Resolution No. 02
Series of 1995
Promulgation of the Syllabi for the Subjects in the Civil Engineering Licensure Examination

WHEREAS Sec. 10 Art II of R.A. No. 544: the "Civil Engineering Law" provides the subjects in the Civil Engineering Licensure Examination;

WHEREAS the Commission has issued these policies and directives on licensure examinations: (1) emorandum Circular No. 8, Series of 1992, (2) Res. No. 265, Series of 1993, (3) Memorandum Circular No. 93-03, Series of 1993, and (4) Memorandum Circular No. 93-04, Series of 1993.

WHEREAS every syllabus for the examination subject containing the concepts/topics, with the corresponding level of knowledge/proficiency shall be the basis for the test questions that will be inputted into the test question bank; and

WHEREAS after consultation with the Department of Education, Culture, and Sports (DECS), the various schools/ colleges offering the civil engineering course, and the Philippine Institute of Civil Engineers (PICE), the board formulated its syllabi for the examination subjects.

NOW, THEREFORE, by virtue of its quasi-legislative (rule-making) power under Sec. 4, Art. II of R.A. No. 544, the Board hereby RESOLVED, as it now so RESOLVES, to adopt and promulgate the syllabi for the subjects in the Civil Engineering Licensure Examination (Annex "A").

FURTHER, RESOLVED, that his resolution, upon approval by the Commission, shall be effective after fifteen (15) days following its publication in the Official Gazette or any newspaper of general circulation, whichever is earlier.

FINALLY, RESOLVED, that this resolution be widely circularized and disseminated to all concerned through the DECS, the colleges offering the civil engineering courses, and the PICE.

Done in the City of Manila this 28th day of February, 1995.

ERNESTO S. DE CASTRO
Chairman

MACRA A. CRUZ
Member

ALBERTO S. OLAN, SR.
Member

Attested to:
CARLOS G. ALMELOR
Secretary, Regulatory Boards

Approved:
HERMOGENES P. POBRE
Commissioner

MARIANO A. MENDIETA
Associate Commissioner

ARMANDO C. PASCUAL
Associate Commissioner

Annex A
The Civil Engineering Licensure Examination Syllabi

Section 4 of the Civil Engineering Law (Republic Act 544) provides among other things the power to the Board of Examinees for Civil Engineers to discharge such other powers and duties as may affect the ethical and technological standards of the Civil Engineering profession in the Philippines. Section 10 enumerates the subjects in which the applicants for certificates of registration shall be examined at the discretion of the Board;

NOW THEREFORE, the Board of Civil Engineering, RESOLVED, as it hereby RESOLVES, that the licensure examinations for Civil Engineering shall be in accord with the following guidelines:

I. **Preparation of Examination Questions and Problems.** The following shall be taken into consideration in the preparation of questions and problems:

a. The areas covered by the examination shall be those included in the topics enumerated in the syllabus for the particular subject. The examination questions in each subject shall be comprehensive and well balanced in scope.

b. Questions and answers should relate to matters which are of general applicability in the civil engineering practice in the Philippines.

c. Questions and answers shall be framed in a clear and concise manner taking into consideration thedegree or level of proficiency for each topic. Instructions or requirements should be clearly stated.

d. The assigned weight and estimated time for each subject shall be indicated. Whenever applicable, references shall be made to statements issued by:

   a. The Board of Civil Engineering
   b. The National Building Code of the Philippines
   c. The National Structural Code of the Philippines
   d. The National Standards Office
   e. The National Water Resources Council
   f. The Philippine Institute of Civil Engineers
   g. The Associate of Structural Engineers of the Philippines.

In areas not covered by Philippine sources, references may also be made to the official pronouncement of authoritative standard setting agencies in the United States (ACI, ASCE, ASHTO, NSC, UBC), International Building Officials (IBO), and the International Federation of Engineers (FIDIC) provided these pronouncements are relevant to Philippine conditions.

e. Electronic and scientific calculators are allowed. However, programmable calculators and pocket personal computers are not allowed and will be confiscated if brought to the examination room.

II. Subjects of Examinations

Unless otherwise indicated, the topics of the subjects shall be effective in the May 1993 Licensure Examinations. The Syllabi shall be fully effective starting on the May 1994 examinations.

A. MATHEMATICS AND SURVEYING

Mathematics

1.0 Algebra
1.1 Set Theory*
1.2 Real Numbers
1.3 Algebraic Expressions and Operations
1.4 Equations and Inequalities
1.5 Roots and Powers
1.6 Linear, Quadratic and Polynomial Functions
1.7 Factoring
1.8 Roots of Algebraic Equations
1.9 System of Equations
1.10Logarithmic and Exponential Functions
1.11Arithmetic and Geometric Progressions
2.0 Trigonometry
2.1 Circular (Trigonometric) Functions
2.2 Trigonometric Identities and Equations
2.3 Solution of Triangles
2.4 Hyperbolic Functions
3.0 Analytic Geometry
3.1 Cartesian Coordinate System
3.2 Functions and Relations
3.3 Functions and their Graphs
3.4 Straight lines
3.5 Conic Sections
3.6 Polar Coordinates
3.7 Transformation of Coordinates
3.8 Parametric Equations
4.0 Calculus
4.1 Differential Equations
4.1.1 Limits and Continuity
4.1.2 Derivatives and Differentiation
4.1.3 Application of Derivatives

4.1.4 The Differential
4.1.5 Partial Derivatives
4.2 Integral Calculus
4.2.1 Theory of Integrals
4.2.2 Integration Methods
4.2.3 Definite Integrals and Applications
4.2.4 Line and Surface Integrals
4.2.5 Multiple Integrals
5.0 Differential Equations
5.1 First Order Differential Equation
5.1.1 Exact Differential Equation
5.1.2 Integrating Factors**
5.1.3 Separable Variables
5.1.4 Homogeneous Differential Equations
5.1.5 Linear Differential Equations
5.1.6 Applications
5.2 Higher Order Differential Equations
6.0 Other Topics
6.1 Infinite Series
6.1.1 Molaurin Series
6.1.2 Taylor Series
6.1.3 Fourier Series
6.2 Complex Variables**
6.3 Vector Analysis
6.4 Matrices*
6.5 Determinants*
6.6 Probability and Statistics
7.0 Engineering Economy
7.1 Present Economy Study
7.2 Time-Value Relations
7.3 Selection Among Alternatives
7.3.1 Present Worth Method
7.3.2 Annual Worth Method
7.3.3 Future Worth Method
7.3.4 Internal Rate of Return Method
7.3.5 External Rate of Return Method

Surveying

1.0 Surveying Concepts
1.1 Uses of Surveys
1.2 Operations in Surveying
1.3 Measurement and Adjustments
1.4 Field and Office Work
1.5 Surveying Instruments
2.0 Basic Surveying Measurements
2.1 Distance Measurements
2.1.1 Pacing
2.1.2 Distance Measurement with Tape
2.2 Vertical Distance Measurement; Leveling
2.3 Angle and Direction Measurement
2.3.1 Location of Points
2.3.2 Meridians
2.3.3 Bearing and Azimuth
2.3.4 Magnetic Declination
2.3.5 Instruments Used
2.3.5.1 Engineers Transit
2.3.5.2 Theodolite
2.4 Stadia and Tacheometry
2.4.1 Principles of Stadia
2.4.2 Plane Table and Alidade
3.0 Survey Operations
3.1 Traverse
3.1.1 Deflection Angle Traverse
3.1.2 Interior Angle Traverse
3.1.3 Traverse by Angle to the Right
3.1.4 Azimuth Traverse

3.1.5 Compass Traverse
3.1.6 Stadia Traverse
3.1.7 Plane Table Traverse
3.2 Calculation of Areas of Land
3.2.1 Area by Triangle
3.2.2 Area by Coordinates
3.2.3 Area by Double Meridian Distance (DMD) and Latitude
3.2.4 Irregular Boundaries (Simpson's and Trapezoidal Rules)
3.3 Triangulation and Trilateralization
3.3.1 Horizontal Control System
3.3.2 Triangulation Figures and Procedures
3.3.3 Error Propagation
3.3.4 Trilateralization
3.4 Astronomical Observation
3.4.1 Celestial Sphere
3.4.2 Equator System
3.4.3 The PZS Triangle
3.4.4 Aximuth and Hour Angle at Elongation
3.4.5 Time
3.4.6 Solar Observation
3.4.7 Stellar Observation
4.0 Engineering Surveys
4.1 Topographic Survey
4.1.1 Horizontal Control
4.1.2 Vertical Control (contours)
4.1.3 Location of Details
4.2 Route Surveying
4.2.1 Horizontal Curves
4.2.1.1 Simple Curves
4.2.1.2 Compound Curves
4.2.1.3 Superelations
4.2.1.4 Spiral Curves
4.2.2 Vertical Curves
4.2.3 Earthwork Operations
4.2.3.1 Methods of Determining Earthwork Volumes
4.2.3.2 Borrow Pits
4.3 Hydrographic Surveys
4.3.1 Datum
4.3.2 Soundings

B. HYDRAULICS

1.0 Fluid Mechanics
1.1 Properties of Fluids
1.2 Fluid Statics
1.3 Fluid Flow Concepts and Basic Equations
1.4 Dimensionally Analysis and Dynamic Similitude
1.5 Viscous Flow and Fluid Resistance
1.6 Ideal Fluid Flow
1.7 Steady Flow in Closed Conduits
1.8 Steady Flow in Open Channels
2.0 Hydrology
2.1 Hydrologic Cycle
2.1.1 Precipitation
2.1.2 Streamflow
2.1.3 Evaporations
2.1.4 Transpiration
2.2 Hydrograph Analysis
2.2.1 Runoff
2.2.2 Storage Routing
2.3 Groundwater
3.0 Hydraulics, System and Structure
3.1 Reservoirs
3.2 Dams
3.3 Spillways, Gates, and Outlet Works
3.4 Open Channels
3.5 Pressure Conduits
3.6 Hydraulics Machinery

4.0 Irrigation, Flood Control and Drainage
4.1 Irrigation
4.1.1 Water Requirement
4.1.2 Soil-Water Relation
4.1.3 Water Quality
4.1.4 Methods
4.1.5 Structures
4.2 Flood Control
4.2.1 Design Flood
4.2.2 Flood Control Structures
4.3 Drainage
4.3.1 Estimate of Flow
4.3.2 Storm Drainage
4.3.3 Land and Highway Drainage
4.3.4 Culvets and Bridges
4.3.5 Drainage Structures
5.0 Water Supply and Sewerage
5.1 Fundamental Concept
5.1.1 Mathematics of Growth (Population Forecasting)
5.1.2 Environmental Chemistry
5.1.3 Mass and Energy Transfer
5.2 Water Supply and Treatment
5.2.1 Components of Water Supply System
5.2.1.1 Water Reservoir and Storage
5.2.1.2 Water Distribution System
5.2.1.3 Water Containment Structures
5.2.2 Water Consumptions Periods of Design
5.2.3 Pre-treatment Methods
5.2.4 Principles of Sedimentation
5.2.5 Sedimentation Tank Design
5.2.6 Coagulation-Sedimentation
5.2.7 Slow Sand Filtration
5.2.8 Rapid Sand Filtration
5.2.9 The Rapid Sand Filter
5.2.10 Underdrain System
5.2.11 Wash Troughs
5.2.12 The Washing Process
5.2.13 Clear Well and Plant Capacity
5.2.14 Water Disinfection
5.3 Waste Water Treatment
5.3.1 Quantity
5.3.2 Methods
5.3.3 Theory of Activated Sludge
5.3.4 Aration Tank
5.3.5 Biokinetic Parameters*
5.3.6 Clarifiers

C. DESIGN AND CONSTRUCTION

1.0 Statics of Rigid Bodies
1.1 Force System
1.1.1 Concurrent and Non-current Force System
1.1.2 Parallel and Non-parallel Force System
1.1.3 Planar and Three Dimentional Force System
1.1.4 Distributed Forces
1.1.5 Frictional Forces
1.2 Equilibrium of Forces
1.2.1 Reactions
1.2.2 Free Body Diagram
1.2.3 Two Force Bodies
1.2.4 Three Force Bodies
1.3 Truss Analysis
1.3.1 Method of Joints
1.3.2 Method of Sections
1.3.3 Graphical Methods
1.4 Beams and Frames
1.4.1 Reactions
1.4.2 Shear Diagrams

1.4.3 Bending Moment Diagrams
1.5 Related Topics
1.5.1 Moment of Lines and Areas
1.5.2 Centroids
1.5.3 Moments of Inertia
1.5.4 Center of Mass
1.5.5 Center of Forces
2.0 Dynamics of Rigid Bodies
2.1 Kinematics of Particles
2.1.1 Rectilinear Motion
2.1.2 Curvilinear Motion
2.2 Kinetics of Particles
2.2.1 NewtonÕs Second Law
2.2.2 Dynamic Equilibrium
2.2.3 Work and Energy Principle
2.2.4 Kinetic and Potential Energy
2.2.5 Impulse and Momentum Principle
2.3 Kinematics of Rigid Bodies
2.3.1 Translation
2.3.2 Rotation
2.3.3 General Plane Motion
2.4 Kinetics of Rigid Bodies
2.4.1 DÕLambertÕs Principle
2.4.2 Work and Energy Principle
2.4.3 Impulse and Momentum Principle
3.0 Mechanics
3.1 Stresses and Strains
3.2 Material Properties
3.3 Axially Loaded Members
3.4 Thin Walled Pressure Vessels
3.5 Torsional Stresses
3.6 Internal Forces and Stresses in Beams
3.6.1 Flexural Stress
3.6.2 Shear Stress
3.6.3 Combined Stresses
3.6.4 Principal Stresses
3.6.5 Unsysmetrical Banding
3.7 Deflections
3.7.1 Double Integration Methods
3.7.2 Area Moment Method
3.7.3 Conjugate Beam Method
3.8 Statistically Indetermine Beams
3.9 Shear Center
3.10 Curved Beams
3.11 Nonhomogenous Beams
3.12 Impact Loading
3.13 Stress Concentration
3.14 Repeated Loading
3.15 Elastic Instability (Buckling)
3.16 Analysis of Connections
3.16.1 Riveted and Bolted Connections
3.16.2 Welded
4.0 Structural Analysis
4.1 Loadings
4.1.1 Verical Loads (dead and live loads)
4.1.2 Lateral Loads (Wind and Earthquake Loads)
4.1.3 Impact Loads
4.2 Energy Methods for Deformation Analysis
4.2.1 CastiglianoÕs Theorem
4.2.2 Virtual Work Method (Unit Load)
4.3 Influence Lines
4.4 Frame Analysis
4.4.1 Approximate Methods
4.4.2 Exact Methods*
4.4.3 Moment Distribution
4.5 Stiffness and Flexibility Methods of Analysis**
4.5.1 Trusses
4.5.2 Beams

4.5.3 Frames
5.0 Design of Timber Structures
5.1 Properties of Wood
5.2 Design of Tension Member
5.3 Design of Bending Members
5.3.1 Laterally Supported Beams
5.3.2 Laterally Unsupported Beams
5.4 Design of Compression Members
5.4.1 Short Columns
5.4.2 Slender Columns
5.4.3 Spaced Columns
5.5 Timber Connections
6.0 Design of Steel Structures
6.1 General
6.1.1 Properties of Structural Steel
6.1.2 Design Philosophy
6.1.2.1 Allowable Stress Design
6.1.2.2 Load and Resistance Factor Design
6.2 Tension Members
6.3 Connections
6.3.1 Bolted
6.3.2 Welded
6.4 Compression Members
6.5 Beams
6.5.1 Compact Sections
6.5.2 Non-compact Sections
6.6 Beam Columns
6.7 Plastic Analysis and Limit Design*
6.8 Composite Steel and Concrete
7.0 Reinforced Concrete Structures
7.1 General
7.1.1 Properties of Concrete Materials
7.1.2 Design Philosophies and Procedures
7.2 Flexural Analysis and Design
7.3 Shear and Diagonal Tension
7.4 Bond, Anchorage Development Lengths
7.5 Serviceability Requirements
7.5.1 Crack Control
7.5.2 Deflections
7.6 Columns
7.6.1 Short Columns
7.6.2 Slender Columns
7.7 Slabs
7.8 Footings
7.9 Retaining Wall
7.10 Prestressed Concrete
8.0 Soil Mechanics and Foundation
8.1 Soil Properties
8.2 Soil Classification
8.3 Flow of Water in Soils
8.3.1 Permeability
8.3.2 Seepage
8.3.3 Effective and Porewater Pressure
8.4 Soil Strength
8.4.1 Shear Strength
8.4.2 Bearing Capacity
8.5 Compressibility of Soils
8.5.1 Elastic Settlement
8.5.2 Consolidation Settlement
8.6 Soil Improvement
8.6.1 Compaction
8.6.2 Soil Stabilization
8.7 Earth Pressures and Retaining Wall
8.8 Slope Stability Analysis
9.0 Design of Civil Engineering Structures and Systems
9.1 Transportation Engineering**
9.1.1 Highway and Urban Transportation Planning and Economics**
9.1.2 Driver, Vehicle, Traffic and Road Characteristics**

9.1.3 Highway Design
9.1.4 Traffic Engineering and Highway Operations**
9.1.5 Road and Pavement Design
9.2 Airport Engineering**
9.3 Ports and Harbors
9.4 Containment Structures (Tanks, soils, storage tanks)
9.5 Bridges
10.0 Construction and Management
10.1 Engineering Relations and Ethics**
10.2 Contracts & Specifications
10.3 Construction Project Organization
10.4 Planning and Scheduling (PERT/CPM)
10.5 Construction Estimates
10.6 Construction Methods & Operations
10.7 Construction Equipment Operations and Maintenance

III. CONDUCT OF THE EXAMINATIONS

Unless otherwise officially announced, the examinations shall be totally computerized. The Board shall provide a minimum of 500 questions for each subject from which the computer of the Commission will select at random on the day or a few days prior to the examination the questions to be given. The number of questions for each subject shall not be less than 20 at 4 points each. The maximum number of questions shall not be more than 100 at 1 point each. The examination shall be closed books and notes. Examinees shall be given 10 computation and scratch sheets which must be submitted with the answer sheets.

IV. CHANGES IN THE SYLLABI

The Syllabi can be changed from time to time only with the introduction of the new methods and technology in civil engineering but not more than once every three years.