformed on land lying or adjoining a city or town, and includecommercial and industrial properties condominiums, townhouses,apartments and other multi-unit developments, regardless of gegraphic location. All ALTA/ACSM Land Title Surveys are included in this classification.

Suburban Surveys (Constant K = 1.0) - Suburban Surveys are performed on land lying outside of urban areas and developed for single family residential use.

Rural Surveys (Constant K = 0.8) - Rural Surveys are performed on undeveloped land lying outside of urban and suburban areas such as farms.

EXHIBIT 4

BOUNDARY OR AREA DETERMINATION SURVEY FOR A GROUP OF PACELS.

STEPS FOR ESTIMATING THE FEE

1) CALCULATE THE FEE FOR EACH PARCEL USING EXHIBIT I

2) ADD ALL PARTIAL FEES TO OBTAIN A SUBTOTAL FEE.

3) CALCULATE THE FEE FOR A PARCEL OR LOT WITH AN AREA

4) ADD FEES CALCULATED IN STEP 2 AND STEP 3 TO OBTAIN THE TOTAL FEE.

5) FEE FOR SURVEYING THE GROUP = [(TOTAL FEE FROM STEP 4) /2]

EXAMPLE:
LAND PARCEL WITH UP TO 50 "CUERDAS" COMPOSED OF FOUR (4) OF THE FOLLOWING LAND PARCELS:

12 CUERDAS	$4,777.84
18 CUERDAS	$5,851.63
4 CUERDAS	$2,758.49
16 CUERDAS	$5,516.97
SUBTOTAL =	$18,904.93
FEES PER LAND PARCEL OF 50 "CUERDAS" =	$ 9,752.72
TOTAL =	$28,657.65

$28,657.65 / 2 = **$14,328.83 = SURVEY FEE(S) FOR GROUP**

EXHIBIT 5

ROUTE SURVEY FOR EXISTING OR PROPOSED URBAN AND RURAL ROADS OR UTILITY ROUTES

I. FIXED FEE:

REFER THE SURVEY TO STATE PLANE COORDINATE(S) SYSTEM, LAMBERT CONFORMAL CONIC PROJECTION, AND NORTH AMERICAN DATUM OF 1983 (NAD 83 latest revision) (NAD83). IN ADDITION RERERRING SYSTEM VERTICALLY TO MEAN SEA LEVEL (MSL), NATIONAL GEODETIC VERTICAL DATUM OF 1929 OR BETTER.

$2,500.00

TO ESTABLISH A GEODETIC CONTROL BASELINE WITH A MINIMUN HORIZONTAL AND VERTICAL POSITIONAL ACCURACY IN COMPLIANCE WITH STANDARDS OF PRACTICE, OF LAND SURVEYS.

*IN COMPLIANCE WITH PR LAW # 264, NOVEMBER 16, 2002, ALL SURVEY PROJECTS SUBMITTED TO GOVERNMENT AGENCIES MUST BE TIED TO THE ABOVE MENTIONED COORDINATE SYSTEM.

II. VARIABLE FEE:

THE FEE FOR ROUTE SURVEYS FOR EXISTING OR PROPOSED URBAN AND RURAL ROADS OR LINEAR UTILITY WILL DEPEND UPON THE DISTANCE TO BE SURVEYED, AS WELL AS THE WIDTH OF THE CORRIDOR OR ROUTE.

STEPS FOR CALCULATING THE FEE

1) DETERMINE THE DISTANCE AND WIDTH TO BE SUREYED
2) DETERMINE THE AREA TO BE SURVEYED (DISTANCE X WIDTH).
3) CALCULATE FEE ACCORDING TO EXHIBIT 3.II.

TOTAL FEE:

Fixed Fee + (Variable Fee x Constant K)

NOTE:
THIS EXHIBIT APPLIES FOR SANITARY SEWER SYSTEMS, AQUEDUCTS, WATER LINES, URBAN ROADS, RURAL ROADS, AND LEVELING SURVEY STUDIES.

EXHIBIT 6

THE SURVEYOR AS AN EXPERT WITNESS IN A COURT OF LAW (EXPERT ASSISTANCE IN COURTS OF JUSTICE)

I. STUDY, RESEARCH (INVESTIGATION) AND CONSULTING SERVICES	$75.00 P/HOUR
II. FIELD VISITS	$75.00 P/HOUR
III. DATA GATHERING(OF DATA) (1 SURVEY CREW)	$75.00 P/DAY
IV. OFFICE WORK AND DRAWINGS	$75.00 P/HOUR
V. SURVEY CREW TO ESTABLISH BOUNDARIES OR PROPERTY	$700.00 P/DAY MATERIALS COSTS
VI. VISIT TO A COURT OF LAW (JUSTICE)	$150.00 P/HOUR

NOTE:
ALL PER HOUR ITEMS WILL BE BILLED AT MINIMUM OF FOUR HOURS. ALL PER DAY ITEMS WILL BE BILLED AT A MINIMUM OF ONE DAY.

EXHIBIT 7

TREE INVENTORY, AS REQUIRED BY CODE # 25 OF THE PUERTO RICO PLANNING BOARD

FEES

FROM 1 TO 100 TREES

THE FIRST 25 TREES $900.00
ADDITIONAL $20.00 EACH

FROM 101 TO 500 TREES

THE FIRST 100 $2,400.00

ADDITIONAL $10.00 EACH

FROM 501 TO 1,000 TREES

THE FIRST 500 $6,400.00
ADDITIONAL $8.00

BOUNDARY OR AREA DETERMINATION SURVEYS, TOPOGRAPHIC SURVEYS AND/OR GEODETIC CONTROL BASE LINE ESTABLISHMENT SHALL BE QUOTED SEPARATELY, USING EXHIBIT 1, 2, 3.

EXHIBIT 8

PHOTOGRAMMETRIC SURVEYS

THE PHOTOGRAMMETRIC SURVEYS CONSIDERS THE FOLLOWING TASKS:

- **FLIGHT PLANNING AND OPERATION**
- **PHOTOGRAPHIC LABORATORY PROCESSING**
- **GROUND CONTROLS**
- **DATA COMPILATION**

COST OF PHOTOGRAMMETRIC SURVEYS WILL BE BASED UPON THE NUMBER OF STEREOSCOPIC MODEL REQUIRED.

THE NUMBER OF MODELS REQUIRED DEPENDS UPON THE AERIAL PHOTOGRAPHY NEGATIVE SCALE. THE NEGATIVE SCALE REQUIRED IS DETERMINED BASED UPON THE FOLLOWING CRITERIA:

- **MAP PURPORSE**
- **(TRUE) CONTOUR INTERVAL**
- **FINAL MAP SCALE**
- **AMOUNT OF DETAIL REQUIRED**
- **POSITIONAL ACCURACY**

I. FEE STRUCTURE:

- **SETUP FEE.....$1,900.00**
- **PER MODEL.....$2,700.00**
- **ORTHO PHOTOGRAPHY PER MODEL (ADDITIONAL).....$1,300.00**

ITEMS NOT INCLUDED IN THE COST PER MODEL:

- **FIELD COMPLETION**
- **FINAL MAPPING**

TRAVEL AND PER DIEM EXPENSES ARE NOT INCLUDED. THESE EXPENSES VARY ACCORDING TO (THE) JOB SITE LOCATION AND IT MAY BE NECESSARY TO COMPLETE THE FOLLOWING TASKS.

- **AERIAL PHOTOGRAPHY**
- **GROUND CONTROL**
- **FIELD EDITION**

EXAMPLES

(True) Contour Interval mts	Final Map Scale	Negative Scale	Area per Model (Cuerdas)	Expected Accuracy
2	1:2,000	1:16,000	820	Less that ½ Contour interval
1	1:1,000	1:8,000	200	-
0.5	1;500	1:4,000	50	-

A "C" FACTOR OF 1200 WAS USED FOR THESE CALCULATIONS.

EXHIBIT 9

HYDROGRAPHIC SURVEYS

THE HYDROGRAPHIC SURVEYS CONSIDERS THE FOLLOWING TASKS:

- **OFFSHORE PLATFORM AND SETUP**
- **HORIZONTAL & VERTICAL CONTROL**
- **DATA COMPILATION**
- **DATA PROCESSING**
- **FINAL MAPPING**

COST OF HYDROGRAPHIC SURVEYS WILL BE BASED ON AREA AND TYPE OF SURVEY:

TODAY, A TYPICAL HYDROGRAPHIC CONDITION SURVEY IS PERFORMED USING HIGHLY SOPHISTICATED ELECTRONIC EQUIPEMENT FOR BOTH. THE DEPTH MEASUREMENTS AND VESSEL POSITIONING. PLANNING OF SUCH A SURVEY INVOLVES THE ESTABLISHMENT OF A GRID AND OR A CROSS SECTION FORMAT TO COVER THE SUBJECT AREA ON A BODY OF WATER.

DEPENDING ON THE PURPOSE AND TYPE OF SURVEY THE CROSS SECTION OR GRID MAY VARY IN DENSITY TO HAVE MORE OR LESS DATA ACCORDING TO SPECIFICATIONS BY THE FINAL USER.

OTHER CONSIDERATIONS FOR THE TYPICAL HYDROGRAPHIC SURVEY IS THE CONSISTENCY OF THE SEA FLOOR OR BOTTOM MATERIAL (CONSIS TENCY).

THIS DETERMINES THE SOUNDER OR FREQUENCY REQUIRED FOR THE SURVEY.

MULTIBEAM SURVEYS, IS A VERY DENSE DATA POINTS BLANKET OF THE SEA FLOOR. THIS TYPE OF SURVEY IS USED TO CONFIRM AND EVALUATE THE SEA BOTTOM IN DETAIL. THIS SURVEY SERVES AS A VALUABLE TOOL BEFORE AND AFTER DREDGING ACTIVITIES PROVIDING DATA POINTS ON A 2.5 FEET GRID THROUGHOUT THE ENTIRE SURVEY AREA.

I. FEE STRUCTURE:

- **SETUP FEE.....$3,900.00**
- **PER LINEAL FEET OF SINGLE BEAM SURVEY.....$0.15**

- **PER LINEAL FEET OF MULTIBEAM SURVEY(Additional).....$0.25**

TRAVEL AND PER DIEM EXPENSES ARE NOT INCLUDED, SHALL BE QUOTED SEPARATELY.

EXHIBIT 10

GLOBAL POSITIONING SYSTEM STUDIES

GLOBAL POSITIONING SYSTEM, (GPS) STUDIES SHALL BE QUOTED IN ACCORDANCE WITH IA/CIAPR STANDARDS OF THE PRACTICE OF LAND SURVEYING, SECTIONS "VI.2.B" OR "VI.2.C". THE SPECIFIC SECTION WILL DEPEND UPON THE AGREEMENT BETWEEN THE LAND SURVEYOR AND HIS/HER CLIENT. ALL GPS STUDIES MUST COMPLY WITH THE APPLICABLE POSITIONAL ACCURACY STATED IN THE IA/CIAPR STANDARDS FOR THE PRACTICE OF LAND SURVEYING.

EXHIBIT 11

LAND SUBDIVISION FEES
PARCELS OR LOTS

AREA IN SQUARE METERS (M²) OF PROPOSED LOT OR PARCEL	FEE
FROM 500 TO 1000 UP TO 500 M² ADDITIONAL $0.40 PER M²	$700.00
FROM 1000 TO 2000 THE FIRST 1000 ADDITIONAL $0.20 PER M²	$900.00
FROM 2000 TO 4000 THE FIRST 2000 ADDITIONAL $0.15 PER M²	$1,100.00
FROM 4000 TO 20000 THE FIRST 4000 ADDITIONAL $0.10 PER M²	$1,400.00

NOTES:

1) WHEN PARCELS ARE LARGER THAN FIVE (5) "CUERDAS", AN ADDITIONAL COST SHALL BE QUOTED RELATED WITH THE TIME ESTIMATED IN DETERMINING BOUNDARIES AND/OR WHEN THE PLACEMENT OF CONCRETE MONUMENTS AS CORNER POINTS IS REQUESTED.

2) CLIENT SHALL BE RESPONSIBLE FOR THE COSTS OF ALL STAMPS, SUBMITTAL FEES AND/OR ECONOMIC(AL) REQUIREMENTS NEEDED TO SUBMIT SUBDIVISION PLANS TO (THE) GOVERNMENTAL AGENCIES.

3) THIS STANDARD APPLIES TO FIVE (5) OR MORE LOTS, FROM ONE (1) TO FOUR (4) LOTS THE FEE SHALL BE $900.00 PER LOT.

4) WHEN THE TOTAL NUMBER OF LOTS SUBDIVIDED FROM A TRACT OF LAND EXCEEDS THE NUMBER PERMITTED BY (THE) CODE NUMBER 3 OF THE PUERTO RICO PLANNING BOARD (10 LOTS RURAL ZONE AND 20 LOTS URBAN ZONE) THE LAND SURVEYOR SHALL CONSULT THE PUERTO RICO PLANNING BOARD.

EXHIBIT 12

PUERTO RICO PLANNING BOARD CONSULTATION FOR LAND SUBDIVISION OF PARCELS OR LOTS

FEES

LOW DENSITY PROJECTS – FROM 1 TO 9 LOTS $3,500.00

MEDIUM DENSITY PROJECTS – FROM 10 TO 20 LOTS.....$5,000.00

HIGH DENSITY PROJECTS – 21 LOTS OR MORE
MEDIUM DENSITY FEE (X) COMPLEXITY FACTOR (CF).....$5,000.00 X CF

NOTE:

THE COMPLEXITY FACTOR (CF) OF THE PROJECT SHALL BE DETERMINED BY THE LAND SURVEY BASED UPON THE NATURE OF THE PROJECT AND ITS SPECIFIC CONDITIONS.

EXHIBIT 13

PLOT PLANS OF LAND PARCELS OR LOTS

FEES

MORTAGE SURVEY PLANS

(PLOT PLAN) .....$ 125.00 P/LOT

INSCRIPTION PLOT PLAN
INCLUDES INSCRIPTION PLAN AND
THE PLACEMENT OF CONCRETE

MONUMENTS AS CORNER POINTS .....$ 450.00 P/LOT*

*THIS STANDARD APPILIES TO A MINIMUM OF SIX (6) LOTS WITH AN AVERAGE AREA OF 350 SQUARE METERS.

NOTES:


COLEGIO DE INGENIEROS Y AGRIMENSORES DE PUERTO RICO
• 1938 •