



PEO Position Statement

Nanotechnology and Molecular Engineering

Issue Date: September 23, 2011

Policy Statement	PEO recognizes Nanotechnology and Molecular Engineering as the practice of professional engineering and a new discipline of professional engineering.
Definition	Nanotechnology: understanding and control of matter and processes at the nanoscale, typically, but not exclusively, below 100 nanometres in one or more dimensions where the onset of size-dependent phenomena usually enables novel applications.
	Molecular Engineering: the design and/or manufacture of molecules by any means, which might or might not be found in nature, including self-assembling systems, generally to be used in works useful to humankind. It may be used to create, on an extremely small scale, most typically one at a time, new molecules that might not exist in nature, or be stable beyond a very narrow range of conditions.
Scope of Practice	<p>The practice of Nanotechnology/Molecular Engineering (NME) is a specialist practice within the practice of professional engineering. All requirements, obligations and responsibilities of NME practitioners derive from their obligations under the <i>Professional Engineers Act</i>. Within this context, NME has special meaning to include:</p> <ul style="list-style-type: none"> • any act of designing, composing, evaluating, planning, advising, reporting, directing or supervising, or making measurements for, laying out work for, • specifying or approving of, auditing of, general review of, • classifying, inventorying and mapping of, <p>an activity that requires the knowledge, understanding and application of the principles fundamental to Nanotechnology and molecular manipulations; and</p> <ul style="list-style-type: none"> • including activities related to the construction, modification, improvement or repair of existing products, • and including the application of nano-science discoveries using engineering principles, <p>where these activities or services require knowledge, training and experience equivalent to that required to become a member under this Act, including actions that may be defined from time to time under the regulations to the Act;</p> <p>where such applications may affect the public interest and, the safeguarding of life, health, property, the environment or the public welfare.</p>

	<p>The practice of Nanotechnology/Molecular engineering is distinct from the practice of Nano-science, which is defined as work in pure science whose objective is the discovery of new scientific principles. Nano-engineering distinguishes itself by applying nano-scientific discoveries to commercialize equipment, products and processes.</p>
Licensure	<p>PEO recognizes the existence of nano-scientists who are already conducting research in the nano-science field and applying the research. PEO will work with such individuals to ensure their licensure as professional engineers where it will serve and protect the public interest. This will be addressed in more detail in the Phase 2 Report.</p>
Rationale	<p>Nanotechnology and molecular engineering is a new discipline that is rapidly growing. NME is an enabling technology that has applications and uses in many other industries. The predicted market size is \$3 Trillion world market by 2015 (\$147 B, 2007) and the growth rate is exponential. In 2008, global research and development investment (public and private) was estimated at \$18.2 B.</p> <p>There is compelling evidence of large potential public safety risks based on the recent reports of deaths of Chinese workers in a plant due to inhalation of nanoparticles. There is great risk for accidents involving the public due to the unknown toxicity and an extremely complex variety of reactions for nanoparticles. Compounding these risks is the exponential growth of products containing engineered nanoparticles. At present, there is little legislation governing these products and no control over those who are practising this new discipline.</p> <p>PEO recognizes that public accountability is enhanced by recognizing Nanotechnology and Molecular Engineering as the practice of professional engineering by a regulatory body, established by statute in the public interest and accountable to the people of Ontario. Unless such accountability is specified in statute, the government and, ultimately the public assume the risk for non-licensed practitioners working in specific areas of engineering.</p>
Areas of Practice	<p>Nanomaterials: the synthesis, characterization and engineering application of several classes of advanced materials;</p> <p>Nanoelectronics: the development of systems and materials that will enable the electronics industry to overcome current technological limits;</p> <p>Nanoinstrumentation: some of the most far-reaching yet practical applications of miniature instruments for measuring atoms or molecules in chemical, clinical, or biochemical analysis; and</p> <p>Nano-biosystems: the molecular manipulation of biomaterials and the engineering of nanoscale systems and processes of biological and medicinal interest.</p>
Core Body of Knowledge	<p>PEO will consult with industry, universities and governments to gather feedback and enhance the core body of knowledge for the areas of practice as defined in the Phase 1 (interim) Report</p>
Academic Requirements	<p>University programs accredited by the Canadian Engineering Accreditation Board.</p> <p>Determination by the Academic Requirements Committee for</p>

	<p>individual applicants.</p> <p>Assessment versus the exam syllabi approved by Council [academic requirements (board sheets) for Nanotechnology and Molecular Engineering to be developed by the Academic Requirements Committee].</p>
Experience Requirements	<p>A significant amount of the knowledge possessed and regularly used by an NME practitioner is learned through hands-on study in the laboratory. It is recommended that graduate NME practitioners have a minimum of 200 hours of relevant supervised laboratory practice in addition to at least 600 hours of practical engineering experience (work term). This will be specified further in the Phase 2 Report.</p>
Enforcement	<p>In accordance with PEO's Enforcement Policy, PEO will provide practitioners the ability to comply with the requirements under the <i>Professional Engineers Act</i> before proceeding to an enforcement action in court.</p> <p>In addition, if the practitioner is a natural scientist, PEO will engage the Overlapping Practice Committee prior to proceeding to an enforcement action in court. This will be addressed in more detail in the Phase 2 Report.</p>
Communication	<p>PEO will provide a public awareness campaign centred on Nanotechnology and Molecular Engineering as the practice of professional engineering and encouraging Ontario universities to consider developing and delivering engineering programs that would be accredited by the Canadian Engineering Accreditation Board.</p>