THE PRACTICE OF ELECTRICAL ENGINEERING IN THE PHILIPPINES *

by

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This article on the practice of electrical engineering in the Philippines is premised on the understanding that the reader is engaged in a development program intended to keep our school curriculum as well as the faculty in pace with or oriented to the needs of the industry and the citizenry.

It, therefore attempts to portray the various fields of practice, or in other words, the kinds of electrical engineering services and jobs observed to be available to the practitioners, and the knowhow and qualifications demanded by the jobs, as well as required by the regulating (licensing) laws of the country.

FIELDS OF PRACTICE

It is the observation that the electrical engineering serivecs and jobs available in the country and even abroad can be grouped as follows:

1. System (electrical) planning
2. Designing
3. Construction/installation
4. Inspection/certification
5. Operation/maintenance
6. Manufacture/fabrication and repair
7. Teaching

System Planning — Briefly described, this is the development or expansion in an orderly, economical manner of an electrical system to enable it to cope with expected (forecasted) load growth. The public electric utility has always needed this kind of service because of the continually increasing demand for electric energy (due to economic progress and population growth). Large utilities such as the National Power Corporation and the MERALCO (where at this writing, the author is the head of the

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Planning Division) and industrial/business firms such as the San Miguel Corporation have their own planning and designing staffs on regular payroll. Smaller utilities and industrial/commercial establishments hire consultants either on piecework or retainer basis.

By and large, planning personnel are college graduates, with the supervisory ranks being professional (licensing category) engineers and/or at least masters degree holders, fairly knowledgeable in equipment specifications and characteristics design concepts, economics, and load flow/short-circuit studies.

Designing — This is the preparation of detailed drawings, specifications, and the bill of materials which service to guide the construction or installation of electrical facilities. As the audience (reader) probably know, a design work (plan) would essentially indicate the proper types, sizes, and other specifications of the electrical materials/equipment to be installed, such as wires, conduits (for underground system), transformers, switches, etc., and such requirements as called for in the Philippine Electrical Code and other applicable codes.

Design personnel would be mostly experienced college graduates, although the drafting chores maybe assigned to undergraduates, tradesmen (vocational school graduates), or graduates under training. Both by exigency of the service and in compliance with Republic Act 184, the country's electrical engineering law, design drawings and specifications are approved and signed/sealed by professional electrical engineers. No construction permit would be issued by the authorized government agency (presently, the Building Official, pursuant to the recently decreed Building Code) until such drawings or plans are submitted, among other requirements.

It might be worthwhile to illustrate how planning differs from designing. For instance, planning may call for the installation, in year 5, of a power line, having a capacity of 10,000 kVA, at 13,800 volts, 3-phase, 4-wire, between a power plant and a substation. On the other hand, the design drawing will indicate the detailed information as to how the line is to be constructed, such as the number and height of the poles, their spanning, sizes and spacing of the wires, etc.

Construction/installation — By necessity, construction of electrical facilities has to be handled by experienced personnel. By law, the supervision must be handled by duly licensed electrical engineers or master electricians, depending on the voltage and type of equipment involved.

Field experience is an emphasis, although constructions are based on supposedly complete design drawings. This is because a drawing would not indicate the procedure or mechanics of performing the installation, such as how to raise a pole, bore the holes and bolt on the crossarms, then string up the wires.

The many types and scopes of electrical installations requiring varied expertise have compelled most contractors to specialize to ensure viability. A group may engage only in residential and commercial building wiring installation, another in transmission line installation, and still another in power plant or substation construction.

Inspection and certification — Pursuant to the law, inspection of new installations must be conducted by authorized government personnel (now from the Office of the Building Official) before the said installations can be energized or put into operation.

It follows that electrical inspectors should be well-versed with the applicable codes and in interpreting design drawings and specifications. They should also be equipped with the appropriate test instruments/apparatus for conducting proof-testing where visual inspection would not be sufficient to determine whether or not an installation or equipment is safe to operate.

There is presently a significant dearth of proficient or qualified electrical inspectors and test equipment throughout the country, except for first class cities and municipalities which can afford them.

Operation/maintenance — Every now and then, we read about fires caused by "faulty electrical wiring." Most of the reports are considered valid. Faulty electrical wiring incidents happen, not because the installations have been defective, but because owners, especially of residential and small commercial buildings are ignorant (except that it electrocutes) of the hazards of electricity and tend to forget about regular check-up and maintenance of their electrical facilities. Vital insulation of wires and other materials and equipment do deteriorate with use and time, and eventually fail, resulting to short-circuits. And if a short-circuit occurs under the "right" conditions (fuse failing to blow in time and combustible materials are nearby) further damage and even a catastrophic fire would be the ultimate consequence.

Generally however, establishments owning large electric motors, substation transformers, and the like make it a point to hire qualified and licensed personnel to watch over their operation and maintenance, by necessity and in accordance with R.A. 184.

Sale — R.A. 184 provides that the sale and distribution of electrical equipment that require "engineering calculation or the application of engineering principles and data" shall be under the charge of a registered associate electrical engineer or a professional electrical engineer.

The law is somewhat ambiguous in this area, as complained by government agents who would like to enforce this provision. It can be deduced, however, that the framers of the law did not intend to cover such things as household electric light bulbs, radio receivers, sewing machine, and the like. It is apparent that the law intends to safeguard the citizenry with regard to supply and utilization equipment of substantial capacity and voltage. But because logically the anticipated hazard would diminish with technological progress, the law has (wisely?) left to the incumbent (present and future) regulatory body to determine dynamically where to "draw the line" based on technology, proficiency, or state of the art obtaining at a given time.

It is the observation that sale establishments that employ electrical engineers are in the minority. It is the argument of some sectors that the customer's design engineer is responsible for specifying the proper equipment and the manufacturer is responsible for providing the equipment according to specifications, and that, therefore, the salesman is a mere intermediary. Two things tend to make this argument weak: The manufacturer of imported equipment could not be touched by our laws; R.A. 184 does not regulate the local manufacture of electrical materials and equipment.

The present Board of Electrical Engineering has determined that the equipment to be covered by the law are those employing voltages higher than 250 volts, having a capacity of more than 25 kVA, and motors of more than 7.5 Horsepower.

Manufacture/fabrication and repair — Although these functions are not covered by R.A. 184, it is the observation that large manufacturers employ electrical engineers and/or technically proficient personnel as demanded by the industry. Lamentably, however, for price competition and profit, some establishments are known to produce inferior or substandard equipment. This is especially true with household items such as switches which do not make good contact and thus heat up, fluorescent lamp ballasts that operate at very high temperature (another fire hazard), wires that are undersized, etc.

A proposed amendment to R.A. 184 covers manufacture and repair.

Teaching — Teaching of major electrical engineering subjects is deemed to be a field of practice because it is accepted as valid experience when applying to take the licensing examination for professionla electrical engineer.

As recommended by the engineering association, the proposed amendment provides that instructors of major Electrical engineering subjects be licensed electrical engineers, or holders of at least masters degree from recognized schools.

THE LAWFULLY-VESTED PRACTITIONERS

Republic Act 184, which was passed in 1947, provides four grades of licensed persons authorized to practice electrical engineering, namely: the master electrician, the assistant electrical engineer, the associate electrical engineer, and the professional electrical engineer.

The master electrician is authorized to take charge or supervise the operation, tending, and maintenance of any electric generating plant (includes substation) employing voltages up to 750 volts, or to take charge of the wiring and installation of *utilization* equipment.

The assistant electrical engineer is authorized to take charge of the operation, tending, and maintenance of any electric generating plant employing voltages up to 4,800 volts, or, of any wiring and installation of utilization equipment.

The associate electrical engineer is authorized to supervise the construction/installation, operation, tending, and maintenance of any electric generating plant, or, of any wiring and installation of *supply* or *utilization* equipment, or of the sale and distribution of supply and utilization equipment requiring engineering calculation and/or application of engineering principles and data.

The professional electrical engineer is authorized to practice, perform or render electrical engineering service in its full scope.

The narration of the mechanics of examination and licensing, and other provisions of the law would be beyond the purpose of this talk.

THE SCHOOL, THE PRACTITIONER, THE INDUSTRY

This topic would probably be out-of-line here and one where the audience are more conversant. It is, however, felt that it could be worthwhile to bring out some relevant observations and express even a small opinion for the possibility that they might contribute to the purpose for which the audience has been convened.

Graduates of the baccalaureate course, when employed by the industry (electric utility, factory, contractor, etc.), would first undergo on-the-job training or attend a systematic training program, whichever is more advantageous to the employers, before they are assigned to responsible positions, or positions that are commensurate to their educational attainment. A more ironic, if not amusing, situation is where a fresh graduate manages to pass a licensing examination and get licensed as assistant electrical engineer. While the law already authorizes him to be in responsible charge of certain functions, yet his employer understandably could delegate to him the responsibilities only after he has undergone training and has proven to be capable.

Of course there are complaints or criticisms about it especially from small establishments, but this situation is generally accepted as unavoidable and taken into stride by the industry. It certainly would not be easy for a school to provide practical training for its many students, considering that the prospective employers would be needing different types of expertise—and there are many in the electrical engineering fields.

This writer has had occasions to hear suggestions on how to make our college graduates immediately productive upon employmnt. One is to require every college to provide, in addition to the regular curriculum, a training course for a particular field. Another suggestion is to have the industry provide the training for the graduates, whether employed or not.

Before this talk gets farther away from the original subject, a suggestion is humbly presented in closing—let us first strengthen what we have got which is the universally standard curriculum, so that the industry would be supplied with graduates having a strong theoretical foundation and hence high potential. A possible "unhappy" result of this suggestion is that board examinations may no longer be justifiable.