

ASEAN Engineers Information Exchange Network (AEIEN)

Mechanical Engineering Qualifications, Practice, Codes and Standards in the Philippines



PREPARED BY THE:

**PHILIPPINE SOCIETY OF
MECHANICAL ENGINEERS INC.**

FIRST EDITION

PREFACE

This report was inspired by the Professional Regulatory Board of Mechanical Engineering (PRBMEs), who tasked the Philippine Society of Mechanical Engineers (PSME) to put together this report on ASEAN Engineers Information Exchange Network (AEIEN) with the goals as follows:

1. To promote collaboration and cooperation among ASEAN members
2. To facilitate mobility of engineers
3. To enhance regional integration
4. To provide means of knowledge sharing and capacity building
5. To support the ASEAN Economic Development

This is timely to set the tones of what is the practice of Mechanical Engineering in the Philippines as the globalization drives the pursuit of excellence in research and development in support to the advancement of the manufacturing technology for both domestic and global industries.

This report is presented to provide a glimpse of the Mechanical Engineering profession in the Philippines and describe its processes, ranging from its educational requirement, licensure, practice, continuing professional development, continuing professional specialization program, the law that regulates the practice, the codes and standards used in the practice and the support and development from the government. Special discussion on the Republic Act (RA) 8495 otherwise known as the Mechanical Engineering Law and the Philippine Mechanical Engineering Code (PMEC) to provide background on the regulation of the profession and the standard set for the best practice, respectively.

As we enter the new era of advance technology where information abounds, the sharing of ideas is paramount to the furtherance of the mechanical engineering practice to support the future development of the profession and be responsive to the needs of the country, the ASEAN and the global community.

This report is a live document and will conform to the existing laws, codes, standards and industry practice or its future successors that controls the practice of Mechanical Engineering profession in the Philippines.

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RATIONALE

Globalization had sparked the growth in the manufacturing industries and the 4th Industrial Revolution or what we call “Industry 4.0” is becoming the norm in the practice of Mechanical Engineering. The access to information through the web and with communication in real time, this makes the benchmarking of the best practice in mechanical engineering profession much easier as well as faster collaboration with the mechanical engineers of the neighboring ASEAN countries. Henceforth, sharing of information shall provide an avenue of networking with similar practicing mechanical engineers in our ASEAN region and to the global community at large.

CHAPTER 1

EDUCATION, QUALIFICATIONS, LICENSURE, CONTINUING EDUCATION AND REGULATIONS IN THE PRACTICE OF MECHANICAL ENGINEERING

A. EDUCATION, QUALIFICATIONS AND LICENSURE FOR MECHANICAL ENGINEERING

1. The curriculum and syllabi recommended by Commission on Higher Education (CHED)

The State in pursuance for quality education for both public and private institutions of higher education, had created the CHED with the enactment of RA 7722 otherwise known as the “Higher Education Act of 1994”. It is an independent body attached to the Office of the President for administrative purposes only and with a policy as follows:

“The State shall protect, foster and promote the right of all citizens to affordable quality education at all levels and shall take appropriate steps to ensure that education shall be accessible to all. The State shall likewise ensure and protect academic freedom and shall promote its exercise and observance for the continuing intellectual growth, the advancement of learning and research, the development of responsible and effective leadership, the education of high-level and middle-level professionals, and the enrichment of our historical and cultural heritage.

State-supported institutions of higher learning shall gear their programs to national, regional or local development plans. Finally, all institutions of higher learning shall exemplify through their physical and natural surroundings the dignity and beauty of, as well as their pride in, the intellectual and scholarly life.”

- a) The CHED Memorandum Order (CMO) No. 97 Series of 2017 – otherwise known as the **Policies, Standards and Guidelines (PSG) for the Bachelor of Science in**

Mechanical Engineering (BSME) program had set the minimum requirement in the course offering for BSME. This PSG is a migration from a 5-year BSME program to a 4-year BSME program in consideration to the K-12 program in the Secondary Education.

- b) The Rationale of CMO No. 97 Series of 2017 was based on the Guidelines for the Implementation of CMO No. 46 series of 2012 and CMO 37 s. 2012, which allow the PSG for BSME program to be implemented with shift to outcome based education leading to competency based standards. This also provides enough leeway for Higher Education Institutions (HEIs) to innovate their curriculum in line with the assessment of how best to achieve learning outcomes in their particular contexts and their respective missions.
- c) Summary of the suggested curriculum for BSME from CHED CMO 97 Series of 2017 is shown in Table 1 below. It has a total of 172 credit units as minimum, which comprised of the general education, technical, allied, fundamental, professional, and technical elective courses. The HEIs can add units to enhance further the qualifications of their graduates to be aligned with the industry requirement for both local and overseas.

Table 1. Minimum course requirement for the BSME degree program

	Classification/ Field	Total No. of Hours		Total No. of Units
		Lecture	Laboratory	
I	TECHNICAL COURSES			
A	Mathematics	12	0	12
B	Natural/Physical Sciences	6	6	8
C	Allied Courses	16	9	9
D	Fundamental Courses	39	33	50
E	Professional Courses	13	21	20
F	Technical Electives	4	0	4
	TOTAL TECHNICAL COURSES	96	78	122
II	NON-TECHNICAL COURSES			
A	General Education Courses	24	0	24
B	General Education Elective Courses/ Mandated Courses	12	0	12
C	PE and NSTP	0	14	14
	TOTAL NON-TECHNICAL SOURSES	36	14	50
	GRAND TOTAL	132	92	172

2. **Comparative curriculum of selected schools.** Table 2 below shows the recommendation from CHED for the curriculum of the BSME considering the technical and non-technical requirement of the course with comparative curriculum from selected schools.

Table 2. Recommendation from CHED for the curriculum of the BSME

Item No.		Description	CHED			Schools				
			Min Hours/week		Min Credit Units	UP	Mapua	La Salle	UST	MSU-IIT
			Lecture	Laboratory						
I		TECHNICAL COURSES								
	A	Mathematics								
		Calculus 1	3	0	3					
		Calculus 2	3	0	3					
		Differential Equations	3	0	3					
		Engineering Data Analysis	3	0	3					
		Sub-Total	12	0	12					
	B	Natural/Physical Sciences								
		Chemistry for Engineers	3	3	4					
		Physics for Engineers	3	3	4					
		Sub-Total	6	6	8					
	C	Basic Engineering Sciences								
		Engineering Drawing	0	3	1					
		Computer - Aided Drafting	0	3	1					
		Computer Fundamentals and Programming	0	3	1					
		Statics of Rigid Bodies	3	0	3					
		Dynamics of Rigid Bodies	2	0	2					
		Mechanics of Deformable Bodies	3	0	3					
		Engineering Economics	3	0	3					
		Engineering Management	2	0	2					
		Technopreneurship 101	3	0	3					
		Sub-Total	16	9	19					
	D	Allied Courses								
		Basic Electrical Engineering	2	3	3					
		Basis Electronics	2	3	3					
		DC and AC Machinery	2	3	3					
		Sub-Total	6	9	9					
	E	Fundamental Mechanical Engineering Courses								
		Mechanical Engineering Orientation	1	0	1					
		Advance Mathematics for ME	3	0	3					
		Methods of Research for ME	1	0	1					
		Fluid Mechanics	3	0	3					
		Machine Elements	2	3	3					
		Materials Science and Engineering for ME	2	3	3					
		Thermodynamics 1	3	0	3					
		Thermodynamics 2	3	0	3					

Item No.		Description	CHED			Schools				
			Min Hours/week		Min Credit Units	UP	Mapua	La Salle	UST	MSU-IIT
			Lecture	Laboratory						
		Combustion Engineering	2	0	2					
		Heat Transfer	2	0	2					
		ME Laboratory 1	0	3	1					
		ME Laboratory 2	0	6	2					
		Manufacturing and Industrial Processes with Plant Visits	1	3	2					
		Basic Occupational Safety and Health	3	0	3					
		Workshop Theory and Practice	0	3	1					
		Machine Theory	0	6	2					
		Control Engineering	2	3	3					
		Fluid Mechanics	3	0	3					
		Refrigeration Systems	3	0	3					
		Air-conditioning and Ventilation Systems	3	0	3					
		Vibration Engineering	2	0	2					
		Computer Applications for ME	0	3	1					
		Sub-Total	39	33	50					
	F	Professional Mechanical Engineering Courses								
		Machine Design 1	3	0	3					
		Machine Design 2	2	3	3					
		ME Laboratory 3	0	6	2					
		Industrial Plant Engineering	3	3	4					
		Power Plant Design with Renewable Energy	3	3	4					
		ME Laws, Ethics, Codes and Standards	2	0	2					
		ME Project Study 1	0	3	1					
		ME Project Study 2	0	3	1					
		Sub- Total	13	21	20					
	G	Elective Courses								
		ME Electives	4	0	4					
		Sub-Total	4	0	4					
		TOTAL TECHNICAL COURSES	96	78	122					
II		NON-TECHNICAL COURSES								
	A	General Education Courses								
		Purposive Communication	3	0	3					
		Mathematics in the Modern World	3	0	3					
		Understanding the Self	3	0	3					
		Art Appreciation	3	0	3					
		Ethics	3	0	3					

Item No.		Description	CHED			Schools				
			Min Hours/week		Min Credit Units	UP	Mapua	La Salle	UST	MSU-IIT
			Lecture	Laboratory						
		Readings in Philippine History	3	0	3					
		The Contemporary World	3	0	3					
		Science, Technology and Society	3	0	3					
		Sub-Total	24	0	24					
	B	General Education Elective and Mandated Courses								
		G.E. Elective 1	3	0	3					
		G.E. Elective 2	3	0	3					
		G.E. Elective 3	3	0	3					
		Life and Works of Rizal	3	0	3					
		Sub-Total	12	0	12					
	C	Physical Education								
		P.E. 1, 2, 3, 4 (2 units each)			8					
		Sub-Total			8					
	D	National Service Training Program								
		NTSP 1 and 2			6					
		Sub-Total			6					
		TOTAL NON-TECHNICAL COURSES	36	0	50					
		GRAND TOTAL			172					

3. Board examination both written and MELE for RME and CPM

- a) **Licensure requirements including renewal processes** – this is provided in Article III of RA 8495 for:
- 1) Certified Plant Mechanic (CPM)
 - 2) Registered Mechanical Engineer (RME)
 - 3) Professional Mechanical Engineer (PME)

4. Concept of the Continuing Professional Development (CPD)

RA 10912 or otherwise known as the “Continuing Professional Development Act of 2016” was an Act Mandating and Strengthening the Continuing Professional Development Program for All Regulated Professions, Creating Continuing Professional Development Council, and Appropriating Funds Therefor, and for Other Related Purpose. It was enacted to make the CPD as a mandatory program for the enhancement of the mechanical engineering practice through technical training and seminars from the PRC accredited institutions. Credit units were earned as a requirement in the renewal of the professional licenses to regulate the practice of the profession.

Section 2 of RA 10912. *Declaration of Policy.* – “It is hereby declared the policy of the State to promote and upgrade the practice of professions in the country. Towards this end,

the State shall institute measures that will continuously improve the competence of the professionals in accordance with the international standards of practice, thereby, ensuring their contribution in uplifting the general welfare, economic growth and development of the nation”.

5. Licensure requirements including renewal processes and CPD system

Section 4, Article II of Republic Act (R.A.) No. 10912, “states that in the formulation and implementation of the Continuing Professional Development (CPD) programs, each of the regulated professions has to ensure international alignment of competencies and qualifications of professionals through career progression mechanisms leading to specialization/sub specialization; and to ensure the development of quality assured mechanisms for the validation, accreditation and recognition of formal, non-formal and informal learning outcomes, including professional work experiences and prior learning;”

The licenses for the Mechanical Engineers (PME, RME and CPM) are renewable every three years and will require 45 units of CPD for renewal. The CPD units can be earned through attendance in seminars and training provided by the approved CPD providers accredited by the Professional Regulation Commission (PRC).

6. Career Progression and Specialization Program (CPSP)

The CPSP program was created to provide a career progression and specialization program for the mechanical engineering profession. Under this program, the practicing Mechanical Engineers are provided with means in upgrading their skill level either through academic track or professional track. The professional track had been developed to provide opportunity for the Mechanical Engineers while working to proceed with higher level skills in parallel to the academic track through specialization.

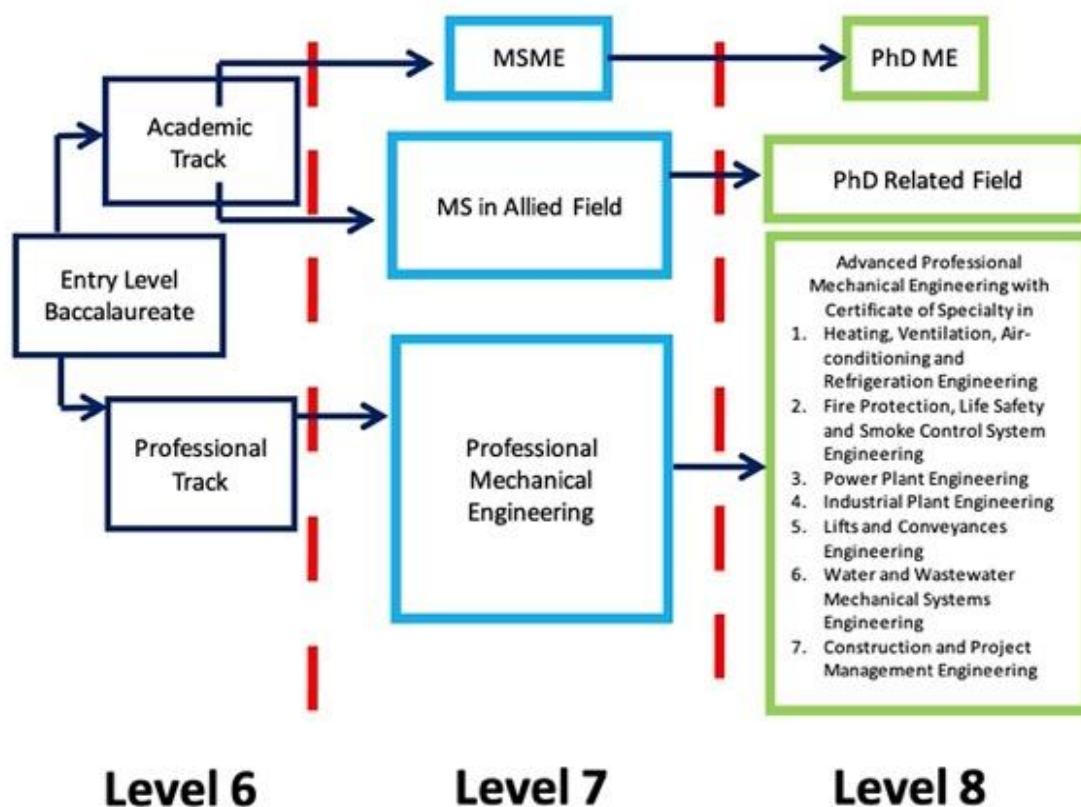
To strengthen the CPSP program, PRC had issued Resolution No. 1262 Series of 2020, as amended, instituting the creation of the Career Progression and Specialization Program and Credit Accumulation and Transfer System (CPSP-CATS) for each of the regulated professions; to strengthen further, PRC Resolution No. 1591 Series of 2022, was issued as a guidelines on the accreditation of specialty society/organization and other specialty categories providing structured training programs for professionals, which need to be recognized and be accredited by the concerned Board and the Commission for the purpose of the formulation and implementation of the CPSP-CATS.

Initially, there will be seven (7) tracks of Career Progression and Specialization programs to include but not limited to the following:

1. Heating, Ventilation, Air-conditioning and Refrigeration Engineering
2. Fire Protection, Life Safety and Smoke Control System Engineering

3. Power Plant Engineering
4. Industrial Plant Engineering
5. Lifts and Conveyances Engineering
6. Water and Wastewater Mechanical Systems Engineering
7. Construction and Project Management Engineering

As shown in the diagram below, the Career Pathways of the Mechanical Engineering profession from Mechanical Engineering Practice (Level 6) to Professional Mechanical Engineering Practice (Level 7) and to Advanced Professional Mechanical Engineering Practice (level 8) which are parallel to the academic track of Bachelor's degree, Master's degree and Doctoral degree, respectively.



a) Specialization Qualification Title and Descriptor

The Philippine Mechanical Engineering Specialization as herein envisioned shall be governed by enabling Rules and Guidelines as prescribed and promulgated by the PRB-MEE in accordance with the provisions of the R.A. No. 8495 and PRC Resolution No. 1117, series 2018. Table 3 below shows the qualification title and descriptor for each field of the seven specialization track.

Table 3. Qualification and descriptor for each field of specialization

Qualification Code	Qualification Title	Descriptor	Level	Authority Granting Agency
PMEE 80715-1	Advanced Professional Mechanical Engineering in Heating, Ventilation, Air-conditioning and Refrigeration	The practice of Advanced Professional Mechanical Engineering with specialized field in Heating, Ventilation, Air Conditioning, and Refrigeration embraces and consists of the highly advanced knowledge of the scientific and engineering principles and skill in utilizing said principles for complex applications for heating, air conditioning, ventilation and refrigeration, while compliant to codes and industry standards. The practice requires a highly advanced degree of independence in the design, installation, supervision, commissioning, operation and maintenance for sustainable air conditioning and ventilating systems to comply with indoor built environment requirements for dwelling, corporate and mercantile, sports and recreation, health care, laboratories, manufacturing, cultural, education, assembly places, institutions, data processing and telecommunications facilities; mission critical facilities; power plants and other facilities that require enhanced indoor environment quality and control of indoor pollution and contamination; and sustainable refrigeration systems for, food and beverage manufacturing, processing, and storage facilities; cold storage facilities for processed and agricultural products; ice-making facilities; and other facilities that require low-temperature applications. The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, engineer-on-record on permit construction, specifications, reports and other technical documents prepared by himself/herself and/or under his/her direct supervision.	8	PRC
PMEE 80715-2	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and	The practice of Advanced Professional Mechanical Engineering, with specialized field in Fire Protection embraces and consists of highly advanced knowledge, skills and values, in the principles of complex applications of passive and active fire protection systems. The practice requires knowledge of local and international	8	PRC

Qualification Code	Qualification Title	Descriptor	Level	Authority Granting Agency
	Smoke Control System	building and fire codes and standards. This knowledge can give solutions to fire protection problems that can be either prescriptive or performance-based solutions. It also includes knowledge and experience on design, installation or operation of the different fire suppressions systems and smoke control system. It also requires skills in using software or performing complex calculations for pipe networks, simulating fire scenarios and behavior. These skills can give a wider perspective on fire and deeper analysis of the fire situation resulting to identification of efficient methods of fire control or suppression. The practice requires a full degree of independence in the design, installation, supervision, operations and maintenance of fire protection systems in commercial, residential, industrial, and power plant facilities. The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, permit applications as engineer-on-record, specifications, reports and other technical documents prepared by himself/herself and/or under his direct supervision.		
PMEE 80715-3	Advanced Professional Mechanical	The practice of Advanced Professional Mechanical Engineering with specialized field in Power Plant embraces and consists of the highly advanced knowledge and skill in the design, analysis, evaluation, engineering, construction, erection, test and commissioning, power plant operation and control, maintenance, reliability and performance, technical services and decommissioning for all the mechanical equipment, component, system of a power plant including but not limited to wind, hydro, internal combustion, combined cycle, geothermal including steam field, gas and steam turbine, Natural Gas/LNG fired and coal fired, nuclear and biogas or biomass and Hybrid system power plant. The practice requires knowledge that covers in-depth expertise and high or full degree of independence, applying best practices that are aligned with both local and international standards, codes and regulatory mandates and other engineering principles and disciplines. The practice also requires knowledge Philippine electric power industry, power supply and	8	PRC

Qualification Code	Qualification Title	Descriptor	Level	Authority Granting Agency
	Engineering in Power Plant	purchase agreement, Engineering, Procurement & Construction (EPC) contract management and negotiation, relevant Philippine Laws and compliance with other regulatory requirements. The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, permit applications as engineer-on-record, specifications, reports and other technical documents prepared by himself/herself and/or under his/her direct supervision.		
PMEE 80715-4	Advanced Professional Mechanical Engineering in Industrial Plant	The practice of Advanced Professional Mechanical Engineering with specialized field in Industrial Plant embraces and consists of the highly advanced knowledge and skills in the design, analysis, evaluation, engineering, construction, erection, testing and commissioning, plant management, operation and control, maintenance including but not limited to food processing and manufacturing, agro-industrial, semi-conductor, oil and gas and petro-chemical, beverage, cement and mining plants. The advanced and specialized skills cover in depth knowledge and expertise in Industrial Plant Engineering, with high or full degree of independence aligned with both local and international standards, codes, practices and other regulatory agency. The practice requires knowledge of the latest technological advancements and developments in industrial plants including the relevant processes, tools, systems, devices, equipment, programs and applications, and other associated support systems. The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, permit applications as engineer-on-record, specifications, reports and other technical documents prepared by himself/herself and/or under his/her direct supervision.	8	PRC

Qualification Code	Qualification Title	Descriptor	Level	Authority Granting Agency
PMEE 80715-5	Advanced Professional Mechanical Engineering in Lifts and Conveyances	The practice of Advanced Professional Mechanical Engineering, with specialized field in Lifts and Conveyances, embraces and consists of highly advanced knowledge, skills and values in the principles of complex applications of passenger and material conveyances. The practice requires a high or full degree of independence in the design, installation, erection, alteration, testing, operation, and maintenance of all mechanical lifts and conveying equipment but not limited to elevators, escalators, moving walkways, conveyors, hoists, multi-level parking lifts, gondolas, temporary construction equipment such as tower crane, gondola lift and construction elevator, and other automated conveyances in commercial, residential, industrial, power plant, airport, seaport, storage warehouse, and all other facilities requiring passenger and material conveyances. The practice also requires an in-depth knowledge of applicable local and international Codes and Standards and a high degree of analytical skills to do safety and risk analysis, and design of mechanical components of lifts and conveyances. The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, permit applications as engineer-on-record, specifications, reports and other technical documents prepared by himself/herself and/or under his/her direct supervision.	8	PRC
PMEE 80715-6	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems	The practice of Advanced Professional Mechanical Engineering with specialized field in Water Supply, Distribution and Treatment Plant embraces and consists of the highly advanced knowledge and skill in the design, analysis, evaluation, engineering, construction, erection, testing and commissioning, plant management, operation and maintenance of water treatment, pumping stations, sewage treatment, industrial wastewater treatment, water supply and distribution systems exceeding a system pressure of 70kPa gauge.	8	PRC

Qualification Code	Qualification Title	Descriptor	Level	Authority Granting Agency
		The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, permit applications as engineer-on-record, specifications, reports and other technical documents prepared by himself/herself and/or under his/her direct supervision.		
PMEE 80715-7	Advanced Professional Mechanical Engineering in Construction and Project Management	The practice of Advanced Professional Mechanical Engineering with specialized field in Construction and Project Management embraces and consists of the highly advanced knowledge and skills in the construction and project management planning, coordination and control of a project from the early stages all the way to project closeout and completion. The specialized practice also includes advanced knowledge and skills in project management planning, cost management, time management, quality management, contract administration, safety management and project engineering. The practice also requires knowledge of International and Local Construction Laws, Contracts and standards, dispute avoidance and resolution methods and techniques and construction arbitration. The Specialty Practice grants the sole authority in providing specialized consulting services and in signing and sealing mechanical plans, drawings, permit applications as engineer-on-record, specifications, reports and other technical documents prepared by himself/herself and/or under his/her direct supervision.	8	PRC

B. REGULATORY LAWS AND PRACTICE

- 1. Republic Act No. 8495** otherwise known as the Mechanical Engineering Law of 1998 is the law that regulates the practice of Mechanical Engineering in the Philippines.

Article I

TITLE, STATEMENT OF POLICY, AND DEFINITION OF TERMS

Article I of RA 8495 is composed of Sections 1-3, which defines the title of the law that regulates the practice of mechanical engineering; the policy of the state and definition of terms. For clarity, the terms used in the ME Law were defined for better understanding of the scope in the practice of the mechanical engineering.

- **Section 3. Definition of Terms.** – As used in this Act, the following terms shall mean as follows:

a) **Practice of Mechanical Engineering** – A person shall be deemed to be practicing mechanical engineering or rendering mechanical engineering service within the meaning and intent of this Act when he performs the following:

- (1) Consultation, valuation, investigation and management services requiring mechanical engineering knowledge;
- (2) Engineering design, preparation of plans, specifications and projects studies or estimates for mechanical equipment, machinery, or processes of any mechanical works, projects or plants;
- (3) Management or supervision of the erection, installation, alteration, testing and commissioning of mechanical equipment, machinery, or processes in mechanical works, projects or plants;
- (4) Management, supervision, operation, tending or maintenance of any mechanical equipment, machinery or processes in mechanical work, projects or plants;
- (5) Management or supervision of the manufacture, sale, supply or distribution of mechanical equipment parts or components;
- (6) Teaching of mechanical engineering professional subjects in government recognized and accredited engineering schools; and
- (7) Employment in government as a professional mechanical engineer, registered mechanical engineer, or certified plant mechanic if the nature and character of his work is in line with his profession requiring professional knowledge of the science of mechanical engineering.

b) **Mechanical equipment or machinery** – includes all prime movers such as steam engines and turbines, internal combustion engines and gas engines and turbines; steam generators such as boiler; furnaces; heat exchanger such as cooling towers, kilns and dryers coolers and heaters; materials handling equipment, such as pumps, cranes, conveyors, hoists, elevators, escalators, mechanized dumbwaiters, moving ramps and walkways: heating, air-conditioning, ventilating, and refrigeration equipment and machinery, including compressors and centrifugal fans, mechanical pollution abatement and environmental control system; piping system with a working pressure of not less than 70 kpa., fired and unfired pressure vessels, printing machine; mechanical working machines for metallic and non-metallic materials and other mechanical equipment and machinery whether installed on land, underground, or on board watercraft.

c) **Mechanical processes, works, projects or plants** shall include steam plants, geothermal plants, dander-thermal plants, nuclear plants, ocean thermal energy conservation (OTEC) plants, internal combustion plants, hydraulic plants, pumping

plants, compressed gas plants, all kinds of mills, shops, factories, shipyards dry docks, heating, air conditioning, ventilating and refrigeration plants containing any mechanical equipment, machinery or process deriving power from steam, fossil fuels, wind, air, gas, water, solar heat, nuclear energy, ocean waves and tides, or other energy sources.

- d) ***Capacity of process works, projects or plant-rated capacity*** in kilowatt of mechanical works, projects or plants for the purpose of this Act shall be the total kilowatt ratings of all engines, motors, boilers, turbines, or other prime movers installed for use in such works, projects or plants, whether in operation or not, and without regard to the number of capacities of the mechanical equipment, machinery or processes receiving power from or intended to be driven by such prime movers.

Article II

BOARD OF MECHANICAL ENGINEERING

Article II of RA 8495 is composed of Sections 4-11, which provides the creation, composition, appointment, qualifications, term of office, power, duties and termination of the Professional Regulatory Board of Mechanical Engineering (PRBME). PRBME is under the supervision of the PRC and tasked to implement the provisions of this Act.

The Board has the supervising power in the practice of Mechanical Engineering, from licensure examinations, oath taking and issuance of the certificate of registration for successful examinees. It prescribe guidelines in the conduct of the continuing professional education. It submits to the office of the President an annual report regarding the practice and upliftment of the profession at the close of the calendar year.

The Board has disciplinary power to investigate violation of the Code of Ethical and Professional Standards for the practice of the mechanical engineering profession and after due process, it may revoke the license of the offender to practice once found guilty.

Article III

EXAMINATION, REGISTRATION AND LICENSE

Article III of RA 8495 is composed of Sections 12-32 which provides the qualification, examination, registration and licensure of Mechanical Engineers.

There are three categories of certification for the practice of mechanical engineering such as Professional Mechanical Engineer (PME), Mechanical Engineer (ME) and Certified Plant Mechanic (CPM). Each category had its own pre-qualifications and scope of examinations conducted by PRBME. Minimum grades were set to pass the licensure examination to qualify for the issuance of certificate of registration and professional license. If the applicant failed, they can take the examination up to three times and after that they have to rest for a year before taking the examination.

Successful candidates shall take an oath before the PRBME or any government official authorized to administer oaths, prior to entering upon the practice of the mechanical engineering. After payment of the registration fee, the applicant shall be issued a certificate of registration and professional license bearing the registration number, date of issuance, expiry date and duly signed by the chairman of the PRBME.

The PRBME shall have the power to withhold the issuance or suspend or revoke the certificate of registration on the ground of violation of this Act or the Code of Ethics for Mechanical Engineering after due process of law. The decision of the PRBME can be appealed to the proper Regional Trial Court for appropriate relief.

Upon application and for reasons of equity and justice, the PRBME may reinstate the validity of a revoked certificate of registration and professional license, upon payment of the required fees, at least two (2) years after revocation. A new certificate of registration to replace any certificate lost, destroyed or mutilated may be issued, subject to the rules of the PRBME, and upon payment of the required fee.

Temporary or Special Permit from the PRBME subject to the approval by the PRC can be issued by the PRBME to foreign engineers who will practice here in the Philippines of about three months within the 12 months period. Rules on reciprocity can be applied.

To professionalize the practice of mechanical engineering, Section 23 of the Act provides that an Accredited Integrated Professional Organization (AIPO) for mechanical engineers shall be approved by the PRC/PRBME. To date, PSME is the AIPO for all mechanical engineers in the Philippines.

Section 23. Integration and Accreditation of Mechanical Engineers.- *“An integrated organization of mechanical engineers shall be created and accredited by the Board of Mechanical Engineering and the Professional Regulation Commission. All persons whose names now appear in the roll of professional mechanical engineers, mechanical engineers, and certified plant mechanics under the custody of the Board and the Commission, or those who may hereafter be included therein upon registration and payment of the required fees shall automatically become members of the integrated and accredited organization of mechanical engineers.*

The integration of the mechanical engineering professional shall not be a bar to the formation of voluntary organization of mechanical engineers which may coexist with the integrated and accredited organization of mechanical engineers and other affiliated organization of mechanical engineers. The Board, subject to the approval by the Commission and after consultation with the existing accredited organization of mechanical engineers and other affiliated organization of mechanical engineers and, if possible, with the substantial number of the mechanical engineers who are non-organization members, shall provide the guidelines and mechanisms for the establishment and creation, continued supervision of the integrated and accredited organization of mechanical engineers. The registered and licensed engineers and certified plant

mechanics shall receive the benefits and privileges appurtenant to their membership in duly integrated and accredited mechanical engineering association only upon payment of the required fees and dues.”

Article IV

PRACTICE OF THE PROFESSION

Article IV of RA 8495 is composed of Section 33-41, which defines the scope and coverage in the practice of Mechanical Engineering in the industry and government institutions. Sections 33 and 34 specifically defines the responsibilities of the PME, RME and CPM according to the installed kW of the plant whether for preparation of plans, designs, investigations, valuation, technical report, specifications, project studies, estimates or supervision and operation of the plant. Accordingly, the CPM, RME and PME can be responsible for rating of 100kW and below 300kW, 300kW and below 2,000kW and above 2,000kW, respectively.

- **Section 33. Field of Action Authorized for Each Category: Prohibition.** – It shall be unlawful for any person, unless authorized under this Act:
 - (a) to be in responsible charge of the preparation of plans, designs, investigations, valuation, technical reports, specifications, project studies or estimates or to be in performance of other professional mechanical engineering activities unless he is a duly licensed Professional Mechanical Engineer.
 - (b) to teach professional subjects in mechanical engineering course unless he is a duly licensed Professional Mechanical Engineer, or a Masters- degree or Doctorate degree holder in mechanical engineering.
 - (c) to be in responsible charge of the construction, erection, installation, alteration, or of the performance of a mechanical engineering service in connection with the manufacture, sale, supply or distribution of any mechanical works, project or plant either for himself or for others, unless he is a duly registered Professional Mechanical Engineer or Mechanical Engineer.
 - (d) to operate, tend or maintain, or be in-charge of the operation, tending, or maintenance of any mechanical works, projects, plant of 100 kw., or more but not more than 300 kw unless he is a duly licensed Professional Mechanical Engineer, Mechanical Engineer or Certified Plant Mechanic.
 - (e) to operate, tend, or maintain or be in-charge of the operation, tending, or maintenance of any mechanical equipment, machinery or process for any mechanical works, projects or plants of 300 kilowatts or above but not more than 2000 kw unless he is a duly licensed Professional Mechanical Engineer or Mechanical Engineer.
 - (f) to operate, tend or maintain, or to be in charge of the operation, tending or maintenance of any mechanical equipment, machinery, process for any mechanical works, projects or plants of over 2000 kw unless he is a duly licensed Professional Mechanical Engineer.
- **Section 34. Personnel Required in Mechanical Plant.** – Every mechanical work project or plant in operation shall have not less than the following complement of

resident licensed professional mechanical engineer, mechanical engineer or certified plant mechanic:

- (a) 100 kw or over but not more than 300 kw: one (1) certified plant mechanic, or one (1) mechanical engineer, or one (1) professional mechanical engineer: *Provided*, That every mechanical work, project, or plant in this category operating in more than one shift every twenty four hours, shall have in addition to the minimum personnel herein required, one (1) certified plant mechanic, or one (1) mechanical engineer, or one (1) professional mechanical engineer in-charge of each and every additional shift.
- (b) 300 kw or over, but not more than 2000 kw: one (1) mechanical engineer or one (1) professional mechanical engineer: *Provided*, That every mechanical work, project, or plant in this category operating in more than one shift every twenty-four (24) hours shall have, in addition to the minimum personnel herein required at least one (1) mechanical engineer, or one (1) professional mechanical engineer in-charge of each and every additional shift.
- (c) Over 2000 kw: one (1) professional mechanical engineer: *Provided*, That every mechanical work, project or plant in this category operating in more than one shift every twenty-four (24) hours shall have, in addition to the minimum personnel herein required at least one (1) professional mechanical engineer in-charge of each and every additional shift.

Article V

PENAL AND CONCLUDING PROVISIONS

Article V of RA 8495 is composed of Sections 42-48, which provides for the violation of this Act.

The Board shall likewise formulate and issue the implementing rules and regulations to carry out the provisions of this Act. The funding for the operation of the Board shall be included in the General Appropriations Act of the year.

2. Support and resources in the practice of Mechanical Engineering

(a) Technical Support and Resources

For the professional development of mechanical engineers, PRC had accredited CPD providers for the conduct of the technical trainings and seminars suited for the mechanical engineers.

For specialized field on metals, the Metals Industry Research and Development Center (MIRDC), an agency of the Department of Science and Technology (DOST), provides technical and professional services to the metals and engineering industries. It is the sole government entity directly supporting the metals and engineering industry with services designed to enhance its competitive advantage.

(b) Academic Resources

Graduate school programs such as Masteral and Doctoral degree for mechanical engineering and allied courses are offered by private and state universities accredited by CHED. DOST Scholarship grants are available for deserving applicants.

3. Ethical Standards and Professional Conduct Guidelines

- (a) CA 294 otherwise known as the Mechanical Engineering Law in the Philippines was passed in 1938. It establishes the qualifications for mechanical plant engineers and the Board of Mechanical Engineering Examiners.

Pursuant to Section 9 of Commonwealth Act No. 294, as amended, the Code of Mechanical Engineering Ethics was hereby adopted by the Board of Mechanical Engineering as part of the Rules and Regulations governing the practice of Mechanical Engineering.

- (b) Section 50 of RA 8495, provided the adoption of the Code of Ethics and Professional Standards for Mechanical Engineers, which states, *“The Board shall, in consultation with the accredited integrated organization of mechanical engineers, adopt and promulgate a Code of Ethics and Professional Standards for the Practice of Mechanical Engineering subject to the approval of the Commission.”*

4. Local Laws on Permits

- (a) Permit requirements

Building Permits are required for any construction project and Table 4 below provides the summarized checklist for the requirement for the building permit application.

Table 4. Building permit application checklist

	CHECKLIST OF REQUIREMENTS	WHERE TO SECURE
0	Legal documents (1 original copy, 2 photocopies)	
	Four (4) copies of filled up Unified Application Form for Building Permit (duly notarized) with ancillary permit and/or accessory permit (if applicable)	One-Stop Shop for Construction Permit (OSCP)
	Certified True Copy of Certificate of Title/ Transfer Certificate of Title (TCT)	Registry of Deeds (ROD)
	If the Lot/Property is not in the name of the applicant (any of the following): 1. Deed of Absolute Sale 2. Lease Purchase Agreement 3. Deed of Assignment 4. Memorandum of Agreement 5. Extrajudicial Settlement 6. Authority to Construct 7. Lease Contract or Certification from the Lessor 8. Conditional Deed of Sale or Contract of Sale 9. Others	Client
	If Transfer Certificate of Title (TCT) is in the name of a corporation. 1. Secretary's Certificate or Board Resolution of Authorized Signatory for the application	

	CHECKLIST OF REQUIREMENTS	WHERE TO SECURE
	If a Representative is applying in behalf of the applicant. 1. Notarized Authorization letter to Transact with OBO (with valid ID of applicant and representative)	
	If a Representative is signing in behalf of the applicant. 1. Notarized Special Power of Attorney (SPA) with valid IF of applicant and representative.	
	If No Individual Title 1. Approved Subdivision plan	
	In the absence of Approved Subdivision plan. 1. Authority to construct	
	For Passive Telecommunication Tower Infrastructure 1. CAAP Clearance – if the telecommunication tower infrastructure is. a) In excess of 50 meters height and in the direct flight plan within a 3-km radius of the airport; or b) Shall be constructe within the 10-km radius of communication navigation surveillance facilities located off-airport 2. Affidavit of undertaking certified by a Geodetic Engineer (notarized, 1 original and 2 photocopies) – attesting that the proposed structure will be built outside the CAAP critical areas for towers within 50 meters height.	
0	Other Clearances (1 original and 2 photocopies)	
	Affidavit of Undertaking (duly filled out and notarized) 1. For other clearances to be submitted 30 days after issuance of the building permit.	Client
0	Technical Documents	
	Three (3) photocopies of valid PRC IDs and current PTRs with Dry Seal and Specimen Signatures (in Blue ink)	Assigned Professional
	Four (4) copies of filled-out and notarized Unified Application Form for Building Permit with ancillary and/or accessory application forms (if applicable) A. Electrical Permit Forms B. Plumbing/Sanitary Permit Forms C. Electronics Permit Forms D. Mechanical Permit Forms E. Fencing Permit Forms F. Demolition Permit Forms G. Excavation Permit Forms H. Temporary Sidewalk Enclosure and Occupancy Permit Forms I. Sign Permit Forms J. Other ancillary/accessory permit forms (Rule III, Section 301, Item 2 of IRR of PD 1096)	One-Stop Shop for Construction Permits (OSCP)
	Four (4) sets of Building Plans, design plans and other documents as follows: A. Architectural/Building (BP 344 – Accessibility Law compliance for commercial, institutional, industrial and public assembly building) B. Structural i. If 2 storey	Assigned Professionals

	CHECKLIST OF REQUIREMENTS	WHERE TO SECURE
	a. Two (2) copies of Structural Design Analysis and computations ii. If 3-5 storey a. Two (2) copies of load test with photos b. Two (2) copies of structural design analysis and computations iii. If 6 storey up a. Two (2) copies soil exploration with photos b. Two (2) copies of structural design analysis and computations C. Electrical (with design analysis, voltage drop and short circuit calculations) D. Plumbing/ Sanitary E. Geodetic (with sketch plan, narrative survey report, relocation survey report except for subdivisions) i. If the building/structure is existing – submit structural design plan. ii. If individual title is still for approval – submit narrative survey report. F. Electronics (if applicable) G. Mechanical (if applicable) i. Design computation (hydraulic calculation of Fire Suppression System as per National Fire Protection Association (NFPA) standards ii. If additional massive machinery like elevators, escalators, generator sets, boilers, etc. a. Certificate of structural stability (original copy/ signed and sealed with PRC/PTR), stating the gross weight of the machinery and the grid location of the structural members that will support the machinery b. Copy of approved structural analysis and design computation c. Copy of approved structural plans H. Fire Protection (if applicable)	
	Two (2) sets notarized Estimated Value of the building/ structure to be erected as declared by the owner/s (signed and sealed by duly licensed professionals and signed by the owner/s)	Assigned Professionals
	Two (2) sets of Technical Specifications (signed and sealed by duly licensed professionals and signed by the owner/s)	Assigned Professionals
	Two (2) sets of Construction Safety and Health Program. In addition, provide picture if the building is existing.	Department of Labor and Employment (DOLE)
	Structural stability certificate for existing buildings at least 15 years old (See Annex 5)	Civil Engineer (with at least 10 years of professional practice)
	One (1) pc long size folder with fastener Yellow Folder – JMC 2018-01 Red Folder – beyond JMC 2018-01	Client
	For Building Permit – amendatory (As-built), attach Building Permit and/or Occupancy Inspection Report and 1 complete set of approved building plans.	

	CHECKLIST OF REQUIREMENTS	WHERE TO SECURE
	For Building Permit – Additional/repair or renovation, attach Building permit and/or certificate of occupancy and 1 complete set of approved building plans	
	Notes: 1. Government buildings are exempted from Building Permit Fees only. 2. The design should incorporate provisions of Philippine Green Building Code (PGBC) with the required minimum Total Gross Floor Area (TGFA) – see Table 1, Section 8 of PGBC for minimum TGFA in Annex 4 3. The design should incorporate requirement for Earthquake Recording instrumentation (ERI) on EO No. 1, s. 2020. See Annex 3. Reminder: ALL NECESSARY DOCUMENTS MUST BE COMPLETE, SIGNED AND SEALED BY PROFESSIONALS.	

Shown below are samples of the forms needed for the building permit application such as:

- (1) Unified Application Form for Building Permit and Fire Safety Evaluation Clearance.
- (2) Mechanical Permit.

☐ NEW ☐ RENEWAL ☐ AMENDATORY

AREA NO.

[illegible][illegible]

DO NOT FILL-UP (PSA USE ONLY)

OWNER/ APPLICANT	LAST NAME	FIRST NAME	M.I.	TIN
FOR CONSTRUCTION OWNED BY AN ENTERPRISE		FORM OF OWNERSHIP		
ADDRESS: NO., STREET,		BARANGAY,	CITY/MUNICIPALITY	ZIP CODE
				TELEPHONE NO.
LOCATION OF CONSTRUCTION:		LOT NO. _____	BLK NO. _____	TCT NO. _____
		TAX DEC. NO. _____		
STREET _____		BARANGAY _____		
		CITY/ MUNICIPALITY OF _____		
SCOPE OF WORK				
☐ NEW CONSTRUCTION	☐ RENOVATION _____	☐ RAISING _____		
☐ ERECTION _____	☐ CONVERSION _____	☐ ACCESSORY BUILDING/STRUCTURE _____		
☐ ADDITION _____	☐ REPAIR _____	☐ OTHERS (Specify) _____		
☐ ALTERATION _____	☐ MOVING _____			
USE OR CHARACTER OF OCCUPANCY				
☐ GROUP A : RESIDENTIAL, DWELLINGS	☐ GROUP F : INDUSTRIAL	☐ OTHERS (Specify) _____		
☐ GROUP B : RESIDENTIAL HOTEL, APARTMENT	☐ GROUP G : INDUSTRIAL STORAGE AND HAZARDOUS			
☐ GROUP C : EDUCATIONAL, RECREATIONAL	☐ GROUP H : RECREATIONAL, ASSEMBLY OCCUPANT LOAD LESS THAN 1000			
☐ GROUP D : INSTITUTIONAL	☐ GROUP I : RECREATIONAL, ASSEMBLY OCCUPANT LOAD 1000 OR MORE			
☐ GROUP E : BUSINESS AND MERCANTILE	☐ GROUP J : AGRICULTURAL, ACCESSORY			
OCCUPANCY CLASSIFIED _____		TOTAL ESTIMATED COST P _____		
NUMBER OF UNITS _____		PROPOSED DATE OF CONSTRUCTION _____		
TOTAL FLOOR AREA _____		EXPECTED DATE OF COMPLETION _____		
LOT AREA _____				

FULL-TIME INSPECTOR AND SUPERVISOR OF CONSTRUCTION WORKS (REPRESENTING THE OWNER)

_____ ARCHITECT OR CIVIL ENGINEER (Signed and Sealed Over Printed Name) Date _____	Address _____ <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">PRC No. _____</td> <td style="width: 50%; padding: 2px;">Validity _____</td> </tr> <tr> <td style="padding: 2px;">PTR No. _____</td> <td style="padding: 2px;">Date Issued _____</td> </tr> <tr> <td style="padding: 2px;">Issued at _____</td> <td style="padding: 2px;">TIN _____</td> </tr> </table>	PRC No. _____	Validity _____	PTR No. _____	Date Issued _____	Issued at _____	TIN _____
PRC No. _____	Validity _____						
PTR No. _____	Date Issued _____						
Issued at _____	TIN _____						

BOX 4

APPLICANT: _____ Date _____ (Signature Over Printed Name)			WITH MY CONSENT: LOT OWNER / AUTHORIZED REPRESENTATIVE _____ Date _____ (Signature Over Printed Name)		
Address _____ _____ _____			Address _____ _____ _____		
CTC No	Date Issued	Place Issued	CTC No	Date Issued	Place Issued

REPUBLIC OF THE PHILIPPINES CITY/MUNICIPALITY OF _____		) S.S		
BEFORE ME, at the City/Municipality of _____, on _____, personally appeared the following:				
_____ APPLICANT	C.T.C. No.	Date Issued	_____ Place Issued	
_____ LICENSED ARCHITECT OR CIVIL ENGINEER (Full-Time Inspector and Supervisor of Construction Works)	C.T.C. No.	Date Issued	_____ Place Issued	
whose signatures appear hereinabove, known to me to be the same persons who executed this standard prescribed form and acknowledged to me that the same is their free and voluntary act and deed.				
WITNESS MY HAND AND SEAL on the date and place above written.				
Doc. No. _____ Page No. _____ Book No. _____ Series of _____	_____ NOTARY PUBLIC (Until December _____)			

BOX 6 (TO BE ACCOMPLISHED BY THE PROCESSING AND EVALUATION DIVISION)

ASSESSED FEES	BASIS OF ASSESSMENT	AMOUNT DUE	ASSESSED BY
☐ FILING FEE			
☐ PROCESSING FEE			
☐ LOCATIONAL / ZONING OF LAND USE			
☐ LINE AND GRADE (Geodetic)			
☐ FENCING			
☐ ARCHITECTURAL			
☐ CIVIL / STRUCTURAL			
☐ ELECTRICAL			
☐ MECHANICAL			
☐ SANITARY			
☐ PLUMBING			
☐ ELECTRONICS			
☐ INTERIOR			
☐ FIRE CODE CONSTRUCTION TAX			
☐ SURCHARGES			
☐ PENALTIES			
TOTAL			

TERMS AND CONDITIONS

1. The Owner/Permittee shall accomplish the prescribe Unified Application Form, with the assistance of the concerned design professional/s and/or the Architect/Civil Engineer, hired/commissioned by the Owner/Permittee as full-time inspector/supervisor of the construction works, by filling up the necessary data / information required thereat.
2. The fully accomplished prescribed Unified Application Form, duly notarized, shall be submitted to the concerned Office of the Building Official accompanied by the various applicable ancillary and accessory permits, plans and specifications signed and sealed by the corresponding design professionals who shall be responsible for the comprehensive and correctness of the plans in compliance to the National Building Code (PD 1096), its IRR and to all applicable referral codes and professional regulatory laws, together with the other documentary requirements pursuant to Section 302 of PD 1096 and its IRR.

Republic of the Philippines
City/Municipality of _____
Province of _____

OFFICE OF THE BUILDING OFFICIAL**MECHANICAL PERMIT**

APPLICATION NO.

--	--	--	--	--	--	--	--	--	--

MP NO

--	--	--	--	--	--	--	--	--	--

BUILDING PERMIT NO.

--	--	--	--	--	--	--	--	--	--

BOX 1 (TO BE ACCOMPLISHED IN PRINT BY THE OWNER/APPLICANT)

OWNER/APPLICANT		LAST NAME		FIRST NAME		M.I.	TIN
FOR CONSTRUCTION OWNED BY AN ENTERPRISE			FORM OF OWNERSHIP		USE OR CHARACTER OF OCCUPANCY		
ADDRESS: NO.,		STREET,		BARANGAY,		CITY/MUNICIPALITY	ZIP CODE
						TELEPHONE NO	
LOCATION OF CONSTRUCTION:		LOT NO. _____		BLK NO. _____		TCT NO. _____	
STREET _____		BARANGAY _____		CITY/ MUNICIPALITY OF _____		TAX DEC. NO. _____	
SCOPE OF WORK							
☐ NEW CONSTRUCTION		☐ RENOVATION _____		☐ RAISING _____			
☐ ERECTION		☐ CONVERSION _____		☐ DEMOLITION _____			
☐ ADDITION		☐ REPAIR _____		☐ ACCESSORY BUILDING/STRUCTURE _____			
☐ ALTERATION		☐ MOVING _____		☐ OTHERS (Specify) _____			

BOX 2 (TO BE ACCOMPLISHED BY THE DESIGN PROFESSIONAL)

INSTALLATION AND OPERATION OF:		
☐ BOILER	☐ CENTRAL AIRCONDITIONING	☐ DUMBWAITER
☐ PRESSURE VESSEL	☐ MECHANICAL VENTILLATION	☐ PUMPS
☐ INTERNAL COMBUSTION ENGINE	☐ ESCALATOR	☐ COMPRESSED AIR, VACUUM, INSTITUTIONAL and/or INDUSTRIAL GAS
☐ REFRIGERATION AND ICE MAKING	☐ MOVING SIDEWALK	☐ PNEUMATIC TUBES, CONVEYORS and/or MONORAILS
☐ WINDOW TYPE AIRCONDITIONING	☐ FREIGHT ELEVATOR	☐ FUNICULAR
☐ PACKAGED/ SPLIT TYPE AIRCONDITIONING	☐ PASSENGER ELEVATOR	
☐ OTHERS (Specify) _____	☐ CABLE CAR	
PREPARED BY _____		

BOX 3

DESIGN PROFESSIONAL, PLANS AND SPECIFICATIONS	
_____ PROFESSIONAL MECHANICAL ENGINEER (Signed and Sealed Over Printed Name) Date _____	
Address _____	
PRC. No	Validity
PTR. No	Date Issued
Issued at	TIN

BOX 4

SUPERVISOR / IN-CHARGE OF MECHANICAL WORKS	
☐ PROFESSIONAL MECHANICAL ENGINEER ☐ MECHANICAL ENGINEER	
_____ (Signed and/or Sealed Over Printed Name) Date _____	
Address _____	
PRC. No	Validity
PTR. No	Date Issued
Issued at	TIN

BOX 5

BUILDING OWNER		
_____ (Signature Over Printed Name) Date _____		
Address _____		
C.T.C. No.	Date Issued	Place Issued

BOX 6

WITH MY CONSENT: LOT OWNER		
_____ (Signature Over Printed Name) Date _____		
Address _____		
C.T.C. No.	Date Issued	Place Issued

TO BE ACCOMPLISHED BY THE PROCESSING AND EVALUATION DIVISION

BOX 7

RECEIVED BY:	DATE:
FIVE (5) SETS OF MECHANICAL DOCUMENTS	
☐ MECHANICAL PLANS AND SPECIFICATIONS	☐ COST ESTIMATES
☐ BILL OF MATERIALS	☐ OTHERS (Specify) _____

BOX 8

PROGRESS FLOW					
	IN		OUT		PROCESSED BY:
	DATE	TIME	DATE	TIME	
MECHANICAL					
OTHERS (Specify)					

BOX 9

ACTION TAKEN:

PERMIT IS HEREBY ISSUED SUBJECT TO THE FOLLOWING:

1. That the proposed mechanical works shall be in accordance with the mechanical plans filed with this Office and in conformity with the latest Philippine Mechanical Code, the National Building Code and its IRR.
2. That prior to any mechanical installation, a duly accomplished prescribed **"NOTICE OF CONSTRUCTION"** shall be submitted to the Office of the Building Official.
3. That upon completion of the mechanical works, the licensed supervisor/in-charge shall submit the entry to the logbook duly signed and sealed to the building official including as-built plans and other documents and shall also accomplish the certificate of completion stating that the mechanical works conform to the provision of the Philippine Mechanical Code, the National Building Code and its IRR.
4. That this permit is **null and void** unless accompanied by the building permit.
5. That a Certificate of Operation shall be issued for the continuous use of mechanical installations.

PERMIT ISSUED BY:

BUILDING OFFICIAL
(Signature Over Printed Name)
Date _____

- (b) Authority having jurisdictions
- 1) Office of the Building Officials (OBO)
 - 2) Bureau of Fire Protection (BFP)
 - 3) Department of Labor and Employment (DOLE)
- (c) Compliance and inspection

After the completion of the installation of a mechanical equipment, it shall be tested, inspected and certified. Below is the form to be filled-out by the Authority Having Jurisdiction wherever the installation was located.

NBC FORM NO. M - 07 CERTIFICATE OF OPERATION: MACHINERY NAME OF OWNER/LESSEE _____ LOCATED AT/ALONG _____ A CERTIFICATE WAS SUBMITTED BY _____ (Name) A DULY LICENSED PROFESSIONAL MECHANICAL ENGINEER HIRED BY THE OWNER WHO UNDERTOOK THE MECHANICAL INSPECTION AND THAT THE INSTALLATION IS IN ORDER. VERIFIED AS TO THE FOLLOWING No. OF UNITS _____ DESCRIPTION _____ TOTAL HP _____ VERIFIED ON _____ EXPIRES ON _____ INSPECTION FEE PAID _____ OFFICIAL RECEIPT NO. _____ DATE ISSUED _____ THE ABOVE DESCRIBED MECHANICAL INSTALLATION COVERED BY MECHANICAL PERMIT NO. _____ ISSUED ON _____ HAS BEEN FOUND SUBSTANTIALLY SATISFACTORY COMPLIED, THEREFORE THE "CERTIFICATE OF OPERATION: MACHINERY" IS HEREBY RECOMMENDED FOR ISSUANCE. <table style="width: 100%;"> <tr> <td style="width: 50%;"> MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____ PRC REG. No. _____ VALIDITY _____ </td> <td style="width: 50%;"> CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____ PRC REG. No. _____ VALIDITY _____ </td> </tr> </table> <table style="width: 100%;"> <tr> <td style="width: 50%;"> CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____ </td> <td style="width: 50%;"> CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____ </td> </tr> </table>	MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____ PRC REG. No. _____ VALIDITY _____	CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____ PRC REG. No. _____ VALIDITY _____	CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	REPUBLIC OF THE PHILIPPINES CITY/MUNICIPALITY OF _____ PROVINCE OF _____ OFFICE OF THE BUILDING OFFICIAL CERTIFICATE OF OPERATION: MACHINERY No. _____ FEE PAID _____ OFFICIAL RECEIPT NO. _____ DATE PAID _____ DATE ISSUED _____ THIS CERTIFICATE OF OPERATION: MACHINERY IS ISSUED/GRANTED PURSUANT TO PERTINENT PROVISION OF THE LATEST PHILIPPINE MECHANICAL CODE, THE NATIONAL BUILDING CODE AND ITS IMPLEMENTING RULES AND REGULATIONS. NAME OF OWNER/LESSEE _____ LOCATED AT/ALONG _____ No. OF UNITS _____ DESCRIPTION _____ TOTAL HP _____ THE OWNER/LESSEE SHALL PROPERLY MAINTAIN THE EQUIPMENT/MACHINERIES TO ENSURE ITS SAFE OPERATION. NO CHANGE, ADDITION OR UPGRADING/ALTERATION DEVIATING FROM THE ORIGINAL MECHANICAL PLANS SHALL BE MADE WITHOUT APPROPRIATE PERMIT. THE AFOREMENTIONED MACHINERY MAY NOW BE OPERATED FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF INSPECTION. THE OWNER/LESSEE OF THE BUILDING/STRUCTURE SHALL NOTIFY IN WRITING THE OFFICE OF THE BUILDING OFFICIAL FOR THE GRANTING/ISSUANCE OF A CERTIFICATE OF OPERATION: MACHINERY FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ISSUANCE OF THIS CERTIFICATE AND YEARLY THEREAFTER. A CERTIFIED COPY HEREOF SHALL BE POSTED WITHIN THE PREMISES OF THE BUILDING AND SHALL NOT BE REMOVED WITHOUT AUTHORITY FROM THE BUILDING OFFICIAL. BUILDING OFFICIAL (SIGNATURE OVER PRINTED NAME) DATE _____
MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____ PRC REG. No. _____ VALIDITY _____	CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____ PRC REG. No. _____ VALIDITY _____				
CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____				

Below are sample of forms for the certificate of inspection and certificate of operation but not limited to the following mechanical equipment:

- 1) Steam Boiler
- 2) Unfired pressure vessel
- 3) Air-conditioning and refrigeration
- 4) Internal combustion engines

NBC FORM NO. M - 03

CERTIFICATE OF INSPECTION: STEAM BOILER

NAME OF OWNER/LESSEE _____

LOCATED AT/ALONG _____

A CERTIFICATE WAS SUBMITTED BY _____ (Name)
A DULY LICENSED PROFESSIONAL MECHANICAL ENGINEER HIRED BY THE OWNER
WHO UNDERTOOK THE MECHANICAL INSPECTIONS AND THAT THE INSTALLATION IS
IN ORDER.

VERIFIED AS TO THE FOLLOWING

TYPE OF BOILER _____
LOCATION OF INSTALLATION _____
TYPE OF BOILER _____ H. P. _____
LENGTH OF SHELL OF DRUM _____
DIAMETER OF SHELL OF DRUM _____
TENSILE STRENGTH OF SHELL PLATES _____ KGMS./SQ. CM. _____
THICKNESS OF SHELL PLATE _____
THICKNESS OF HEADS _____
NUMBER SIZE OF TUBES _____
STYLE OF LONGITUDINAL JOINT _____

H. P. _____ A. W. P. _____ KGMS./SQ. CM. _____

DATE OF INSPECTION _____ ISSUED ON _____
DATE OF EXPIRATION _____
DATE ISSUED _____
FEE PAID _____
OFFICIAL RECEIPT NO. _____
DATE PAID _____

THE ABOVE DESCRIBED MECHANICAL INSTALLATION COVERED BY MECHANICAL PERMIT NO. _____ ISSUED ON _____ HAS
BEEN FOUND SUBSTANTIALLY SATISFACTORY COMPLIED, THEREFORE THE
"CERTIFICATE OF OPERATION: STEAM BOILER" IS HEREBY RECOMMENDED
FOR ISSUANCE.

MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____ PRC. REG. NO. _____ VALIDITY _____ CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____ PRC. REG. NO. _____ VALIDITY _____ CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____
---	---

REPUBLIC OF THE PHILIPPINES
CITY/MUNICIPALITY OF _____
PROVINCE OF _____

OFFICE OF THE BUILDING OFFICIAL

CERTIFICATE OF OPERATION: STEAM BOILER

No. _____
FEE PAID _____
OFFICIAL RECEIPT NO. _____
DATE PAID _____

DATE ISSUED _____

THIS **CERTIFICATE OF OPERATION: STEAM BOILER** IS ISSUED/GRANTED PURSUANT TO PERTINENT PROVISION OF THE LATEST PHILIPPINE MECHANICAL CODE, THE NATIONAL BUILDING CODE AND ITS IMPLEMENTING RULES AND REGULATIONS.

NAME OF OWNER/LESSEE _____
LOCATED AT/ALONG _____
PRESSURE NOT TO EXCEED _____ KGMS./SQ. CM. USE _____
TYPE _____ YEAR BUILT _____
No. OF DRUM OR SHELL _____ DIAMETER _____ LENGTH _____
THICKNESS OF SHELL PLATE _____ THICKNESS OF HEADS _____ TS _____ KGMS./SQ. CM. _____
No. & SIZE OF TUBES _____ TOTAL HEATING SURFACE AREA _____ SQ. M. GAUGE NO. _____
TYPE OF LONGITUDINAL JOINT _____ EFFICIENCY _____
LOCATION OF FUSIBLE PLUG _____ SYSTEM OF FIRING _____

THE OWNER/LESSEE SHALL PROPERLY MAINTAIN THE EQUIPMENT/MACHINERIES TO ENSURE ITS SAFE
USE AND OPERATION.
NO CHANGE, ADDITION OR UPGRADING/ALTERATION DEVIATING FROM THE ORIGINAL MECHANICAL
PLANS SHALL BE MADE WITHOUT APPROPRIATE PERMIT.

THE AFOREMENTIONED **STEAM BOILER** MAY NOW BE OPERATED FOR A PERIOD OF ONE (1) YEAR
FROM THE DATE OF INSPECTION.

THE OWNER/LESSEE OF THE BUILDING/STRUCTURE SHALL NOTIFY IN WRITING THE OFFICE OF THE
BUILDING OFFICIAL FOR THE GRANTING/ISSUANCE OF A **CERTIFICATE OF OPERATION: STEAM
BOILER** FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ISSUANCE OF THIS CERTIFICATE AND YEARLY
THEREAFTER.

A CERTIFIED COPY HEREOF SHALL BE POSTED WITHIN THE PREMISES OF THE BUILDING AND SHALL NOT
BE REMOVED WITHOUT AUTHORITY FROM THE BUILDING OFFICIAL.

BUILDING OFFICIAL
(SIGNATURE OVER PRINTED NAME)
DATE _____

NBC FORM NO. M - 04

CERTIFICATE OF INSPECTION: UNFIRED PRESSURE VESSELS

NAME OF OWNER/LESSEE _____

LOCATED AT/ALONG _____

A CERTIFICATE WAS SUBMITTED BY _____ (Name)
A DULY LICENSED PROFESSIONAL MECHANICAL ENGINEER HIRED BY THE OWNER
WHO UNDERTOOK THE MECHANICAL INSPECTIONS AND THAT THE INSTALLATION IS
IN ORDER.

VERIFIED AS TO THE FOLLOWING

TYPE _____
LENGTH OF SHELL _____
DIAMETER OF SHELL PLATE _____
THICKNESS OF SHELL PLATE _____
TYPE OF HEAD _____
RADIUS _____
LONGITUDINAL JOINT _____
EFFICIENCY OF LONG JOINT _____
PRESSURE ALLOWED _____
DATE OF INSPECTION _____
DATE OF EXPIRATION _____
DATE ISSUED _____
CAPACITY _____ Cu. M. _____
FEE PAID _____
OFFICIAL RECEIPT NO. _____
DATE PAID _____

THE ABOVE DESCRIBED MECHANICAL INSTALLATION COVERED BY MECHANICAL
PERMIT NO. _____ ISSUED ON _____ HAS
BEEN FOUND SUBSTANTIALLY SATISFACTORY COMPLIED, THEREFORE THE
"CERTIFICATE OF OPERATION: UNFIRED PRESSURE VESSELS" IS HEREBY
RECOMMENDED FOR ISSUANCE.

MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____ PRC. REG. NO. _____ VALIDITY _____ CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____ PRC. REG. NO. _____ VALIDITY _____ CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____
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REPUBLIC OF THE PHILIPPINES
CITY/MUNICIPALITY OF _____
PROVINCE OF _____

OFFICE OF THE BUILDING OFFICIAL

CERTIFICATE OF OPERATION: UNFIRED PRESSURE VESSELS

No. _____
FEE PAID _____
OFFICIAL RECEIPT NO. _____
DATE PAID _____

DATE ISSUED _____

THIS **CERTIFICATE OF OPERATION: UNFIRED PRESSURE VESSELS** IS ISSUED/GRANTED PURSUANT TO PERTINENT PROVISION OF THE LATEST PHILIPPINE MECHANICAL CODE, THE NATIONAL BUILDING CODE AND ITS IMPLEMENTING RULES AND REGULATIONS.

NAME OF OWNER/LESSEE _____
LOCATED AT/ALONG _____
PRESSURE NOT TO EXCEED _____ KGMS./SQ. CM. TYPE _____
LONGITUDINAL JOINT _____ EFFICIENCY _____ %
SHELL DIAMETER _____ LENGTH _____ HEAD TYPE _____
SHELL THICKNESS _____ TEN. STRG. _____ HEAD THICKNESS _____
USE FOR _____

THE OWNER/LESSEE SHALL PROPERLY MAINTAIN THE EQUIPMENT/ MACHINERIES TO ENSURE ITS
SAFE USE AND OPERATION.
NO CHANGE, ADDITION OR UPGRADING/ALTERATION DEVIATING FROM THE ORIGINAL MECHANICAL
PLANS SHALL BE MADE WITHOUT APPROPRIATE PERMIT.

THE AFOREMENTIONED **UNFIRED PRESSURE VESSELS** MAY NOW BE OPERATED FOR A PERIOD OF
ONE (1) YEAR FROM THE DATE OF INSPECTION.

THE OWNER/LESSEE OF THE BUILDING/STRUCTURE SHALL NOTIFY IN WRITING THE OFFICE OF THE
BUILDING OFFICIAL FOR THE GRANTING/ISSUANCE OF A **CERTIFICATE OF OPERATION: UNFIRED
PRESSURE VESSELS** FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ISSUANCE OF THIS CERTIFICATE
AND YEARLY THEREAFTER.

A CERTIFIED COPY HEREOF SHALL BE POSTED WITHIN THE PREMISES OF THE BUILDING AND SHALL NOT
BE REMOVED WITHOUT AUTHORITY FROM THE BUILDING OFFICIAL.

BUILDING OFFICIAL
(SIGNATURE OVER PRINTED NAME)
DATE _____

NBC FORM NO. M-10

CERTIFICATE OF OPERATION: AIR-CONDITIONING/REFRIGERATION

NAME OF OWNER/LESSEE _____

LOCATED AT/ALONG _____

A CERTIFICATE WAS SUBMITTED BY _____ (NAME)
A DULY LICENSED PROFESSIONAL MECHANICAL ENGINEER HIRED BY THE OWNER WHO UNDERTOOK THE MECHANICAL INSPECTIONS AND THAT THE INSTALLATION IS IN ORDER.

VERIFIED AS TO THE FOLLOWING

_____ UNITS, REFRIGERATION.....	_____ TONS
_____ UNITS, ICE PLANT.....	_____ TONS
_____ UNITS, CENTRAL A.C.....	_____ TONS
_____ UNITS, PACKAGED A.C.....	_____ TONS
_____ UNITS, WINDOW TYPE A.C.....	_____ H.P.
_____ UNITS, MECHANICAL VENTILATION.....	_____ H.P.

VERIFIED ON _____

DATE OF EXPIRATION _____

INSPECTION FEE PAID _____

OFFICIAL RECEIPT NO. _____

DATE ISSUED _____

THE ABOVE DESCRIBED MECHANICAL INSTALLATION COVERED BY MECHANICAL PERMIT NO. _____ ISSUED ON _____ HAS BEEN FOUND SUBSTANTIALLY SATISFACTORY COMPLIED, THEREFORE THE "CERTIFICATE OF OPERATION: AIR-CONDITIONING/REFRIGERATION" IS HEREBY RECOMMENDED FOR ISSUANCE.

MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____
PRC REG. NO. _____ VALIDITY _____	PRC REG. NO. _____ VALIDITY _____

CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____
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REPUBLIC OF THE PHILIPPINES
CITY/MUNICIPALITY OF _____
PROVINCE OF _____
OFFICE OF THE BUILDING OFFICIAL

CERTIFICATE OF OPERATION: AIR-CONDITIONING/REFRIGERATION

No. _____
FEE PAID _____
OFFICIAL RECEIPT NO. _____
DATE PAID _____

DATE ISSUED _____

THIS **CERTIFICATE OF OPERATION: AIR-CONDITIONING/REFRIGERATION** IS ISSUED/GRANTED PURSUANT TO PERTINENT PROVISION OF THE LATEST PHILIPPINE MECHANICAL CODE, THE NATIONAL BUILDING CODE AND ITS IMPLEMENTING RULES AND REGULATIONS.

NAME OF OWNER/LESSEE _____

LOCATED AT/ALONG _____

_____ UNITS, REFRIGERATION	_____ TONS
_____ UNITS, ICE PLANT	_____ TONS
_____ UNITS, CENTRAL A.C.	_____ TONS
_____ UNITS, PACKAGED A.C.	_____ TONS
_____ UNITS, WINDOW TYPE A.C.	_____ H.P.
_____ UNITS, MECHANICAL VENTILATION	_____ H.P.

THE OWNER/LESSEE SHALL PROPERLY MAINTAIN THE EQUIPMENT/MACHINERIES TO ENSURE ITS SAFE OPERATION.

NO CHANGE, ADDITION OR UPGRADING/ALTERATION DEVIATING FROM THE ORIGINAL MECHANICAL PLANS SHALL BE MADE WITHOUT APPROPRIATE PERMIT.

THE AFOREMENTIONED **AIR-CONDITIONING/REFRIGERATION** MAY NOW BE OPERATED FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF INSPECTION.

THE OWNER/LESSEE OF THE BUILDING/STRUCTURE SHALL NOTIFY IN WRITING THE OFFICE OF THE BUILDING OFFICIAL FOR THE GRANTING/ISSUANCE OF A **CERTIFICATE OF OPERATION: AIR-CONDITIONING/ REFRIGERATION** FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ISSUANCE OF THIS CERTIFICATE AND YEARLY THEREAFTER.

A CERTIFIED COPY HEREOF SHALL BE POSTED WITHIN THE PREMISES OF THE BUILDING AND SHALL NOT BE REMOVED WITHOUT AUTHORITY FROM THE BUILDING OFFICIAL.

BUILDING OFFICIAL
(SIGNATURE OVER PRINTED NAME)
DATE _____

NBC FORM NO. M-06

CERTIFICATE OF OPERATION: INTERNAL COMBUSTION ENGINE

NAME OF OWNER/LESSEE _____

LOCATED AT/ALONG _____

A CERTIFICATE WAS SUBMITTED BY _____ (NAME)
A DULY LICENSED PROFESSIONAL MECHANICAL ENGINEER HIRED BY THE OWNER WHO UNDERTOOK THE MECHANICAL INSPECTION AND THAT THE INSTALLATION IS IN ORDER.

VERIFIED AS TO THE FOLLOWING

TYPE _____

MANUFACTURER _____

R.P.M. _____ H.P. _____

DATE OF INSPECTION _____

EXPIRES ON _____

FEE PAID _____

OFFICIAL RECEIPT NO. _____

DATE ISSUED _____

THE ABOVE DESCRIBED MECHANICAL INSTALLATION COVERED BY MECHANICAL PERMIT NO. _____ ISSUED ON _____ HAS BEEN FOUND SUBSTANTIALLY SATISFACTORY COMPLIED, THEREFORE THE "CERTIFICATE OF OPERATION: INTERNAL COMBUSTION ENGINE" IS HEREBY RECOMMENDED FOR ISSUANCE.

MECHANICAL INSPECTOR (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, MECHANICAL SECTION (SIGNATURE OVER PRINTED NAME) DATE _____
PRC REG. NO. _____ VALIDITY _____	PRC REG. NO. _____ VALIDITY _____

CHIEF, INSPECTION AND ENFORCEMENT DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____	CHIEF, PROCESSING AND EVALUATION DIVISION (SIGNATURE OVER PRINTED NAME) DATE _____
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REPUBLIC OF THE PHILIPPINES
CITY/MUNICIPALITY OF _____
PROVINCE OF _____
OFFICE OF THE BUILDING OFFICIAL

CERTIFICATE OF OPERATION: INTERNAL COMBUSTION ENGINE

No. _____
FEE PAID _____
OFFICIAL RECEIPT NO. _____
DATE PAID _____

DATE ISSUED _____

THIS **CERTIFICATE OF OPERATION: INTERNAL COMBUSTION ENGINE** IS ISSUED/GRANTED PURSUANT TO PERTINENT PROVISION OF THE LATEST PHILIPPINE MECHANICAL CODE, THE NATIONAL BUILDING CODE AND ITS IMPLEMENTING RULES AND REGULATIONS.

NAME OF OWNER/LESSEE _____

LOCATED AT/ALONG _____

ENGINE USED FOR _____ TYPE OF ENGINE _____

MANUFACTURED BY _____ H.P. OF ENGINE _____

THE OWNER/LESSEE SHALL PROPERLY MAINTAIN THE EQUIPMENT/MACHINERIES TO ENSURE ITS SAFE OPERATION.

NO CHANGE, ADDITION OR UPGRADING/ALTERATION DEVIATING FROM THE ORIGINAL MECHANICAL PLANS SHALL BE MADE WITHOUT APPROPRIATE PERMIT.

THE AFOREMENTIONED **INTERNAL COMBUSTION ENGINE** MAY NOW BE OPERATED WITH A SPEED NOT TO EXCEED _____ R.P.M. FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF INSPECTION.

THE OWNER/LESSEE OF THE BUILDING/STRUCTURE SHALL NOTIFY IN WRITING THE OFFICE OF THE BUILDING OFFICIAL FOR THE GRANTING/ISSUANCE OF A **CERTIFICATE OF OPERATION: INTERNAL COMBUSTION ENGINE** FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ISSUANCE OF THIS CERTIFICATE AND YEARLY THEREAFTER.

A CERTIFIED COPY HEREOF SHALL BE POSTED WITHIN THE PREMISES OF THE BUILDING AND SHALL NOT BE REMOVED WITHOUT AUTHORITY FROM THE BUILDING OFFICIAL.

BUILDING OFFICIAL
(SIGNATURE OVER PRINTED NAME)
DATE _____

5. Legal and Ethical Considerations

(a) Legal framework for the practice of Mechanical Engineering in the Philippines

Pursuant to the provisions of Section 9(a) of Republic Act No. 8495, and Section 50, Rule XIII of Board Resolution No. 16, Series of 1998, providing for the Rules and Regulations to carry out the purpose of the Act, the PRBME hereby adopts, promulgates and issues this Board Resolution No. 06 Series of 2003 otherwise known as the **“Code of Ethical and Professional Standard for the Practice of the Mechanical Engineering profession.”**

The **FUNDAMENTAL CANONS** for Mechanical Engineers in the fulfillment of their professional duties shall be as follows:

- 1) Hold paramount the safety, health, and welfare of the public in the performance of their professional duties.
- 2) Perform services only in areas of their competence.
- 3) Make/Issue public statements on issues only in an objective and truthful manner.
- 4) Act in a professional manner for each employer or client as faithful trustees.
- 5) Avoid improper solicitation from clients of professional employment.

In the fulfillment of its duties the mechanical engineer shall maintain good relations with the following:

- 1) Relations with the State
- 2) Relations with the Community
- 3) Relations with Labor
- 4) Relations with Clients and Employer
- 5) Relations with Colleagues Associates

Violation of any provision of this Code shall constitute a ground for the revocation or suspension of the certificate of registration and professional license/ professional identification card (PIC) or the cancellation of a temporary or special permit under the provisions of Sec. 26 and Sec. 27, Art. III of R.A. No. 8495, known as the “Mechanical Engineering Act of 1998” and Sec. 41, Rule VII of the “Rules and Regulations Implementing R.A. No. 8495”.

6. Compliance and certification process

In the Philippines, the compliance and certification process for mechanical engineering involves graduating from a recognized program, passing the Professional Mechanical Engineer licensure exam administered by the Professional Regulation Commission (PRC), and maintaining a valid professional license, which requires submitting necessary documents proving your qualifications and experience to practice mechanical engineering professionally; this includes verification of your degree, work history, and ethical conduct.

CHAPTER 2

CODES AND STANDARDS

C. CODES AND STANDARDS USED IN THE PHILIPPINES

1. The Philippine Mechanical Engineering Code (2012)

Pursuant to the PRC Board Resolution No. 212-56 Series of 2012, the PRC has adopted and promulgated the Philippine Mechanical Engineering Code of 2012 with an objective *to establish and maintain high professional and ethical standards for mechanical engineers by outlining guidelines for safe and responsible design, construction, and operation of mechanical systems, prioritizing public safety, and ensuring that engineers practice only within their areas of competence, ultimately aiming to protect the public welfare through proper engineering practices.*

- **Chapter 1 – Administration.** This chapter provides an outline of the process of implementing mechanical engineering works or projects according to the rules and regulations set by the Philippine government to protect health, life and property and the control in the practice of mechanical engineering profession as provided in RA 8495 or otherwise known as the Mechanical Engineering Act of 1998. It also outlined the strict compliance to the requirement for licenses, permits and inspections in implementing mechanical related projects.

Any conflicts with different sections of this Code and other reference standards, the most stringent shall prevail as determined by the Authority Having Jurisdiction. Any conflict between the general and specific, the specific requirement shall prevail.

- **Chapter 2 – Definitions.** For immediate understanding of everyone in reading the Code, this chapter provides typical definitions, words, and derivatives, terms and phrases and certain abbreviations related to all things mechanical. Likewise, Sections 3, 33, 34 and 35 of RA 8495 defines what is the practice of mechanical engineering, mechanical equipment or machinery, mechanical processes, works, projects or plants and the capacity of process works, projects or plant-rated capacity and the limitations of which grade of mechanical engineer shall be responsible with.
- **Chapter 3 – General Requirements.** This chapter is divided into two Articles, namely, Article 1 for Mechanical and Article 2 for Water Distribution and Drainage System.

Article 1 provides the general requirement for the installation of heat producing and energy utilizing equipment such as heating, ventilating, air-conditioning, refrigeration and other similarly related equipment which shall conform to the requirements of this Code. For specialized applications like burning equipment, the requirements of NFPA 31, Standard for the Installation of Oil Burning Equipment shall be adhered to and for

the Liquefied Petroleum Gas (LPG) facilities it shall be installed in accordance with NFPA 58.

Article 2 provides the standard used in the design, materials specifications and installation of water distribution system and drainage piping system in compliance to this Code and the National Building Code of the Philippines, whichever are more stringent that will provide safety and health protection to the general public.

- **Chapter 4 – Ventilation Air Supply and Exhaust.** Covered by this chapter are the requirements for ventilation air supply and air exhaust, make-up air requirements and evaporative cooling systems with specific application in hospitals. ASHRAE standards were adapted for the design and references for calculations.
- **Chapter 5 – Exhaust Systems.** This chapter provides the design, materials specifications, safety requirement, installation and maintenance requirements for the environmental air ducts, product conveying systems, and commercial hoods and kitchen ventilation. Portions of this chapter had adopted the NFPA 96 for the design and installation of the exhaust fans and duct system whenever applicable.
- **Chapter 6 – Duct Systems.** This chapter provides the standards in the design, material specifications, safety requirement and installation of ducts and plenums which are portions of a heating, cooling, absorption or evaporative cooling, or product conveying system. Portions of this chapter had adopted the ASHRAE and NFPA standards in the design and installation whenever applicable.
- **Chapter 7 – Air Ventilation for Combustion.** This chapter provides calculation methods adapting the NFPA 54 standards for the required air for combustion, ventilation, and dilution gases for gas utilization equipment installed within the buildings. Design to include the ducting, louvers, screens and fans for the supply and exhaust air. Installation of the gas utilization equipment shall comply with the manufacturer's recommendation.
- **Chapter 8 – Chimneys and Vents.** This chapter provides the design, construction and installation of venting system for low heat gas fuel burning appliances adapting the NFPA 54 standards. Other gas burning appliances shall be vented in accordance with NFPA 211 or other applicable standards.
- **Chapter 9 – Smoke Control / Fire Stop Protection.** This chapter shall provide the recommended practices for the smoke control systems applied to the design, installation, testing, operation, and maintenance of new and retrofitted mechanical air conditioning and ventilation systems for the control of the smoke. This also apply to system dedicated solely for the control of smoke. The NFPA 92 standards were adopted as well as those practices based on the Fire Code of the

Philippines. The fire stop protection system's material specifications and installation provided in this chapter shall be in accordance with the Building Code of the Philippines and the manufacturer's instructions.

- **Chapter 10 – Hydronics.** This chapter is presented in two (2) parts, namely: Part I, the steam and water piping and Part II, the hydronic panel cooling system. Part I, includes the steam and water piping system that are part of a heating or cooling system which shall comply with the provisions of this chapter for the design, material specification, fabrication and installation. Adapted the ASTM D 3309 standard for the Polybutylene (PB) plastic piping used in hot water system. Part II, established and provided the minimum standards for the protection of public health, welfare and property by regulating and controlling the design and installation of panel cooling system. Portions of this chapter had adopted the California Mechanical Code 2007 and NFPA standards.
- **Chapter 11 – Steam and Hot Water Boilers.** This chapter shall establish and provide the minimum standards for the protection of public welfare, health, by regulating and controlling the quality, location, construction, installation, operation, repair and alteration of all boilers (steam and hot water boilers) and pressure vessels with some exceptions mentioned in Section 1102.0. Strict compliance with the requirements from the Authority Having Jurisdiction for the testing, inspection and issuance of operating permits shall be done strictly. Portions of this chapter had adapted the California Mechanical Code 2007 standards.
- **Chapter 12 – Refrigeration.** This chapter is presented in two (2) parts, namely: Part I, the refrigeration system and Part II, the cooling system. Part I, includes the refrigeration system, equipment, and devices, including the replacement of parts, alterations, and substitution of a different refrigerant, shall conform to the requirements of this chapter and other applicable provisions of this Code. Part II, provides the methods of installation of the cooling towers with compliance to the Plumbing Code, Building Code and Fire Code. Portions of this chapter had adopted the California Mechanical Code 2007 standards.
- **Chapter 13 – Installation of Equipment.** This chapter is presented in two (2) parts, namely: Part I, the air conditioning and refrigeration/boilers and other equipment and Part II, the internal combustion engine power generation. Part I, includes air conditioning system ventilation appliances, and refrigeration equipment shall comply with the general requirements of Chapter 3 of this Code in addition to the requirements of this chapter. Standards are geared toward the safety installation, commissioning, and testing of specific equipment such as air conditioning systems, ventilation appliances, refrigeration equipment, low pressure boilers, plenums and air ducts, food service equipment, clothes dryers, household cooking appliances, illuminating appliances, incinerators, pool heaters, and power

generators. Portions of this chapter had adopted the California Mechanical Code 2007 and NFPA 54-2002 standards. Part II, The standards in this chapter applies to the fire safety for the installation and operation of stationary combustion engines, gas turbines not exceeding 7,500 horsepower (hp) per unit. For engines exceeding 7,500 hp, NFPA 850 standards shall be complied. Portions of this chapter had adopted the NFPA 37 standards.

- **Chapter 14 – Water Supply.** This chapter provides standards for the materials and installation of the piping system for potable, non-potable and reclaimed water supply systems in all types of buildings whether industrial, commercial or residential including the use of various piping and plumbing materials. Strict compliance to the installation procedure to avoid cross contamination.
- **Chapter 15 – Drainage Pipe System / Building Sewers.** This chapter is presented in two (2) parts, namely: Part I, the drainage pipe system and Part II, the building sewers. It shall govern the materials, design, installation and product limitations of drainage and waste piping systems within building structures. Portions of this chapter had adopted the California Plumbing Code 2007 standards.
- **Chapter 16 – Vents.** This chapter shall govern the materials, design, installation and product limitations of vent piping systems within building structures. Strict compliance to the installation procedure of the venting system to avoid siphonage and back pressure to the drainage system. Portions of this chapter had adopted the California Plumbing Code 2007 standards.
- **Chapter 17 – Storm Drainage.** This chapter shall govern the materials, design, installation and product limitations of storm drainage systems within building structures subject to the approval of the Authority Having Jurisdiction. Portions of this chapter had adopted the California Plumbing Code 2007 standard.
- **Chapter 18 – Fuel Gas Piping.** This chapter shall govern the installation of all fuel gas piping in connection with any building or structure within the property lines of any premises using fuel gases pressure up to 5 psi, which shall be authorized by permit issued by the Authority Having Jurisdiction.

The scope shall cover all pipes starting from the point of delivery of the gas company to the connections with each gas utilization device. The fuel gas piping for other than undiluted liquefied petroleum (LPG) systems shall consider the point of delivery at the outlet of the service meter assembly, or the outlet of the service regulator or service shut off valve where no meter is provided. The fuel gas piping for undiluted LPG systems, the point of delivery shall be considered the outlet of the final pressure regulator, exclusive of the line gas regulators, in the system. Portions of this chapter had adopted the California Plumbing Code 2007 and NFPA 54 standards.

- **Chapter 19 – Health Care Facilities and Medical Gas and Vacuum Systems.** This chapter is presented in two (2) parts, namely: Part I, the special requirement for health care facilities and Part II, the medical gas and vacuum systems. Part I of this chapter applies to the special fixtures and systems in health care facilities and to the special plumbing requirements of such facilities. Part II of this chapter shall provide the requirements for the installation, testing and verification of medical gas and medical vacuum systems from the central supply system to the station outlets or inlets. Certificate of approval shall be issued by the Authority Having Jurisdiction after satisfactory completion of all tests. Portions of this chapter had adopted the California Plumbing Code 2007 and NFPA 99 standards.
- **Chapter 20 – Fire Protection System.** The provisions of this chapter shall specify where fire protection systems are required in accordance with RA 9514, Revised Fire Code of the Philippines of 2008 and shall apply the design, installation, inspection, operation, testing and maintenance of all fire protection systems. Portions of this chapter had adopted the California Fire Code 2007 and NFPA standards.
- **Chapter 21 – Indirect Drain, Traps and Interceptors and Sewage Treatment Plant.** This chapter provides design and installation for indirect waste, traps and interceptors for the safety of all equipment and protection from the waste in a system such as condensate, solid waste, chemical waste, air and smell wastes which are detrimental to health. Design and installation shall be approved by the Authority Having Jurisdiction. Portions of this chapter had adopted the California Plumbing Code 2007 standards.
- **Chapter 22 – Flammable and Combustion Liquid Piping Systems and Storage.** This chapter deals with the safety management of handling combustible liquids. It is very explicit and detailed when it comes to information data, testing, installation, commissioning, security and markings, and disposal management. The local government will be empowered to come up with ordinances pertaining to safety for this particular hot topic. Portions of this chapter had adopted the NFPA 30 standards.
- **Chapter 23 – Pressure Vessel Safety Requirement.** This chapter deals with both unfired and fired pressure vessels and discusses extensively on the design and construction, installation, safety, inspection, identification and even provisions for the certification and training of qualified welders and inspectors. Portions of this chapter had adopted the California Division of Occupational Safety Standards.
- **Chapter 24 – Energy Conservation.** The aim of this chapter is to make the reader be aware of how to achieve energy efficient buildings without sacrificing comfort

which ultimately leads to a sustainable environment, less greenhouse gas emissions and reduced global warming with application to non-residential and high-rise building such as hotels, motels and high residential building. This chapter also recognize the adoption of the 2010 PSVARE standard on Energy Efficiency Buildings developed by the Philippine Society of Ventilating Air Conditioning and Refrigerating Engineers Inc. a professional affiliate of PSME.

- **Chapter 25 – Elevator Safety.** This purpose of this chapter is to provide for the safety of life and limb, and to promote the public welfare on elevator operation. It shall include the design, construction, installation, alteration, inspection, maintenance, testing, operation, repairing, and licensing of all types of elevators, escalators, moving walks, dumbwaiters, man lifts, private residence elevators and inclined elevators, inclined lifts, reciprocating conveyors, wheelchair lifts, inclined stairway chair conveyors lifts, private residence inclined stairway chair lifts and wheelchair lift, their hoist ways and their appurtenances. Portions of this chapter had adopted the California Elevator Safety Orders of Title 8 and the Part 7 of the California Code of Regulation 2007 standards.
- **Chapter 26 – Standard Practice for the Control of Flammable and Combustible Liquid and Gases in Manholes, Sewers and Underground Structure.** This chapter shall provide the enforcement officials, fire authorities, contractors and owners of underground structures guidance on the problems involving flammable and combustible liquids and gases that might be found in underground structures. The underground structures shall include sanitary sewers, storm drains, water lines, fuel gas distribution system, electric light and power conduits, police and fire signal systems, traffic signal lines, refrigeration service lines, steam lines and petroleum pipelines. Portions of this chapter had adopted NFPA 328 standards.
- **Chapter 27 – Renewable Energy Source.** The Renewable energy is envisioned to become a part of the mechanical engineering field that will have dynamic evolution. Renewable energy may include solar power, biomass, wind power, ocean thermal energy, geothermal and dendro-thermal, hydro-electric plants. Initially this chapter will have two (2) articles such as Article 1 for solar systems and Article 2 for biomass power sources. For the solar power, this chapter shall provide the requirements of a solar system for the purpose of generating electricity of at least one (1) kW and not more than five (5) MW. For the biomass, this chapter provides the standard which specifies the requirements for the design, operation and maintenance of a biomass boilers which used Agri-forestry wastes as fuel.
- **Chapter 28 – Non-Renewable Energy Source.** This chapter shall be dedicated to the non-conventional fuel as a source of energy like diesel-engine-driven power plants, fuel cell power plant, coal-fired power plants, nuclear power plants and all other power generating plants using non-renewable fuel that will be developed in

the future. This chapter is a work in progress being developed by PSME and shall be adopted as part of this Code.

- **Chapter 29 – Standards.** This chapter provides the list of standards from different organizations and associations all over the world, which form part of this Code. These standards were adopted by PSME based on the best practices and years of experience of each organization's attempt in preserving order in the realm of mechanical engineering practice. We honor them by generously quoting their good engineering practices adapted to our country's prevailing conditions.

2. Philippine National Standards (PNS)

The standards in the Philippines were formalized with the enactment of RA 4109 otherwise known as the "Standard Law" which created the Bureau of Philippine Standards (BPS) on June 20, 1964. The Bureau serves as the National Standards Body (NSB) under the Department of Trade and Industry (DTI) with a mandate to develop, promulgate, and implement standards for all products in the Philippines, to promote standardization activities in the country, and to ensure the manufacture, production, and distribution of quality products for the protection of the consumer.

On April 13, 1992, the mandate of RA 4109 was reiterated by the enactment of RA 7394 otherwise known as the "Consumer Act of the Philippines" which declares as a policy that it is the duty of the State to develop and provide safety and quality standards for consumer products, including performance or use-oriented standards, codes of practice and methods of tests.

At present, the BPS is positioned within the administrative ambit of the Fair-Trade Group (FTG) of the DTI, working alongside with the Fair-Trade Enforcement Bureau (FTEB) and the Philippine Accreditation Bureau (PAB).

The programs and services of the BPS are as follows:

- Develop and maintain national standards and coordinate standardization activities to address the country's needs for standards in consumer protection and trade facilitation,
- Certify products for safety and quality in accordance with the Philippine National Standards (PNS) and other conformity assessment schemes, as necessary,
- Operate a Testing Center to support its product certification scheme and conduct confirmatory tests for laboratories,
- Maintain a Standards Data Center or a repository of standards and a website where a list of PNS and certified products are published, and
- Disseminate information on standards developed and adopted to manufacturers, traders and other standards users.

a) Overview of the national standards

Standardization is the process of developing standards through collaborative study and consensus of experts from the government, business, and consumer sectors. The results of these concerted efforts are the technical specifications known as the standards.

The Philippine National Standards (PNS) are technical specifications that set minimum standards for products in the Philippines. The Bureau of Philippine Standards (BPS) develops and publishes PNS.

The Purpose of PNS is to help industries produce quality products, increase productivity, protect consumers, and facilitate trade. Examples of PNS specification for various products used in the industry.

- 1) PNS 55:1986 – specifications for Pipes and Fittings High density polyethylene (PE) pipes for potable water supply.
- 2) PNS 152:1987 – specifications for Polybutylene (PB) pipes for potable water supply.
- 3) PNS 65:1993 – specifications for Unplasticized polyvinyl chloride (uPVC) pipes for potable water supply.
- 4) PNS 1991:2002 – specifications for Grey iron pipes for pressure water lines.

b) Significant differences of international and national standards

A standard is a document approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method (World Trade Organization – Technical Barriers to Trade Agreement).

It is also defined in the ISO/IEC Guide 2 as a document, established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in each context.

There are various levels of standards:

- 1) **International Standard** - a standard published by an international standardizing organization such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). These standards generally reflect the best experience of the industry, researchers, consumers and regulators worldwide, and cover common needs in a variety of countries, thus, they constitute one of the important bases for the removal of technical barriers to trade. These standards are adopted by WTO member countries in compliance to the Technical Barriers to Trade Agreement (WTO-TBT) to facilitate international trade.

- 2) **Regional Standard** - a standard developed or adopted by a regional standardizing organization [e.g., European Committee for Standardization (CEN); and Pan American Standards Commission (COPANT)]. Regional standards are generally voluntary in nature, representing the joint action of the national standards bodies of a group of nations within one geographical, political or economic area.
- 3) **National Standard** - a standard developed/adopted and published by a National Standards Body and made available to the public. The BPS develops and publishes Philippine National Standards (PNS).

3. Typical Standards used in the Philippines with respect to Mechanical Engineering Practices

In the practice of mechanical engineering profession in the Philippines, it had been using foreign standards to supplement the local standards as follows:

- a) ANSI: basic, design, management systems, process, product, test methods, and others.
- b) ASTM: specification, test method, terminology, practice, guide.
- c) ISO: product, test methods, codes of practice, guideline, management systems.

4. Implementation and Compliance

For the implementation and compliance of the standards, the BPS created four divisions with their respective functions as follows:

a) Standards Development Division (SDD)

- 1) Formulate national standards development policies, in consultation with relevant government agencies and other stakeholders.
- 2) Formulate Philippine National Standards (PNS) for consumer protection and trade facilitation through the conduct of regular review of these standards for possible revision/updating to align with developments in trade and latest technology; and
- 3) Coordinate national standardization activities in the country to avoid duplication of work by various government regulatory agencies and harmonization of standards and technical regulations with international standards.

b) Standards Conformity Division (SCD)

- 1) Operate and implement the BPS Product Certification Schemes (PCS) for both locally produced and imported products covered by mandatory standards;
- 2) Prepare implementing policies and guidelines for every standard approved for mandatory certification; organize meetings and public hearings on standards implementation; and
- 3) Prepare market surveillance and monitoring policies for mandatory standards on products affecting life, health and safety; monitor the development of conformity assessment procedures for the country to be at par with internationally accepted protocols.

c) Product Testing Division (PTD)

- 1) Conduct third-party testing of products through the BPS Testing Center to verify their conformity with specified PNS;
- 2) Provide support to the BPS PCS requirements through the performance of electrical, chemical and mechanical testing of products;
- 3) Provide support to standards development by conducting developmental tests on products for which standards are being developed/formulated; and
- 4) Conduct confirmatory tests when there are conflicts about results of other government and private laboratories.

d) Standards Mainstreaming Division (SMD)

- 1) Conceptualize, prepare and propose programs, projects and activities for the mainstreaming and dissemination of new national and international standards for adoption and standardization and conformity assessment activities, such as testing, inspection and certification to industries, manufacturers, traders, regulators and other users;
- 2) Maintain and update the Standards and Conformance Portal at all times;
- 3) Operate the Enquiry Point in connection with the country's obligations to the World Trade Organization (WTO) Agreement on Technical Barriers to Trade; and
- 4) Monitor developments for forging of strategic alliances with international and regional aggrupations.

5. Safety standards and Practices

a) OCCUPATIONAL SAFETY AND HEALTH (OSH) reporting

RA 11058, otherwise known as the “Act Strengthening Compliance with Occupational Safety and Health Standards,” was a landmark legislation in the Philippines that mandated the strict adherence to Occupational Safety and Health (OSH) Standards. In 2019, the Department of Labor and Employment (DOLE) released Department Advisory 04-19 or also known as “Guide for Compliance of Establishments to DO 198-18. This guideline aims to ensure effective service and in line with the implementation of Republic Act No. 11058 along with its Implementing Rules and Regulations (IRR) issued under Department Order No. 198-18, which came into effect on January 25, 2019

Occupational Safety and Health (OSH) reporting requirements in the Philippines include:

- 1) Employer's Work Accident Illness Report: A report on any work-related accidents or illnesses
- 2) Annual Work Accident/Illness Exposure Data Report: A yearly report on work-related accidents and illnesses
- 3) Annual Medical Report: A yearly report on the medical conditions of employees
- 4) Application for Registration/Re-registration: An application to register or re-register for OSH
- 5) Report on Safety and Health Organization: A report on the safety and health organization

- 6) Government Safety Engineer's Accident Investigation report: A report on any accidents investigated by a government safety engineer
- 7) Certificate of attendance: A certificate of attendance to the Workers' OSH Seminar

OSH in the Philippines aims to ensure safe and healthy working conditions for all employees. This includes preventing accidents, injuries, and illnesses.

b) Incident reporting

In cases of work accidents resulting in serious injuries or deaths, the employer or worker must promptly notify the nearest DOLE office with jurisdiction over the workplace using the quickest available means of communication. The following reports are required:

- 1) Employer's Work Accident/Injury Report (WAIR): A report for work-related incidents that result in disabling injuries or conditions
- 2) Annual Work Accident/Injury Exposure Data Report (AEDR): A report that must be submitted by January 30 following the covered year
- 3) Annual Medical Report (AMR): A report that must be submitted by March 31 following the covered year
- 4) OSH Committee Report: A report that includes meeting minutes and must be submitted at least quarterly

6. Environmental Regulations

- a) Republic Act (RA) 3931 otherwise known as the Pollution Control Law was passed on June 18, 1964. It created the National Water and Air Pollution Control Commission, which is responsible for developing plans to reduce pollution. The act also established standards for sewage and industrial waste.
- b) Presidential Decree (PD) 984 was enacted on August 18, 1976 and it amended the Pollution Control Law. The decree had established the National Pollution Control Commission under the Office of the President.
- c) Republic Act (RA) 8749 otherwise known as the Philippine Clean Air Act, this act was established on June 23, 1999. It focuses on preventing air pollution and includes provisions to address ozone-depleting substances and persistent organic pollutants

In support to the environmental programs of the government, the PRC/PRBME had developed an Advanced Professional Mechanical Engineering course with specialization in Water and Wastewater Mechanical Systems as one of the Career Progression and Specialization Program (CPSP) for Mechanical Engineering.

7. National Building Code

PD 1096 otherwise known as the "National Building Code of the Philippines" was enacted on February 19, 1977 with a State policy stated in Section 102 as follows: *"It is hereby*

declared to be the policy of the State to safeguard life, health, property, and public welfare, consistent with the principles of sound environmental management and control; and to this end, make it the purpose of this Code to provide for all buildings and structures, a framework of minimum standards and requirements to regulate and control their location, site, design, quality of materials, construction, use, occupancy, and maintenance."

8. Fire Code of the Philippines

RA 1185 otherwise known as the Fire Code of the Philippines was enacted on August 26, 1977. Such law was repealed on December 19, 2008 by RA 9514 otherwise known as the Fire Code of the Philippines of 2008 with the State policy stated in Section 2 as follows: *"It is the policy of the State to ensure public safety and promote economic development through the prevention and suppression of all kinds of destructive fires and promote the professionalization of the fire service as a profession. Towards this end, the State shall enforce all laws, rules and regulations to ensure adherence to standard fire prevention and safety measures and promote accountability for fire safety in the fire protection service and prevention service."*

The Revised Implementing Rules and Regulations of RA 9514 was approved on August 7, 2019, and adopted to carry out the provisions of RA 9514. In support to this Code, an Advanced Professional Mechanical Engineering course in Fire protection, Life Safety and Smoke Control System is one of the specializations in the Career Progression and Specialization Program (CPSP) for Mechanical Engineering.

D. CONTINUOUS IMPROVEMENTS

1. Technology and Innovation

a) Adaptation to emerging technologies

Mechanical engineers can adapt to emerging technologies by staying current with trends, learning new skills, and collaborating with other professionals for networking.

1) Stay current

- Read: Read journals, blogs, and books about mechanical engineering
- Attend events: Go to webinars, workshops, conferences, and courses
- Join professional groups: Connect with other mechanical engineers through professional associations, online communities, and social media

2) Learn new skills

- Take courses: Enroll in courses to learn new technologies and broaden your education
- Earn a graduate degree: Get a degree in engineering or business administration to learn new technologies and improve project management skills

3) Collaborate

- Work with others: Work with people from other disciplines to solve problems
 - Join partnerships: Participate in internships, collaborative projects, and networking opportunities
- 4) Adopt new technologies – Use digital tools and software, such as digital twins, to reduce the need for physical prototypes
 - 5) Embrace automation and artificial intelligence (AI) to improve innovation and problem-solving

Mechanical engineering experts have broad skill sets, enabling them to drive progress in many sectors. They analyze complex problems and use engineering principles and tools such as computer-aided design to develop creative solutions: longer-lasting batteries, innovative medical devices and power-producing machines, among many others. They also test emerging technologies and optimize the performance of new tools and mechanisms.

These professionals frequently collaborate with experts in other disciplines. Multidisciplinary projects can lead to exciting new developments that require knowledge from several areas.

b) Research and development

Pursuant to Section 22 of Republic Act No. 8439, otherwise known as the Magna Carta for Scientists, Engineers, Researchers and Other Science and Technology Personnel in Government, which was approved on December 22, 1997 and took effect on February 4, 1998, it has formulated the Rules and Regulations, as amended, for its implementation. SECTION 1. Declaration of Policy – *“The State recognizes science and technology as an essential element for the attainment of national development and progress. To attain this objective, it is hereby declared the policy of the State to provide for a program of human resources development in science and technology to achieve and maintain the necessary competent pool of expertise that will sustain its drive for total science and technology effectiveness and excellence.*

The State shall establish, promote and support programs leading to the realization of this objective, such as the science, technology and engineering scholarship programs; improvement of the quality of science, technology and engineering education; promotion of science and technology culture; and provision of incentives for pursuing careers in science and technology.

In furtherance of this policy, the science and technology community shall ensure the utilization of research and development results to maximize benefits from such endeavors.”

The Department of Science and Technology (DOST) offers grants and scholarships for mechanical engineering students and researchers. These includes:

- 1) Grants-In-Aid (GIA) which provides grants to support S&T activities, including research and development (R&D). The DOST’s Grants-In-Aid (GIA) program aims

to harness the country's scientific and technological capabilities to spur and attain a sustainable economic growth and development. Through the funding of relevant S&T undertakings, the GIA program is designed to contribute to productivity improvement and quality of life of Filipinos by generating and promoting appropriate technologies. It also aims to strengthen the participation of various S&T sectors particularly in research and development (R&D), promotion, technology transfer and utilization, human resources development, information dissemination, advocacy, and linkages. The GIA program provides grants for the implementation of programs/projects identified in the current DOST priorities and thrusts and supports S&T activities classified in the General Appropriations Act (GAA).

- 2) DOST-PCIEERD research grants which provides grants to student teams for research projects aligned with the sectors that the program supports

2. Professional Networking and Association

a) Professional Associations for ME requirements and privileges

The Professional associations for engineers like PSME can offer a variety of benefits, including networking, education, and professional development opportunities. The benefits are as follows:

- 1) Networking: Members can connect with other professionals in their field
- 2) Education: Members can learn new skills and gain certifications
- 3) Professional development: Members can invest in their professional development
- 4) Publications: Members can access professional journals
- 5) Awards: Members can be recognized for their work
- 6) Online resources: Members can access exclusive online resources
- 7) Conferences: Members can attend conferences and events
- 8) Special interest groups: Members can join groups focused on specific topics
- 9) Chapters: Members can join local chapters of national associations

Requirements

- To practice in some professions, you may need to be registered with a professional association
- Registration may involve understanding and applying the association's guidelines and rules

b) Networking opportunities

In a professional setting, networking involves connecting, communicating and collaborating with industry professionals. It's a way to exchange ideas, knowledge, and opportunities with like-minded individuals. Networking can help professionals advance their careers, grow their personal lives, and establish life-long friendships through similar lived experiences and interests.

PSME as an AIPO, is representing all mechanical engineers in the Philippines. It had established relationship with other mechanical engineering organization in the ASEAN regions and local industries and institutions through MOU/MOA to start collaborative work through information sharing on the best practices of the profession.

PSME had a permanent seat in the PTC and PTC as a permanent member of AFEO will provide opportunities for networking of Filipino mechanical engineers with other professional organization in the ASEAN region.

3. Mutual Recognition Arrangements (MRAs)

The Mutual Recognition Arrangements (MRAs) was established as the framework arrangements in support of liberalizing and facilitating trade in services among member nations. The Philippines as a member nation of ASEAN had forged an agreement with the other member nations to allow mutual recognition of conformity assessments and qualifications of mechanical engineers to allow mobility of professional practice in the ASEAN region.

The Philippines being a signatory of the ASEAN AGREEMENT ON THE MOVEMENT OF NATURAL PERSONS may admit non-resident aliens to the Philippines for the supply of a service after a determination of the non-availability of a person in the Philippines who is competent, able and willing at the time of application, to perform the services for which the alien is desired as provided in Article 40 of the Labor Code, as amended and its implementing rules and regulations,

Likewise, pursuant to Section 14, Article XII of the Constitution of the Republic of the Philippines, the practice of profession in the Philippines shall be limited to Filipino citizens, save in cases prescribed by law. If the position of the natural person constitutes the practice of a regulated profession under the laws and regulations of the Philippines, the natural person must secure a special permit to practice the regulated profession from the PRC pursuant to Section 7(j) of Republic Act No. 8981 otherwise known as the "PRC Modernization Act of 2000", and obtain an Alien Employment Permit (AEP) from DOLE pursuant to Article 40 of the Labor Code as amended. The natural person shall likewise comply with the requirements relative to practice of profession by a foreign national as provided for in the appropriate professional regulatory law.

As per RA 8991, it is the policy of the state that, *"The State recognizes the important role of professionals in nation-building and, towards this end, promotes the sustained development of a reservoir of professionals whose competence has been determined by honest and credible licensure examinations and whose standards of professional service and practice are internationally recognized and considered world-class brought about by regulatory measures, programs and activities that foster professional growth and advancement."*

4. Legal Considerations for MEs to work in any ASEAN countries

The law on reciprocity may provide opportunity for the Philippine Mechanical Engineers to practice their profession in ASEAN countries depending on the trade agreements between ASEAN members. The ACPE and AER programs may open such opportunities for cross-border practice of mechanical engineering profession. The Philippines is an active participant on both programs through the support of PRC and PTC.

5. Other technical programs

a) ACPE

ACPE refers to an ASEAN Chartered Professional Engineer who has successfully applied to and is authorized by the Professional Regulatory Authority (PRA) of a Host Country to work, not in independent practice, but in collaboration with one or more Professional Engineer of the Host Country.

b) ASEAN Engineers

The ASEAN Federation of Engineering Organizations (AFEO) is a non-governmental body with members from the engineering institutions and organizations of ASEAN countries with the following main objectives:

- 1) To promote goodwill and mutual understanding, and
- 2) To establish and develop an ASEAN baseline standard for the engineering profession with the objective of facilitating the mobility of the engineers within the ASEAN countries.

AFEO governing bodies had initiated the formation of the ASEAN Engineering Register (AER) which now had 10 members from ASEAN countries such as Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. The objectives of the AER are as follows:

- To promote recognition of ASEAN engineering team within and outside ASEAN.
- To safeguard and promote the professional interest of engineers, engineering technologists and technicians.
- To foster high standards of formation and professional practice and regularly review them.
- To promote cultural and professional links among members of the engineering profession within ASEAN.
- To enhance wealth of ASEAN countries.
- To provide sufficient data regarding the formation of an individual engineers, engineering technologists and technicians for the benefit of prospective employers.
- To encourage a continuous updating of the quality of engineers, engineering technologists and technicians by setting, monitoring and reviewing standards.

The Philippines Technological Council (PTC) is a permanent member of AFEO and currently hold the chairmanship position. As a chairman it is tasked to prepare the

findings and to standardize the level of engineering competence required for attainment of professional engineer status with relation to the regulation of each of the ASEAN countries. PSME is a permanent member of PTC with the incumbent National President setting as member of the Council.

E. ABBREVIATIONS

- a) AER – ASEAN Engineering Register
- b) ACPE – ASEAN Chartered Professional Engineer
- c) AFEO – ASEAN Federation of Engineering Organization
- d) ANSI – American National Standards Institute
- e) ASTM – American Society for Testing and Materials
- f) BPS – Bureau of the Philippine Standards
- g) CHED – Commission on Higher Education
- h) CPD – Continuing Professional Development
- i) CPM – Certified Plant Mechanic
- j) CPSP – Career Progression Specialization Program
- k) CTC – Certified True Copy
- l) DOE – Department of Energy
- m) DOST – Department of Science and Technology
- n) DTI – Department of Trade and Industry
- o) ISO – International Standards Organization
- p) LGU – Local Government Unit
- q) MOA – Memorandum of Agreement
- r) MRA – Mutual Recognition Arrangements
- s) OBO – Office of the Building Official
- t) OSHA-Occupational Safety and Health Administration
- u) PD – Presidential Decree
- v) PME – Professional Mechanical Engineer
- w) PMEC – Philippine Mechanical Engineering Code
- x) PRBME – Professional Regulatory Board of Mechanical Engineering
- y) PRC – Professional Regulation Commission
- z) PSME – Philippine Society of Mechanical Engineers
- aa) PTC – Philippine Technological Council
- bb) PTR – Professional Tax Receipts
- cc) RA – Republic Act
- dd) RME – Registered Mechanical Engineer
- ee) SEC- Securities and Exchange Commission
- ff) SPA – Special Power of Attorney
- gg) TCT – Transfer of Certificate of Title

F. REFERENCES

- a. Bureau of Fire Protection
- b. Commission on Higher Education
- c. Department of Environment and Natural Resources
- d. Department of Science and Technology

- e. Department of Labor and Employment
- f. Local Government Units
- g. Mechanical Engineering Law
- h. National Building Code
- i. Philippine Mechanical Engineering Code
- j. Professional Regulation Commission
- k. Professional Regulatory Board of Mechanical Engineering

G. APPENDIX

a. CHED RECOMMENDED SEMESTRAL PROGRAM OF STUDY FOR BSME

The institution may enrich the sample/model program of study depending on the needs of the industry, provided that all prescribed courses required in the curriculum outlines are offered and pre-requisites and co-requisites are complied with.

The sample Program of Study provided in this PSG is meant for HEIs operating on a semestral system. HEIs with CHED approved trimester or quarter term system may adjust their courses and course specifications accordingly to fit their delivery system, as long as the minimum requirements are still satisfied.

The HEIs are also encouraged to include other courses to fulfill their institutional outcomes, as long as the total units for the whole program shall not be less than 172 units including PE and NSTP.

First Year – First Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
National Service Training Program 1	0	3	3	
Physical Education 1	0	2	2	
Purposive Communication	3	0	3	
Mathematics in the Modern World	3	0	3	
Understanding the Self	3	0	3	
Calculus 1	3	0	3	
Chemistry for Engineers (lecture)	3	0	3	
Chemistry for Engineers (laboratory)	0	3	1	Chemistry for Engineers lecture
Engineering Drawing	0	3	1	
Mechanical Engineering Orientation	1	0	1	
TOTAL	16	11	23	

First Year – Second Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
National Service Training Program 2	0	3	3	
Physical Education 2	0	2	2	
Art Appreciation	3	0	3	
Life and Works of Rizal	3	0	3	
Readings in Philippine History	3	0	3	
Calculus 2	3	0	3	Calculus 1
Physics for Engineers (lecture)	3	3	4	Calculus 1/ Co-requisite of Calculus 2

Computer – Aided Drafting	0	3	1	Chemistry for Engineers lecture
The Contemporary World	3	0	3	
TOTAL	18	11	25	

Second Year – First Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
Physical Education 3	0	2	2	
Science, Technology and Society	3	0	3	
Differential Equations	3	0	3	Calculus 2
Static of Rigid Bodies	3	0	3	Physics for Engineers/ Calculus 2
Basic Electrical Engineering	2	3	3	Physics for Engineers/ Calculus 2
Computer Fundamentals and Programming	0	3	1	
Thermodynamics 1	3	0	3	Physics for Engineers/ Calculus 2
Workshop Theory and Practice	0	3	1	
G.E. Elective 1	3	0	3	Chemistry for Engineers
TOTAL	17	11	22	

Second Year – Second Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
Physical Education 4	0	2	2	
Engineering Data Analysis	3	0	3	Calculus 1
Dynamic of Rigid Bodies	2	0	2	Static of Rigid Bodies 1
Basic Electronics	2	3	3	Basic Electrical Engineering
Thermodynamics 2	3	0	3	Thermodynamics 1
Machine Shop Theory	0	6	2	Workshop Theory and Practice
Engineering Management	2	0	2	
Advance Mathematics for ME	3	0	3	Differential Equations
TOTAL	15	11	20	

Third Year – First Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
Mechanics of Deformable Bodies	3	0	3	Dynamic of Rigid Bodies
Engineering Economics	3	0	3	
DC and AC Machinery	2	3	3	Basic Electrical Engineering
Heat Transfer	2	0	2	Thermodynamics 2
Fluid Mechanics	3	0	3	Thermodynamics 1
Machine Elements	2	3	3	Dynamics of Rigid Bodies
Vibration Engineering	2	0	2	Differential Equations
Computer Applications for ME	0	3	1	Computer Fundamentals and Programming
TOTAL	17	9	20	

Third Year – Second Semester			
Description of Subjects	No. of hours	Units	Prerequisites

	Lecture	Laboratory		
Methods of Research for ME	1	0	1	Engineering Data Analysis
Refrigeration Systems	3	0	3	Heat Transfer
Fluid Machineries	3	0	3	Fluid Mechanics
Combustion Engineering	2	0	2	Thermodynamics 2
Materials Science and Engineering for ME	2	3	3	Mechanics of Deformable Bodies/ Chemistry for Engineers
Mechanical Engineering Lab 1	0	3	1	Thermodynamics 2
Ethics	3	0	3	
GE Elective 2	3	0	3	
Mechanical Engineering Elective 1	2	0	2	
TOTAL	19	6	21	

Fourth Year – First Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
Mechanical Engineering Elective 2	2	0	2	
ME Project Study 1	0	3	1	Methods of Research for ME
Air Conditioning and Ventilation Systems	3	0	3	Refrigeration Systems
Control Engineering	2	0	2	Basic Electronics
Control Engineering Laboratory	0	3	1	Control Engineering
Power Plant Design with Renewable Energy	3	3	4	Combustion Engineering
Machine Design 1	3	0	3	Machine Elements
Technopreneurship	3	0	3	
Mechanical Engineering Lab 2	0	6	2	Fluid Machineries, ME Lab 1
TOTAL	19	6	21	

Fourth Year – Second Semester				
Description of Subjects	No. of hours		Units	Prerequisites
	Lecture	Laboratory		
Industrial Plant Engineering	3	3	4	Air Conditioning and Ventilation Systems, Manufacturing and Industrial Plant Visits (C)
ME Project Study 2	0	3	1	ME Project 1
Machine Design 2	2	3	3	Machine Design 1
Basic Occupational Safety and Health	3	0	3	
Manufacturing & Industrial Processes with Plant Visits	1	3	2	
Mechanical Engineering Lab 3	0	6	2	Power Plant Design with Renewable Energy
ME Laws, Ethics, Contracts, Codes and Standards	2	0	2	Ethics
GE Elective 3	3	0	3	
TOTAL	14	18	20	

b) LIST OF NATIONAL LICENSING BODIES WITH WEBSITE FOR REFERENCE

- 1) Professional Regulations Commission (PRC): <https://prc.gov.ph.com>
- 2) Philippine Contractors Accreditation Board (PCAB): <https://pcabgovph.com>

c) CPSP LINKS BETWEEN QUALIFICATION OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS

(1) LINKS BETWEEN QUALIFICATIONS OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN HEATING, VENTILATION, AIR-CONDITIONING AND REFRIGERATION

QUALIFICATION TITLE
QUALIFICATION CODE

Advanced Professional Mechanical Engineering in Heating, Ventilation, Air conditioning and Refrigeration
PMEE 80715-1

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Heating, Ventilation, Air conditioning and Refrigeration		
	Knowledge, Skills and Values ¹	Application ²	Degree of Independence ³
1. Integrates knowledge of mathematics, physical sciences, Information Technology, building science, and mechanical engineering principles on applications for air conditioning, ventilation, refrigeration and indoor environmental quality. 1.1 Proposes innovations or modifications in the systems and process design of heating, air conditioning, ventilation, refrigeration and indoor environmental quality needs of a structure /building based on assessment parameters used in the plan and design of such systems. 1.2 Develops and upgrades systems and process design efficiency using appropriate numerical and computation models to solve mechanical engineering problems as needed in areas specified in 1.1 1.3 Implements and improves operations based on innovations/modifications/upgrades developed based on assessment 1.4 Imparts learning to peers through conferences, on site discussions, on the job demonstrations.	1.1	1.1 1.2 1.3	1.3 1.4
2. Identifies, formulates research literature and analyzes complex air conditioning, ventilating and refrigerating system, indoor environmental quality, operations and maintenance, and sustainability problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. 2.1. Consolidates results of research and technical information in formulating solutions to air conditioning, ventilating and refrigerating processes and adapt these into systems to achieve targets. 2.2. Imparts these technological advances to peers.	2.1 2.2	2.1 2.2	2.2

¹ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

² Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

³ Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability.

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Heating, Ventilation, Air conditioning and Refrigeration		
	Knowledge, Skills and Values ¹	Application ²	Degree of Independence ³
3. Evaluates and develops solutions for complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems and designs systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Consolidates studies made and proposes changes. 3.2 Specializes in specific fields of practice of the Mechanical Engineering profession. 3.3 Uses technical expertise in designing solutions to applicable complex problems. 3.4 Prepares project proposals, budget and reports related to improvements on air conditioning, ventilating and refrigerating problems. 3.5 Imparts learning to peers.	3.1 3.2 3.3	3.1 3.2 3.4 3.5	3.3 3.4 3.5
4. Conducts investigations on complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 4.1 Organizes teams of experts, plans and designs experiments in conducting investigations of complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems. 4.2 Conducts lab scale and plant scale trials as may be deemed necessary to validate conclusions. 4.3 Prepares feasibility, reports, implementation plans and makes presentations to the concerned entities on the proposed solutions to the complex air conditioning, ventilating, refrigerating, indoor environmental quality, and related mechanical engineering problems. 4.4 Imparts learning to peers.	4.1 4.2	4.1 4.2 4.3 4.4	4.1 4.2 4.3 4.4
5. Creates, selects and applies appropriate techniques, resources, and modern engineering and IT tools related to air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability and mechanical engineering, including prediction and modeling, to solve complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems, with an understanding of the limitations. 5.1 Adapts applicable modern tools and techniques to solve air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems taking into consideration its limitations. 5.2 Uses industrial experience in conjunction with technical expertise and appropriate modern tools in solving complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems. 5.3 Prepares reports and recommendations and presents these to the concerned entities.	5.1 5.2	5.1 5.2 5.3	5.2 5.3
6. Applies reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional mechanical engineering practice in the			

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Heating, Ventilation, Air conditioning and Refrigeration		
	Knowledge, Skills and Values ¹	Application ²	Degree of Independence ³
specialized field of air conditioning, ventilating and refrigerating and solutions to complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems. 6.1 Determines relevant policies, laws, regulations and technical standards both locally and internationally in conjunction with the Advanced Professional Mechanical Engineering Practice. 6.2 Selects specific country regulations on professional mechanical engineering practice in implementing solutions to complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems. 6.3 Prepares plans and designs to address related mechanical engineering problems while taking into consideration moral, ethical and environmental concerns. 6.4 Imparts learning to peers.	6.1 6.2 6.3	6.1 6.3 6.4	6.3 6.4
7. Evaluates and determines the sustainability and impact of professional engineering work in the solution of complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems in societal and environmental contexts. 7.1 Selects relevant applicable technical and engineering standards that can be applied in advanced professional practice of the specialized field of air conditioning ventilating, refrigerating and related aspects of indoor environmental quality and sustainability. 7.2 Applies green technologies and other upcoming standards. 7.3 Uses gained experience in industrial professional practice to measure impacts on society and environment. 7.4 Conducts research, develops projects and prepares implementation plans to implement and assess advanced professional mechanical engineering works in relation to complex air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering problems. 7.5 Imparts learning to peers.	7.1 7.2 7.3	7.2 7.3 7.4	7.4 7.5
8. Applies ethical principles and commits to professional ethics and responsibilities and norms of mechanical engineering practice in the milieu of air conditioning, ventilation, refrigeration, indoor environmental quality, sustainability, and other related mechanical engineering disciplines. 8.1 Utilizes the Mechanical Engineering Code of Ethics and applies and behaves according to this code in professional practice. 8.2 Practices, observes and complies with government and corporate policies and regulations. 8.3 Applies ethical principles in conjunction with the specialized practice of air conditioning, ventilating and refrigerating systems incorporating public safety as a priority. 8.4 Exemplifies ethical and moral values through participation in socially relevant projects that contributes to national development.	8.1 8.2 8.3	8.1 8.2 8.3 8.4 8.5	8.5 8.6

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Heating, Ventilation, Air conditioning and Refrigeration		
	Knowledge, Skills and Values ¹	Application ²	Degree of Independence ³
8.5 Imparts learning to peers. 8.6 Models integrity, morality and ethical practice to upcoming professional mechanical engineers.			
9. Functions effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. 9.1 Supervises and manages processes, people and facilities locally or internationally enabling efficiency, improved performance, business profitability and safety. 9.2 Prepares policies, rules, regulations, instructions, procedures, and implements them. 9.3 Trains other mechanical engineers.	9.1 9.2	9.3	9.2 9.3
10. Communicates effectively on complex engineering activities with the mechanical engineering community and with society at large, such as being able to comprehend and write effective reports and designs documentation, makes effective presentations, and gives and receives clear instructions. 10.1 Uses principles of effective communication. 10.2 Consolidates reports and makes presentations to peers and superiors on projects or on assigned endeavors. 10.3 Communicates and coordinates clearly and acts as liaison officer on matters concerning legal or regulatory issues. 10.4 Conducts trainings to subordinates, peers and superiors.	10.1 10.2 10.3	10.1 10.2 10.3 10.4	10.2 10.3 10.4
11. Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and applies these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 11.1 Utilizes the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of mechanical engineering. 11.2 Manages financial aspects of the project. 11.3 Prepares reports related to projects. 11.4 Manages supervisors and peers.	11.1 11.2 11.3	11.1 11.2 11.3 11.4	11.3 11.4
12. Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning for mechanical engineering in general and for air conditioning, ventilation, refrigeration and indoor environmental quality specialization in the broadest context of technological change. 12.1 Attends trainings, seminars, conferences and participate in professional organizations that encourages continued learning in the Professional Mechanical Engineering profession. 12.2 Prepares modules for training peers, subordinates and students. 12.3 Organizes seminars, trainings or conferences. 12.4 Supervises or acts as adviser to other Professional Mechanical Engineers. 12.5 Publishes research papers.	12.1 12.2	12.2 12.3 12.4	12.2 12.3 12.4 12.5

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Heating, Ventilation, Air conditioning and Refrigeration		
	Knowledge, Skills and Values ¹	Application ²	Degree of Independence ³
13. Contributes to the development and improvement of the practice of air conditioning, ventilation, refrigeration, indoor environmental quality, sustainability, and related engineering disciplines.			
13.1 Provides significant contributions to science and practice of air conditioning, ventilating, refrigerating, indoor environmental quality, sustainability, and related mechanical engineering disciplines.	13.1	13.4	13.3
13.2 Leads mechanical engineering practice in the area of engineering specialization.	13.2	13.5	13.5
13.3 Develops new codes, standards and mechanical engineering practices for air conditioning, ventilation, refrigeration, indoor environmental quality, sustainability, and related mechanical engineering disciplines.	13.3	13.6	13.6
13.4 Develops or applies new mechanical engineering principles for the specialized field of air conditioning, ventilation, refrigeration, indoor environmental quality, sustainability, and related engineering aspects.	13.4		
13.5 Contributes to developing and communicating the engineering body of knowledge.	13.5		
13.6 Contributes professional services for the civic good.			

14. Leads and manages significant air conditioning, ventilation, refrigeration and indoor environmental quality projects. 14.1 Interprets project scope. 14.2 Reviews the design outcomes in operation. 14.3 Manages time and progress. 14.4 Reviews the design to achieve acceptance. 14.5 Manages project quality, safety and risk. 14.6 Implements planning and design process. 14.7 Prepares and maintains documentation during the design process. 14.8 Manages work priorities and resources. 14.9 Manages the assets within the operation/ system.	14.1 14.2 14.3 14.4	14.3 14.4 14.5 14.6 14.7	14.4 14.5 14.6 14.7 14.8 14.9
15. Demonstrates Engineering Leadership through highly advanced level of expertise in air conditioning, ventilation, refrigeration and indoor environmental quality. 15.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization. 15.2 Promotes the mechanical engineering profession and the practice of heating, ventilation, air conditioning, refrigeration, indoor environmental quality, sustainability as specialized engineering endeavors. 15.3 Establishes mechanical engineering business/organization directions towards the development of the practice of the specialized field of air conditioning, ventilation and refrigeration systems engineering. 15.4 Provides significant mechanical engineering contributions to community 15.5 Encourages and manages workplace change. 15.6 Motivates and mentors other professional mechanical engineers in the practice of air conditioning, ventilation and refrigeration systems engineering. 15.7 Encourages responsive and sustainable mechanical engineering practices in the specialized field of air conditioning, ventilation and refrigeration systems engineering.	15.1 15.2 15.3 15.4	15.1 15.2 15.3 15.4 15.5 15.6	 15.3 15.4 15.5 15.6 15.7
16. Manages Engineering Business Organization in air conditioning, ventilation, refrigeration and indoor environmental quality. 16.1 Establishes engineering business direction. 16.2 Leads and manages engineering organization. 16.3 Manages a multi-disciplined team. 16.4 Encourages continued professional development.	16.1 16.2	16.1 16.2 16.3 16.4	16.1 16.2 16.3 16.4
17. Conducts research and development in air conditioning, ventilation, refrigeration and indoor environmental quality. 17.1 Identifies opportunities for new or improved processes and/or products. 17.2 Initiates concept development. 17.3 Identifies the resources required for research and development. 17.4 Collaborates in the application or potential commercialization of research outcomes.	17.1 17.2 17.3	17.1 17.2 17.3 17.4	17.1 17.2 17.3 17.4

(2) **LINKS BETWEEN QUALIFICATIONS OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN FIRE PROTECTION, LIFE SAFETY AND SMOKE CONTROL SYSTEM**

QUALIFICATION TITLE	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and Smoke Control System
QUALIFICATION CODE	PMEE 80715-2

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and Smoke Control System		
	Knowledge, Skills and Values ⁴	Application ⁵	Degree of Independence ⁶
1. Integrates knowledge of mathematics, physical sciences, Information Technology, and fire protection, life safety, and smoke control principles. 1.1 Proposes innovations in process design and operations improvement and optimization. 1.2 Develops and continually upgrades proficiency in numerical and computational modeling in solving mechanical engineering problems. 1.3 Keeps abreast with and learns the latest engineering tools, scientific trends and technical applications in electronic and digital platforms. 1.4 Imparts learning to peers.	1.1 1.2	1.1 1.2 1.3	1.3 1.4
2. Identifies, formulates research literature and analyzes complex fire protection, life safety, and smoke control problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. 2.1 Consolidates results of research and technical information in formulating solutions to fire protection, life safety, and smoke control processes and adapt these into systems to achieve targets. 2.2 Imparts these technological advances to peers.	2.1 2.2	2.1 2.2	2.2
3. Evaluates and develops solutions for complex fire protection, life safety, and smoke control problems and designs systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Consolidates studies made and proposes changes. 3.2 Specializes in fire protection, life safety, and smoke control practice in the Mechanical Engineering Profession. 3.3 Uses technical expertise in designing solutions to applicable complex problems.	3.1 3.2 3.3	3.1 3.2 3.4	3.3 3.4 3.5

⁴ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

⁵ Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

⁶ Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability.

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and Smoke Control System		
	Knowledge, Skills and Values ⁴	Application ⁵	Degree of Independence ⁶
3.4 Prepares project proposals, budget and reports related to improvements fire protection, life safety, and smoke control problems. 3.5 Imparts learning to peers.			
4. Conducts investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 4.1 Organizes teams of experts, plans and designs experiments in conducting investigations of complex fire protection, life safety, and smoke control problems. 4.2 Conducts lab scale and plant scale trials as may be deemed necessary to validate conclusions. 4.3 Prepares feasibility, reports, implementation plans and makes presentations to the concerned entities on the proposed solutions to the complex fire protection, life safety, and smoke control problems. 4.4 Imparts learning to peers.	4.1 4.2	4.1 4.2 4.3 4.4	4.1 4.2
5. Creates, selects and applies appropriate techniques, resources, and modern fire protection, life safety, and smoke control and IT tools, including prediction and modeling, to solve complex fire protection, life safety, and smoke control problems, with an understanding of the limitations. 5.1 Adapts applicable modern tools and techniques to solve fire protection, life safety, and smoke control problems taking into consideration its limitations. 5.2 Uses industrial experience in conjunction with technical expertise and appropriate modern tools in solving complex fire protection, life safety, and smoke control problems. 5.3 Prepares reports and recommendations and presents these to the concerned entities.	5.1 5.2	5.1 5.2 5.3	5.2 5.3
6. Applies reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to fire protection, life safety, and smoke control specialization practice and solutions to complex fire protection, life safety, and smoke control problems. 6.1 Determines relevant policies, laws, regulations and technical standards both locally and internationally in conjunction with the Advanced Professional Mechanical Engineering Practice. 6.2 Selects specific country regulations on fire protection, life safety, and smoke control specialization practice in implementing solutions to complex fire protection, life safety, and smoke control problems. 6.3 Prepares plans and designs to address fire protection, life safety, and smoke control problems while taking into consideration moral, ethical and environmental concerns. 6.4 Imparts learning to peers.	6.1 6.2 6.3	6.1 6.3 6.4	6.3 6.4
7. Evaluates and determines the sustainability and impact of fire protection, life safety, and smoke control specialization in the solution of complex fire protection, life safety, and smoke control problems in societal and environmental contexts.	7.1	7.2	7.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and Smoke Control System		
	Knowledge, Skills and Values ⁴	Application ⁵	Degree of Independence ⁶
7.1 Selects relevant applicable technical and fire protection, life safety, and smoke control standards that can be applied in fire protection, life safety, and smoke control specialization practice. 7.2 Applies green technologies and other upcoming standards. 7.3 Uses gained experience in fire protection, life safety, and smoke control specialization practice to measure impacts on society and environment. 7.4 Conducts research, develops projects and prepares implementation plans to implement and assess advanced professional mechanical engineering works in relation to complex fire protection, life safety, and smoke control problems. 7.5 Imparts learning to peers.	7.2 7.3	7.3 7.4 7.5	7.5
8. Applies ethical principles and commits to professional ethics and responsibilities and norms of advanced professional mechanical engineering practice. 8.1 Utilizes the Mechanical Engineering Code of Ethics and applies and behaves according to this code in professional practice. 8.2 Practices, observes and complies with government and corporate policies and regulations. 8.3 Applies ethical principles in conjunction with fire protection, life safety, and smoke control specialization practice incorporating public safety as a priority. 8.4 Exemplifies ethical and moral values through participation in socially relevant projects that contribute to national development. 8.5 Imparts learning to peers. 8.6 Models integrity, morality and ethical practice to upcoming professional mechanical engineers.	8.1 8.2 8.3	8.1 8.2 8.3 8.4	8.5 8.6
9. Functions effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. 9.1 Supervises and manages processes, people and facilities locally or internationally enabling efficiency, improved performance, business profitability and safety. 9.2 Prepares policies, rules, regulations, instructions, procedures, and implements them. 9.3 Trains other mechanical engineers and fire protection, life safety, and smoke control practitioners.	9.1 9.2	9.3	9.2 9.3 9.4
10. Communicates effectively on complex fire protection, life safety, and smoke control specialization activities with the mechanical engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, makes effective presentations, and gives and receives clear instructions. 10.1 Uses the principles of effective communication. 10.2 Consolidates reports and makes presentations to peers and superiors on projects or on assigned endeavors.	10.1 10.2 10.3	10.1 10.2 10.3	10.1 10.2 10.3

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and Smoke Control System		
	Knowledge, Skills and Values ⁴	Application ⁵	Degree of Independence ⁶
10.3 Communicates and coordinates clearly and acts as liaison officer on matters concerning legal or regulatory issues. 10.4 Conducts trainings to subordinates, peers and superiors.		10.4	10.4
11. Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and applies these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 11.1 Be knowledgeable with the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of fire protection, life safety, and smoke control specialization. 11.2 Manages financial aspects of the project. 11.3 Prepares reports related to projects. 11.4 Manages supervisors and peers.	11.1 11.2 11.3	11.1 11.2 11.3 11.4	11.3 11.4
12. Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning for mechanical engineering in general and for fire protection, life safety, and smoke control in the broadest context of technological change. 12.1 Attends trainings, seminars, conferences and participate in professional organizations that encourage continued learning in the Professional Mechanical Engineering profession. 12.2 Prepares modules for training peers, subordinates and students. 12.3 Organizes seminars, trainings or conferences. 12.4 Supervises or acts as adviser to other Professional Mechanical Engineers. 12.5 Publishes research papers.	12.1 12.2	12.2 12.3 12.4	12.2 12.3 12.4 12.5
13. Contributes to the development and improvement of mechanical engineering and fire protection, life safety, and smoke control specialization practice. 13.1 Provides significant contributions to science and practice of mechanical engineering and fire protection, life safety, and smoke control specialization. 13.2 Leads mechanical engineering practice in area of fire protection, life safety, and smoke control specialization. 13.3 Develops new codes, standards and mechanical engineering practices. 13.4 Develops or applies new fire protection, life safety, and smoke control principles. 13.5 Contributes to developing and communicating the engineering body of knowledge. 13.6 Contributes professional services for the civic good.	13.1 13.2 13.3 13.4 13.5	 13.4 13.5 13.6	 13.3 13.5 13.6
14. Leads and manages significant projects fire protection, life safety, and smoke control. 14.1 Interprets project scope. 14.2 Reviews the design outcomes in operation. 14.3 Manages time and progress. Reviews the design to achieve acceptance.	 14.1 14.2	 14.3 14.4	 14.4 14.5

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Fire Protection, Life Safety and Smoke Control System		
	Knowledge, Skills and Values ⁴	Application ⁵	Degree of Independence ⁶
14.4 Manages project quality, safety and risk. 14.5 Implements planning and design process. 14.6 Prepares and maintains documentation during the design process. 14.7 Manages work priorities and resources. 14.8 Manages the assets within the operation/system.	14.3 14.4	14.5 14.6 14.7	14.6 14.7 14.8 14.9
15. Demonstrates Engineering Leadership through highly advanced level of expertise in fire protection, life safety, and smoke control. 15.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization. 15.2 Promotes the mechanical engineering profession and fire protection, life safety, and smoke control specialization. 15.3 Establishes mechanical engineering organization direction. 15.4 Provides significant mechanical engineering contributions to community. 15.5 Encourages and manages workplace change. 15.6 Motivates and mentors other professional. 15.7 Encourages responsive and sustainable fire protection, life safety, and smoke control practices.	15.1 15.2 15.3 15.4	15.1 15.2 15.3 15.4 15.5 15.6	15.3 15.4 15.5 15.6 15.7
16. Manages Engineering Business Organization in fire protection, life safety, and smoke control. 16.1 Establishes engineering business direction. 16.2 Leads and manages engineering organization. 16.3 Manages a multi-disciplined team. 16.4 Encourages continued professional development.	16.1 16.2	16.1 16.2 16.3 16.4	16.1 16.2 16.3 16.4
17. Conducts research and development in fire protection, life safety, and smoke control. 17.1 Identifies opportunities for new or improved processes and/or products. 17.2 Initiates concept development. 17.3 Identifies the resources required for research and development. 17.4 Collaborates in the application or potential commercialization of research outcomes.	17.1 17.2 17.3	17.1 17.2 17.3 17.4	17.1 17.2 17.3 17.4

(3) LINKS BETWEEN QUALIFICATIONS OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN POWER PLANT

QUALIFICATION TITLE

Advanced Professional Mechanical Engineering in Power Plant

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Power Plant		
	Knowledge, Skills and Values ⁷	Application ⁸	Degree of Independence ⁹
1. Integrates knowledge of mathematics, physical sciences, and Information Technology in Power Plant design, construction, installation, inspection, testing & commissioning, operation and maintenance principles. 1.1 Proposes innovations in process design, plant engineering, construction, operations & maintenance improvement and optimization affecting systems, equipment and facilities. 1.2 Develops and continually upgrades proficiency in numerical and computational modeling in solving mechanical engineering problems. 1.3 Keeps abreast with and learns the latest engineering tools, scientific trends and technical applications in electronic and digital platforms. 1.4 Imparts learning, mentoring and coaching to peers and colleagues.	1.1 1.2	1.1 1.2 1.3	1.3 1.4
2. Identifies, formulates, research literature and analyzes complex power plant design, construction and erection, testing and commissioning, production operation and control and maintenance, modification, upgrade, inspection (visual, destructive testing and non-destructive testing) and plant performance problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. 2.1. Consolidates results of research and technical information in formulating solutions to power plant design, construction and erection, testing and commissioning, production operation and control and maintenance, modification, upgrade, inspection (visual, destructive testing and non-destructive testing) and plant performance processes and adapts these into systems to achieve targets. 2.2. Imparts these technological advances to peers.	2.1 2.2	2.1 2.2	2.1 2.2
3. Evaluates and develops solutions for complex power plant design, construction, operation and maintenance problems and designs systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Consolidates studies made and proposes changes.			

⁷ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

⁸ Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

⁹ Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability.

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Power Plant		
	Knowledge, Skills and Values ⁷	Application ⁸	Degree of Independence ⁹
3.2 Specializes in power plant design, construction, operation and maintenance practice in the Mechanical Engineering Profession. 3.3 Uses technical expertise in designing solutions to applicable complex problems. 3.4 Prepares project proposals, budgets, and reports related to improvements in power plant design, construction, operation and maintenance problems. 3.5 Imparts learning to peers. 3.6 Formulates a program of equipment life assessment and extension and monitors equipment status to enhance and optimize plant availability, reliability, efficiency, over-all equipment effectiveness, safety and environmental performance.	3.1 3.2 3.3	3.1 3.2 3.3 3.4 3.5	3.3 3.4 3.5 3.6
4. Conducts investigations and analysis of complex power plant problems, issues and challenges using research-based knowledge and methods including design of experiments, simulations, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 4.0 Organizes teams of experts, plans and designs experiments in conducting investigations of complex power plant design, construction, operation and maintenance problems. 4.1 Conducts simulations, laboratory and plant scale trials as may be deemed necessary to validate conclusions. 4.2 Prepares feasibility studies, evaluation reports, implementation plans, cost analysis and makes presentations to the concerned entities on the proposed solutions to the complex power plant design, construction, operation and maintenance problems. 4.3 Establishes professional and technical collaborations with experts and technologists in the conduct of researches, experiments, testing and technical exchanges in advancing ideas. 4.4 Imparts learning, mentoring and coaching to peers and colleagues.	4.1 4.2	4.1 4.2 4.3 4.4	4.1 4.2 4.5
5. Creates, selects and applies appropriate techniques, resources, and modern tools considering the latest technological advancements in power plant design, construction, operation and maintenance including prediction and modeling, to solve complex problems with understanding of the limitations. 5.1 Adapts applicable modern tools and techniques to solve power plant design, construction, operation and maintenance problems taking into consideration its limitations. 5.2 Uses industrial experience in conjunction with technical expertise and appropriate modern tools in solving complex power plant design, construction, operation and maintenance problems. 5.3 Prepares reports and recommendations and presents these to the concerned entities. 5.4 Develops and adopts condition monitoring and predictive maintenance program applying the latest IT and digital technology to enhance and optimize plant availability, reliability, efficiency, over-all equipment effectiveness, safety and environmental performance.	5.1 5.2	5.1 5.2 5.3	5.3 5.4 5.5

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Power Plant		
	Knowledge, Skills and Values ⁷	Application ⁸	Degree of Independence ⁹
7.4 Conducts research, develops projects and prepares implementation plans to implement and assess advanced professional mechanical engineering works in relation to complex power plant design, construction, operation and maintenance problems. 7.5 Develops and implements Quality and other Management Systems covering process and mechanical equipment of Power Plants to promote continuous improvements, sustained efficiency and lengthened mechanical life of each equipment. 7.6 Imparts learning, mentoring and coaching to peers and other professional field.			
8. Practices of ethical principles and commits to uphold professional ethics, and responsibilities and norms of advanced professional mechanical engineering profession. 8.1 Utilizes the Mechanical Engineering Code of Ethics, applies and behaves according to the said code in professional practice. 8.2 Practices, observes and complies with government and corporate policies and regulations. 8.3 Applies ethical principles in conjunction with power plant design, construction, operation and maintenance specialization. 8.4 Exemplifies ethical and moral values through participation in socially relevant projects that contribute to nation building. 8.5 Exemplifies integrity and morality in professional practice and business dealings. 8.6 Models integrity, morality and ethical practice to upcoming professional mechanical engineers.	8.1 8.2 8.3 8.4 8.5 8.6	8.1 8.2 8.3 8.4 8.5 8.6	8.1 8.3 8.4 8.5
9. Functions effectively as an individual, and as a team member or team leader in diverse and teams and in multi-disciplinary settings. 9.1 Supervises and manages processes, people and facilities locally or internationally enabling efficiency, improved performance, innovation, business profitability and safety. 9.2 Prepares policies, rules, regulations, instructions, procedures, and implements the same. 9.3 Trains and prepares other mechanical engineers, and particularly the power plant design, construction, operation and maintenance practitioners to become the future specialized engineers.	9.1 9.2	9.1 9.3	9.2 9.3
10. Communicates effectively on complex power plant design, construction, modification, inspection, testing and commissioning, operation and maintenance specialization activities with the mechanical engineering community and with society at large, such as being able to comprehend and writes effective reports and design documentation, makes effective presentations, and gives and receives clear instructions. 10.1 Uses principles of effective communication and presentation. 10.2 Consolidates reports and makes presentations to peers and superiors on projects or on assigned endeavors.	10.1 10.2 10.3	10.1 10.2 10.3 10.4	10.1 10.2 10.3 10.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Power Plant		
	Knowledge, Skills and Values ⁷	Application ⁸	Degree of Independence ⁹
10.3 Communicates and coordinates clearly and act as liaison officer on matters concerning legal or regulatory issues. 10.4 Conducts trainings to subordinates, peers and superiors. 10.5 Applies the latest tools, techniques and methods for clear, complete and timely dissemination, transmission and utilization of required applications.			10.5
11. Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and applies these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 11.1 Be knowledgeable with the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of Power Plant design, construction, operation and maintenance specialization. 11.2 Manages financial and economic aspect of the project. 11.3 Develops the capability to evaluate, assess and decide on the viability of projects and the economic sustainability of plant operations. 11.4 Achieves performance goals and objectives in managing projects involving multi-disciplinary functions. 11.5 Prepares reports related to projects. 11.6 Manages supervisors and peers.	11.1 11.2 11.3 11.4 11.5 11.6	11.1 11.2 11.3 11.4	11.3 11.4 11.5
12. Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning for mechanical engineering in general and for power plant specialization in particular in the broadest context of technological change. 12.0 Attends trainings, seminars, conferences and participate in professional organizations that encourage continued learning in the Professional Mechanical Engineering profession. 12.1 Prepares modules and takes lead in training peers, subordinates and students. 12.2 Organizes seminars, trainings and conferences and promotes learning into applications. 12.3 Supervises or acts as adviser to other Professional Mechanical Engineers. 12.4 Publishes research and technical papers that contributes in the application of Advance Professional Mechanical Engineering. 12.5 To be updated on the latest Mechanical Engineering best standard practices. 12.6 Initiates research on Mechanical Engineering new technological innovation, case studies result and practical applications.	12.1 12.2	12.2 12.3 12.4 12.6 12.7	12.2 12.3 12.4 12.5 12.6

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Power Plant		
	Knowledge, Skills and Values ⁷	Application ⁸	Degree of Independence ⁹
14.10 Manages work priorities and resources and encourages the utilization of modern plant equipment, components and instruments brought about by global technology advances. 14.11 Manages the assets within the operation/system. 14.12 Applies project cost management and budgeting. 14.13 Applies policy on equipment life cycle from conceptual design to retirement and disposal. 14.14 Applies efficient and effective project management principles employing best practices and policies in attaining time, economic, safety, environmental, quality and human resource objectives. 14.15 Reviews and evaluates contractual claims, requests for variation orders and time extensions. 14.16 Coordinates the work of Consultants, Contractors and/or Subcontractors, and other project stakeholders.		14.16	14.16
15. Demonstrates Engineering Leadership through highly advanced level of expertise in power plant design, construction and erection, testing and commissioning, production operation and control and maintenance. 15.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization. 15.2 Promotes the mechanical engineering profession, power plant design, construction, operation and maintenance specializations. 15.3 Establishes mechanical engineering business/organization vision and direction. 15.4 Provides significant mechanical engineering solutions and contributions to technical problems of the community and the country as a whole. 15.5 Encourages and manages progressive and constructive culture of change at workplace. 15.6 Motivates, trains, guides and mentors other professionals to enable them achieve more in their work. 15.7 Encourages responsive and sustainable power plant design, construction, operation and maintenance. 15.8 Enhances problem solving and decision-making skills of practicing mechanical engineers. 15.9 Demonstrates a clear exchange of information or ideas with fellow mechanical engineers and other professionals. 15.10 Builds a stronger ties and closer relationships with other mechanical engineers and other professionals. 15.11 Maintains a high level of integrity and honesty to all engagement at work an involvement with other professionals and professional organizations. 15.12 Promotes trust and respect with one another at all times.	15.1 15.2 15.3 15.4 15.8 15.9	15.1 15.2 15.3 15.4 15.5 15.6 15.9	15.3 15.4 15.5 15.6 15.7 15.8 15.10 15.11 15.12

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Power Plant		
	Knowledge, Skills and Values ⁷	Application ⁸	Degree of Independence ⁹
16 Manages Engineering Business Organization in power plant design, construction and erection, testing and commissioning, production operation and control and maintenance. 16.1 Establishes engineering business direction. 16.2 Leads and manages engineering organization. 16.3 Manages a multi-disciplined team. 16.4 Encourages continued professional development.	16.1 16.2	16.1 16.2 16.3 16.4	16.1 16.2 16.3 16.4
17 Conducts research and development in power plant design, construction and erection, testing and commissioning, production operation and control and maintenance . 17.1 Identifies energy research and development policies and priorities with due consideration to limited funds and skilled manpower. 17.2 Identifies opportunities for new or improved processes and/or products. 17.3 Initiates concept development. 17.4 Identifies the resources required for research and development. 17.5 Collaborates in the application or potential commercialization of research outcomes. 17.6 Develops and promotes programs for continuous improvement and innovations. 17.7 Keeps abreast with the latest technological developments in the national and international levels.	17.1 17.2 17.3 17.4 17.5	17.1 17.2 17.3 17.4 17.7	17.1 17.2 17.3 17.4 17.5

(4) **LINKS BETWEEN QUALIFICATION OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN INDUSTRIAL PLANT**

QUALIFICATION TITLE
QUALIFICATION CODE

Advanced Professional Mechanical Engineering in Industrial Plant
PMEE 807154

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Industrial Plant		
	Knowledge, Skills and Values ¹⁰	Application ¹¹	Degree of Independence ¹²
1. Integrates knowledge of mathematics, physical sciences, Information Technology, and industrial plant design, construction, operation and maintenance principles. 1.1 Proposes innovations in process design and operations improvement and optimization and imparts these to peers. 1.2 Develops and continually upgrades proficiency in numerical and computational modeling in solving mechanical engineering problems. 1.3 Keeps abreast with and learns the latest engineering tools, scientific trends and technical applications in electronic and digital platforms. 1.4 Imparts learning to peers.	1.1 1.2	1.1 1.2 1.3	1.3 1.4
2. Identifies, formulates research literature and analyzes complex industrial plant design, construction, operation and maintenance problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. 2.1 Consolidates results of research and technical information in formulating solutions to industrial plant design, construction, operation and maintenance processes and adapts these into systems to achieve targets. 2.2 Imparts technological advances to peers.	2.1	2.1 2.2	2.1
3. Evaluates and develops solutions for complex industrial plant design, construction, operation and maintenance problems and designs systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Consolidates studies made and proposes changes. 3.2 Specializes in industrial plant design, construction, operation and maintenance practice in the Mechanical Engineering Profession. 3.3 Uses technical expertise in designing solutions to applicable complex problems. 3.4 Prepares project proposals, budget and reports related to improvements in industrial plant design, construction, operation and maintenance problems. 3.5 Imparts learning to peers.	3.2 3.3 3.4	3.1 3.2 3.3 3.4 3.5	3.2 3.3 3.4

¹⁰ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

¹¹ Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

¹² Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability.

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Industrial Plant		
	Knowledge, Skills and Values ¹⁰	Application ¹¹	Degree of Independence ¹²
4. Conducts investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 4.1 Organizes teams of experts, plans and designs experiments in conducting investigations of complex industrial plant design, construction, operations and maintenance problems. 4.2 Conducts laboratory and plant scale trials as may be deemed necessary to validate conclusions. 4.3 Prepares feasibility, reports, implementation plans and makes presentations to the concerned entities on the proposed solutions to the complex industrial plant design, construction, operations and maintenance problems. 4.4 Imparts learning to peers.	4.1 4.2 4.3	4.1 4.2 4.3 4.4	4.1 4.3
5. Creates, selects and applies appropriate techniques, resources, and modern industrial plant design, construction, operation and maintenance and IT tools, including prediction and modeling, to solve complex industrial plant design, construction, operations and maintenance problems, with an understanding of the limitations. 5.1 Adapts applicable modern tools and techniques to solve industrial plant design, construction, operation and maintenance problems taking into consideration its limitations. 5.2 Uses industrial experience in conjunction with technical expertise and appropriate modern tools in solving complex industrial plant design, construction, operation and maintenance problems. 5.3 Prepares reports and recommendations and presents these to the concerned entities.	5.1 5.2	5.1 5.2 5.3	5.1 5.2
6. Applies reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to industrial plant design, construction, operation and maintenance specialization practice and solutions to complex industrial plant design, construction, operation and maintenance problems. 6.1 Determines relevant policies, laws, regulations and technical standards both locally and internationally in conjunction with the Advanced Professional Mechanical Engineering Practice. 6.2 Selects specific country regulations on industrial plant design, construction, operation and maintenance specialization practice in implementing solutions to complex industrial plant design, construction, operations and maintenance problems. 6.3 Prepares plans and designs to address industrial plant design, construction, operations and maintenance problems while taking into consideration moral, ethical and environmental concerns. 6.4 Imparts learning to peers.	6.1 6.2 6.3	6.1 6.2 6.3	6.1 6.2 6.3 6.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Industrial Plant		
	Knowledge, Skills and Values ¹⁰	Application ¹¹	Degree of Independence ¹²
7. Evaluates and determines the sustainability and impact of industrial plant design, construction, operation and maintenance specialization in the solution of complex industrial plant design, construction, operations and maintenance problems in societal and environmental contexts. 7.1 Selects relevant applicable technical and industrial plant design, construction, operation and maintenance standards that can be applied in industrial plant design, construction, operation and maintenance specialization practice. 7.2 Applies green technologies and other upcoming standards. 7.3 Uses gained experience in industrial plant design, construction, operation and maintenance specialization practice to measure impacts on society and environment. 7.4 Conducts research, develops projects and prepares implementation plans to implement and assess advanced professional mechanical engineering works in relation to complex industrial plant design, construction, operation and maintenance problems. 7.5 Imparts learning to peers.	7.1 7.2 7.3 7.4	7.1 7.2 7.3 7.4 7.5	7.1 7.3 7.4
8. Applies ethical principles and commit to professional ethics and responsibilities and norms of advanced professional mechanical engineering practice. 8.1 Utilizes the Mechanical Engineering Code of Ethics and applies and behaves according to this code in professional practice. 8.2 Practices, observes and complies with government and corporate policies and regulations. 8.3 Applies ethical principles in conjunction with industrial plant design, construction, operation and maintenance specialization practice incorporating public safety as a priority. 8.4 Exemplifies ethical and moral values through participation in socially relevant projects that contributes to national development. 8.5 Imparts learning to peers. 8.6 Models integrity, morality and ethical practice to upcoming professional mechanical engineers.	8.1 8.2 8.3 8.4 8.6	8.1 8.2 8.3 8.4 8.5 8.6	8.1 8.2 8.3 8.4 8.6
9. Functions effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. 9.1 Supervises and manages processes, people and facilities locally or internationally enabling efficiency, improved performance, business profitability and safety. 9.2 Prepares policies, rules, regulations, instructions, procedures, and implements them. 9.3 Trains other mechanical engineers and other industrial plant engineers.	9.1 9.2 9.3	9.1 9.2 9.3	9.1 9.2
10. Communicates effectively on complex industrial plant design, construction, operations and maintenance specialization activities with the mechanical engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, makes effective presentations, and gives and receives clear instructions.			

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Industrial Plant		
	Knowledge, Skills and Values ¹⁰	Application ¹¹	Degree of Independence ¹²
10.1 Uses principles of effective communication. 10.2 Consolidates reports and makes presentations to peers and superiors on projects or on assigned endeavors. 10.3 Communicates and coordinates clearly and act as liaison officer on matters concerning legal or regulatory issues. 10.4 Conducts trainings to subordinates, peers and superiors.	10.1 10.2 10.3 10.4	10.1 10.2 10.3 10.4	10.1 10.3
11. Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and applies these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 11.1 Be knowledgeable with the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of industrial plant design, construction, operation and maintenance specialization. 11.2 Manages financial aspects of the project. 11.3 Prepares reports related to projects. 11.4 Manages supervisors and peers.	11.1 11.2 11.4	11.1 11.2 11.3 11.4	11.1 11.2 11.4
12. Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning for mechanical engineering in general and for industrial plant design, construction, operation and maintenance in the broadest context of technological change. 12.1 Attends trainings, seminars, conferences and participates in professional organizations that encourage continued learning in the Professional Mechanical Engineering profession. 12.2 Prepares modules for training peers, subordinates and students. 12.3 Organizes seminars, trainings or conferences. 12.4 Supervises or acts as adviser to other Professional Mechanical Engineers. 12.5 Publishes research papers.	12.1 12.2 12.4	12.1 12.2 12.3 12.4	12.3 12.4 12.5
13. Contributes to the development and improvement of mechanical engineering and industrial plant design, construction, operation and maintenance specialization practice. 13.1 Provides significant contributions to science and practice of mechanical engineering and industrial plant design, construction, operation and maintenance specialization. 13.2 Leads mechanical engineering practice in area of industrial plant design, construction, operation and maintenance specialization. 13.3 Develops new codes, standards and mechanical engineering practices. 13.4 Develops or applies new industrial plant design, construction, operations and maintenance principles. 13.5 Contributes to developing and communicating the engineering body of knowledge.	13.1 13.2 13.3 13.4 13.5 13.6	13.1 13.2 13.3 13.4 13.5 13.6	13.1 13.2 13.3 13.4 13.5

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Industrial Plant		
	Knowledge, Skills and Values ¹⁰	Application ¹¹	Degree of Independence ¹²
13.6 Contributes professional services for the civic good.			
14. Leads and manages significant industrial plant projects.			
14.1 Interprets project scope.	14.1	14.2	14.1
14.2 Reviews the design outcomes in operation.	14.2	14.4	14.2
14.3 Manages time and progress.	14.3	14.5	14.4
14.4 Reviews the design to achieve acceptance.	14.4	14.6	14.6
14.5 Manages project quality, safety and risk.	14.5	14.7	14.8
14.6 Implements planning and design process.	14.6	14.8	14.9
14.7 Prepares and maintains documentation during the design process.	14.8		
14.8 Manages work priorities and resources.	14.9		
14.9 Manages the assets within the operation/system.			
15. Demonstrates Engineering Leadership through highly advanced level of expertise in industrial plant design, construction, operation and maintenance.			
15.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization.	15.1	15.1	15.2
	15.2	15.2	15.3
15.2 Promotes the mechanical engineering profession and industrial plant design, construction, operation and maintenance specialization.	15.3	15.3	15.4
	15.4	15.4	
15.3 Establishes mechanical engineering business/organization direction.			
15.4 Provides significant mechanical engineering contributions to community.	15.6	15.5	15.6
15.5 Encourages and manages workplace change.	15.7	15.6	15.7
15.6 Motivates and mentors other professional.		15.7	
15.7 Encourages responsive and sustainable industrial plant design, construction, operation and maintenance.			
16. Manages Engineering Business Organization in industrial plant design, construction, operation and maintenance.			
16.1 Establishes engineering business direction.	16.1	16.1	16.1
16.2 Leads and manages engineering organization.	16.2	16.2	16.3
16.3 Manages a multi-disciplined team.	16.3	16.3	16.4
16.4 Encourages continued professional development.	16.4	16.4	
17. Conducts research and development industrial plant design, construction, operation and maintenance.			
17.1 Identifies opportunities for new or improved processes and/or products.	17.1	17.1	17.1
17.2 Initiates concept development.	17.2	17.2	17.2
17.3 Identifies the resources required for research and development.	17.3	17.3	17.3

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Industrial Plant		
	Knowledge, Skills and Values ¹⁰	Application ¹¹	Degree of Independence ¹²
17.4 Collaborates in the application or potential commercialization of research outcomes.	17.4	17.4	17.4

(5) **LINKS BETWEEN QUALIFICATION OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN LIFTS AND CONVEYANCES**

QUALIFICATION TITLE	Advanced Professional Mechanical Engineering in Lifts and Conveyances
QUALIFICATION CODE	PMEE 807155

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
1. Integrates knowledge of mathematics, natural and physical sciences, Information Technology in Lifts & Conveyances design, construction, erection, installation, inspection, testing, commissioning, operations, and maintenance.			
1.1 Proposes innovations and modernization in design, improvement, alterations and optimization, construction, operations, and maintenance. affecting equipment, facilities, and systems about Lifts and Conveyances.	1.1	1.1	1.3
1.2 Upgrades and strengthens proficiency in numerical and computational modeling in solving mechanical engineering problems.	1.2	1.2	1.4
1.3 Keeps abreast with and learns the latest engineering tools, scientific trends, and technical applications in material, electrical, electronic, and digital platforms.		1.3	
1.4 Imparts learning, mentoring and coaching to peers, practitioners, and stakeholders.			

¹³ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

¹⁴ Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

¹⁵ Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
2. Identifies and formulates research literature to analyze complex problems in lifts and conveyances related to design, construction, modification, inspection, testing and commissioning, operations, and maintenance to come out with substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. 2.1 Evaluates results of researches and technical information to develop-solutions to lifts and conveyances design, construction, operations, and maintenance. 2.2 Develops and establishes policies on asset management to enforce protocols in the design, construction, operations, and maintenance of lifts and conveyances. 2.3 Establishes project standards, operating guidelines, procedures, and best practices as baselines for lifts and conveyances applications. 2.4 Imparts these technological advances to peers.	2.1 2.2 2.3	2.1 2.2 2.3 2.4	2.1 2.2 2.3 2.4
3. Evaluates and develops solutions for complex lifts and conveyances, construction, inspection, testing and commissioning, operations and maintenance, systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Evaluates and analyzes studies made and proposes changes. 3.2 Specializes in lifts and conveyances design, construction, operation, and maintenance practice in the Mechanical Engineering Profession. 3.3 Uses technical expertise in designing solutions to applicable complex problems. 3.4 Prepares project proposals, budget, and reports related to improvements, lifts, and conveyances design, construction, operation, and maintenance problems. 3.5 Creates and implements facilities compliance matrix consistent with public safety, societal considerations, environmental and regulatory requirements. 3.6 Imparts learning by sharing advanced technical knowledge and expertise to peers and others.	3.1 3.2 3.3	3.1 3.2 3.4 3.5	3.3 3.4 3.5 3.6
4. Investigates and analyzes complex Lifts and Conveyances issues and challenges using research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, simulations, and synthesis of information to provide valid conclusions. 4.1 Organizes teams of experts, plan, and design experiments in conducting investigations of complex lifts and conveyances design, construction, operations, and maintenance problems. 4.2 Conducts simulation, laboratory, and plant scale trials as may be deemed necessary to validate conclusions. 4.3 Prepares feasibility reports and evaluations, implementation plans, cost analysis, and economic studies and makes presentations to the concerned entities on the proposed solutions to the complex lifts and conveyances design, construction, operations, and maintenance problems.	4.1 4.2	4.1 4.2 4.3 4.4	4.1 4.2 4.5 4.6

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
4.4 Establishes professional and technical collaborations with allied discipline experts to have access on and be able to apply the latest developments on lifts and conveyances. 4.5 Promotes and participates in the conduct of researches, experiments, testing and technical exchanges in advancing ideas. 4.6 Imparts learning by sharing advanced technical knowledge and expertise to peers and others.			
5. Creates, evaluates, selects and applies appropriate techniques, resources, and modern tools considering the latest technological advancements in lifts and conveyances design, construction, upgrading, inspection, audit, testing and commissioning, operation and maintenance including prediction and modeling, to solve complex issues with understanding of the limitations. 5.1 Adapts applicable modern tools and techniques to solve lifts and conveyances design, construction, operation, and maintenance problems taking into consideration its limitations. 5.2 Evaluates, analyzes and adopts the latest technological developments and advancements that promote safety, efficiency, reliability, and availability. 5.3 Uses technical expertise and appropriate modern tools in solving complex lifts and conveyances design, construction, operation and maintenance problems. 5.4 Uses modern tools and techniques in conducting comprehensive technical and safety audits. 5.5 Evaluates and adopts relevant recommendations from various parties, harmonizes results and establishes conclusive outputs. 5.6 Prepares reports and recommendations and presents these to the concerned entities.	5.1 5.2	5.1 5.2 5.3	5.3 5.4 5.5 5.6
6. Applies contextual knowledge and life cycle perspective to assess issues in societal, health, safety, environment, legal, moral, ethical, cultural, and the consequent responsibilities relevant to lifts and conveyances design, construction, inspection, audit, testing,–commissioning, operation, maintenance, and solutions to complex problems. 6.1 Determines relevant statutory and regulatory requirements, technical codes and standards both locally and internationally in conjunction with lifts and conveyances design, construction, operation, maintenance and solutions to complex problems. 6.2 Applies expertise on plans and designs by adopting a life cycle perspective to address lifts and conveyances problems taking into consideration, societal, health, safety, environment, legal, moral, ethical, and cultural issues. 6.3 Applies knowledge of advance lifts and conveyances engineering and relevant statutory and regulatory requirements, technical codes and standards both locally and internationally in resolving interdisciplinary conflicts. 6.4 Imparts learning by sharing advanced technical knowledge and expertise with peers and others.	6.1 6.2 6.3	6.2 6.3 6.4	6.2 6.3 6.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
7. Evaluates and determines the sustainability, reliability, and impact of lifts and conveyances design, construction, modification, inspection, testing and commissioning, operations, and maintenance specialization in the solution of complex lifts and conveyances problems in societal and environmental contexts. 7.1 Determines relevant applicable technical and lifts and conveyances design, construction, operation, and maintenance standards that can be applied in lifts and conveyances design, construction, operation, and maintenance specialization practice. 7.2 Applies green technologies and other upcoming standards. 7.3 Uses gained experience in complex lifts and conveyances design, construction, operation, and maintenance specialization practice to measure impacts on society and the environment. 7.4 Conducts research, develops projects, and prepares implementation plans to implement and assess advanced professional mechanical engineering works about complex lifts and conveyances design, construction, operation, and maintenance problems. 7.5 Develops and implements Quality and other Management Systems covering process and mechanical equipment of lifts and conveyances to promote continuous improvements, sustained efficiency, and lengthened mechanical life. 7.6 Imparts learning, mentoring and coaching to peers and others.	7.1 7.2 7.3	7.2 7.3 7.4 7.5	7.4 7.6
8. Applies ethical principles and commit to professional ethics, responsibilities, and norms of advanced professional mechanical engineering practice. 8.1 Utilizes the Mechanical Engineering Code of Ethics and applies and behaves according to this code in professional practice. 8.2 Practices, observes and complies with government and corporate policies and regulations. 8.3 Applies ethical principles in conjunction with the practice of lifts and conveyances design, construction, operation, and maintenance specialization practice incorporating public safety as a priority. 8.4 Exemplifies ethical and moral values through participation in socially relevant projects that contributes to local and national development. 8.5 Imparts learning, mentoring, and coaching to peers and others. 8.6 Models integrity, morality and ethical practice to upcoming professional mechanical engineers. 8.7 Promotes and rewards professional competence at the highest ethical standard. 8.8 Professes and practices impartiality, neutrality, and sound judgment affecting Lifts and Conveyances and the practice of the profession.	8.1 8.2 8.3	8.1 8.3 8.4 8.5 8.6	8.5 8.6 8.7 8.8

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
9. Functions effectively as an individual, and as a member or leader in diverse teams under multi-disciplinary settings. 9.1 Supervises and manages processes, people, and facilities locally or internationally focusing on efficiency, safety, performance improvement, business, and profitability. 9.2 Prepares pertinent Mechanical Engineering policies, rules, regulations, instructions, procedures, and implements them under mutually beneficial and viable repercussions to all stakeholders. 9.3 Trains other mechanical engineers and other lifts and conveyances design, construction, erection, installation, inspection, testing, commissioning, operations, and maintenance practitioners. 9.4 Increases and expands competence beyond the Mechanical Engineering discipline to raise capacity for bigger responsibilities. 9.5 Develops the ability to efficiently lead multi-disciplinary functions in managing Lifts and Conveyances projects. 9.6 Learns and applies advanced professional knowledge on the various facets of a Lifts & Conveyances.	9.1 9.2 9.5	9.1 9.3 9.6	9.2 9.3 9.4 9.5 9.6
10. Communicates effectively on complex lifts and conveyances design, construction, erection, installation, inspection, testing, commissioning, operations, and maintenance specialization activities with the mechanical engineering community and with society at large. Comprehend and write effective reports, design documentation, presentations, and clear instructions. 10.1 Uses the principles of effective communication. 10.2 Consolidates reports and makes presentations to peers and superiors on projects or assigned endeavors. 10.3 Communicates and coordinates clearly and acts as a liaison officer on matters concerning legal or regulatory issues. 10.4 Conducts training to subordinates, peers, and superiors. 10.5 Utilizes the latest tools, techniques, and technology for clear, complete, timely dissemination, and transmission.	10.1 10.2 10.3	10.1 10.2 10.3 10.4	10.2 10.3 10.4 10.5
11. Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 11.1 Be knowledgeable with the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of lifts and conveyances design, construction, upgrading, inspection, audit, testing and commissioning, operation, and maintenance. 11.2 Manages the financial and economic aspects of the project. 11.3 Prepares technical audit reports and certifications on Installation & Operations related to Lifts and Conveyances projects. 11.4 Manages supervisors and peers.	11.1 11.2 11.3	11.2 11.3 11.4	11.3 11.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
12. Recognizes the need for, possesses the ability and prepares to engage in independent and life-long learning for mechanical engineering in general and for lifts and conveyances specialization in particular in the broadest context of technological change. 12.1 Attends training, seminars, conferences, and participates in professional organizations that encourage continued learning in the Professional Mechanical Engineering profession. 12.2 Prepares modules and takes lead in training peers, subordinates, and students. 12.3 Organizes seminars, training, conferences, and promotes learnings into applications. 12.4 Supervises or acts as an adviser to other Professional Mechanical Engineers. 12.5 Publishes research and technical papers that contribute to the application of Advanced Professional Mechanical Engineering.	12.1 12.1 12.2	12.2 12.3 12.4	12.2 12.3 12.4 12.5
13. Contributes to the development and improvement of mechanical engineering in the practice of design, construction, upgrading, inspection, audit, testing and commissioning, operation, and maintenance. 13.1 Provides significant contributions to the science and practice of mechanical engineering in lifts and conveyances design, construction, upgrading, inspection, audit, testing and commissioning, operation, and maintenance. 13.2 Leads mechanical engineering practice in the area of design, construction, upgrading, inspection, audit, testing and commissioning, operation, and maintenance. 13.3 Develops new codes, standards and mechanical engineering practices with clear considerations to other regulatory standards and laws. 13.4 Develops and applies new lifts and conveyances design, construction, operations, and maintenance principles. 13.5 Contributes to developing and communicating the engineering body of knowledge. 13.6 Contributes professional services for the civic good. 13.7 Collaborates with technical associations, technologists, experts and other specialists in the advancement of the profession. 13.8 Renders expert consultancy services and support to government agencies, industries, relevant studies, researches and other technical initiatives to advance the profession.	13.1 13.3 13.4 13.5	13.1 13.2 13.4 13.5 13.6	13.3 13.5 13.6 13.7 13.8
14. Leads and manages significant Lifts & Conveyances projects. 14.1 Interprets and defines project scope. 14.2 Reviews the design outcomes in operation. 14.3 Manages time and progress. 14.4 Reviews the design to achieve acceptance. 14.5 Manages project quality, safety, and risks. 14.6 Implements the planning and design process. 14.7 Prepares and maintains documentation during the design process.	14.1 14.2 14.3 14.4	14.3 14.4 14.5 14.6 14.7	14.4 14.5 14.6 14.7 14.8

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
14.8 Manages work priorities and resources. 14.9 Manages the assets within the operation and system. 14.10 Applies project cost management and budgeting. 14.11 Applies policy on equipment life cycle from conceptual design to retirement and disposal. 14.12 Applies efficient and effective project management principles employing best practices and policies in attaining time, economic, safety, environmental, quality, and human resource objectives.		14.10 14.11 14.12	14.9 14.10 14.12
15. Demonstrates Engineering Leadership through highly advanced level of expertise in lifts and conveyances specialization. 15.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization. 15.2 Promotes the mechanical engineering profession and lifts and conveyances design, construction, upgrading, inspection, audit, testing and commissioning, operation, and maintenance. 15.3 Establishes lifts and conveyances engineering business/organization strategic directions. 15.4 Provides significant mechanical engineering contributions industry, community, and country. 15.5 Encourages and manages the workplace towards progressive and constructive changes. 15.6 Motivates, trains, coaches and mentors other professionals in the field of technology. 15.7 Encourages responsive and sustainable lifts and conveyances design, construction, upgrading, inspection, audit, testing and commissioning, operation, and maintenance. 15.8 Promotes and encourages outstanding professional achievements and the upliftment of profession. 15.9 Practices the Mechanical Engineering profession that is attuned to civic obligations and Corporate Social Responsibility.	15.1 15.2 15.3 15.4	15.1 15.2 15.3 15.4 15.5 15.6	15.3 15.4 15.5 15.6 15.7 15.8 15.9
16. Manages Engineering Business Organization in lifts and conveyances specialization. 16.1 Establishes engineering business direction. 16.2 Leads and manages the engineering organization. 16.3 Manages a multi-disciplined team. 16.4 Encourages continuous professional development. 16.5 Provides guidelines, mechanics and training for professional-level progression. 16.6 Establishes and institutes programs creating opportunities for professional growth and career development.	16.1 16.2	16.1 16.2 16.3 16.4 16.6	16.1 16.2 16.3 16.4 16.5 16.6
17. Conducts research and development in lifts and conveyances specialization. 17.1 Identifies opportunities for new or improved processes and/or products. 17.2 Initiates concept development. 17.3 Identifies the resources required for research and development. 17.4 Collaborates in the application or potential commercialization of research outcome.	17.1 17.2 17.3 17.6	17.1 17.2 17.3 17.4	17.1 17.2 17.3 17.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Lifts and Conveyances		
	Knowledge, Skills and Values ¹³	Application ¹⁴	Degree of Independence ¹⁵
17.5 Develops and promotes programs for continuous improvement and innovations.		17.5	17.5
17.6 Keeps abreast with the latest technological developments in the national and international levels.			

(6) LINKS BETWEEN QUALIFICATION OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN WATER AND WASTEWATER MECHANICAL SYSTEMS

QUALIFICATION TITLE
QUALIFICATION CODE

Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems
PMEE 807156

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
1. Integrates knowledge of mathematics, physical sciences, Information Technology, and water and wastewater mechanical systems design, construction, operation and maintenance principles.			
1.1 Proposes innovations in process design and operation.	1.1	1.1	1.3
1.2 Develops and continually upgrade proficiency in numerical and computational hydraulic modeling in solving complex mechanical engineering problems.	1.2	1.2	1.4
1.3 Imparts learning to peers.	1.3	1.3	
1.4 Evaluates water and wastewater processes, machineries and distribution network to ensure their applicability, availability, reliability, efficiency, safety and environmental compliance.			

¹⁶ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

¹⁷ Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

¹⁸ Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability.

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
2. Identifies, formulates research literature and analyzes complex water and wastewater mechanical systems design, construction, operation and maintenance problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. 2.1 Consolidates results of research and technical information in formulating solutions to water and wastewater mechanical systems design, construction, operation and maintenance processes and adapt these into systems to achieve targets. 2.2 Imparts these technological advances to peers. 2.3 Evaluates latest technology, equipment and innovative tools in the market to enhance and optimize plant availability, reliability, efficiency, over-all equipment effectiveness, safety and environmental performance. 2.4 Influences equipment suppliers and manufacturers to update or upgrade current mechanical equipment to suit latest technological needs.	2.1 2.2 2.3	2.1 2.2 2.3 2.4	2.1 2.2 2.3 2.4
3. Evaluates and develops solutions to complex water and wastewater mechanical systems for operation and maintenance problems that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Consolidates studies made and proposes changes. 3.2 Specializes in water and wastewater mechanical systems design, construction, operation and maintenance practice in the Mechanical Engineering Profession. 3.3 Uses technical expertise in designing solutions to complex problems. 3.4 Prepares project proposals, budget and reports related to improvements in water and wastewater mechanical systems design, construction, operation and maintenance problems. 3.5 Imparts learning to peers. 3.6 Formulates a program of equipment life assessment and extension and monitors equipment health index to enhance and optimize plant availability, reliability, efficiency, over-all equipment effectiveness, safety and environmental performance. 3.7 Develops reference manuals/catalogues of water and wastewater machineries for prompt information on equipment selection needed for budgetary purpose and decision making.	3.1 3.2 3.3 3.5 3.6 3.7	3.1 3.2 3.3 3.4 3.5 3.6 3.7	3.1 3.2 3.3 3.4 3.5 3.6 3.7
4. Conducts investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 4.1 Organizes teams of experts, plans and designs experiments in conducting investigations of complex water and wastewater mechanical systems design, construction, operations and maintenance problems.	4.1 4.2	4.1 4.2	4.1 4.2

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
4.2 Conducts bench scale and plant scale trials as may be deemed necessary to validate conclusions. 4.3 Prepares feasibility, reports, implementation plans and makes presentations to the concerned entities on the proposed solutions to the complex water and wastewater mechanical systems design, construction, operations and maintenance problems. 4.4 Imparts learning to peers. 4.5 Analyzes operations parameters, maintenance, reliability and efficiency data to enhance and optimize plant availability, reliability, efficiency and safety and overall equipment effectiveness. 4.6 Establishes the process of root-cause investigation and analysis (Failure Mode, Effect and Criticality Analysis) of critical equipment failure and evaluates and builds up lessons learned to enhance and optimize plant availability, reliability, efficiency, over-all equipment effectiveness, safety and environmental performance. 4.7 Reviews and revises mechanical equipment requirements to conform to the results of experiments, field investigation and recommendations of concerned entities.	4.3 4.4 4.5 4.6 4.7	4.3 4.4 4.5 4.6 4.7	4.3 4.4 4.5 4.6 4.7
5. Creates solutions to complex water and wastewater mechanical systems problems through application of modern techniques in design, construction or operation including hydraulic computer modelling / simulation programs and other IT tools. 5.1 Adapts applicable modern tools and techniques to solve water and wastewater treatment plants and distribution network design, construction, operation and maintenance problems taking into consideration its limitations. 5.2 Uses industrial experience in conjunction with technical expertise and appropriate modern tools in solving complex water and wastewater mechanical systems design, construction, operation and maintenance problems. 5.3 Prepares reports and recommendations and presents these to the concerned entities. 5.4 Develops and adopts condition monitoring and predictive maintenance program applying the latest IT and digital technology to enhance and optimize plant availability, reliability, efficiency, over-all equipment effectiveness, safety, and environmental performance. 5.5 Evaluates and supports digital transformation and automation of plant operation and address multiple issues that could interfere in the safe and efficient water production and supply distribution to customers.	5.1 5.2 5.3 5.4 5.5	5.1 5.2 5.3 5.4 5.5	5.3 5.4 5.5
6. Applies reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional mechanical engineering practice in the specialized field of water and wastewater mechanical systems problems. 6.1 Determines relevant policies, laws, regulations and technical standards both locally and internationally in conjunction with the Advanced Professional Mechanical Engineering Practice.	6.1 6.2 6.3	6.1 6.2 6.3	6.3 6.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
6.2 Selects specific country regulations on water and wastewater mechanical systems design, construction, operation and maintenance specialization practice in implementing solutions to complex mechanical engineering problems. 6.3 Prepares plans and designs to address water and wastewater mechanical systems design, construction, operations and maintenance problems while taking into consideration moral, ethical and environmental concerns. 6.4 Imparts learning to peers.	6.4	6.4	
7. Evaluates and determines the sustainability and impact of water and wastewater mechanical systems design, construction, operation and maintenance specialization in the solution of complex water and wastewater mechanical systems design, construction, operation and maintenance problems in societal and environmental contexts. 7.1 Selects relevant technical standards and specialization practices that can be applied to the design, construction, operation and maintenance of water and wastewater treatment plants and distribution system. 7.2 Applies green technologies and other upcoming standards. 7.3 Uses gained experience in water and wastewater mechanical systems design, construction, operation and maintenance specialization practice to measure impacts on society and environment. 7.4 Conducts research, develops projects and prepares implementation plans to implement and assess advanced professional mechanical engineering works in relation to complex water and wastewater mechanical systems design, construction, operation and maintenance problems. 7.5 Imparts learning to peers. 7.6 Applies the process of Management of Change (MOC), evaluates and documents all system and equipment upgrade and modification, the basis of which is enhanced or improved plant availability, reliability, efficiency, safety and environmental performance. 7.7 Supports the development of Quality Management System, Environmental Management System, Occupational Health and Safety Management System, Risk Management and Asset Management System.	7.1 7.2 7.3 7.4 7.5 7.6 7.7	7.2 7.3 7.4 7.5 7.6 7.7	7.3 7.4 7.5 7.6 7.7
8. Applies ethical principles and commits to professional ethics and responsibilities and norms of advanced professional mechanical engineering practice. 8.1 Utilizes Mechanical Engineering Code of Ethics and applies and behaves according to this code in professional practice. 8.2 Practices, observes and complies with government and corporate policies and regulations. 8.3 Applies ethical principles in conjunction with water and wastewater mechanical systems design, construction, operation and maintenance specialization practice incorporating public safety as a priority.	8.1 8.2 8.3 8.4 8.5 8.6	8.1 8.2 8.3 8.4 8.5 8.6	8.4 8.5 8.6

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
8.4 Exemplifies ethical and moral values through participation in socially relevant projects that contributes to national development. 8.5 Imparts learning to peers. 8.6 Models integrity, morality and ethical practice to upcoming professional mechanical engineers.			
9. Functions effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. 9.1 Supervises and manages processes, people and facilities locally or internationally enabling efficiency, improved performance, business profitability and safety. 9.2 Prepares policies, rules, regulations, instructions, procedures, and implements them. 9.3 Trains other mechanical engineers and water and wastewater mechanical systems design, construction, operation and maintenance practitioners.	9.1 9.2 9.3	9.1 9.2 9.3	9.1 9.2 9.3
10. Communicates effectively on complex water and wastewater mechanical systems design, construction, operations and maintenance specialization activities with the mechanical engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. 10.1 Be knowledgeable with the principles of effective communication. 10.2 Consolidates reports and makes presentations to peers and superiors on projects or on assigned endeavors. 10.3 Communicates and coordinates clearly and act as liaison officer on matters concerning legal or regulatory issues. 10.4 Conducts any manner of trainings (blended learning, flexible learning, face-to-face, etc.) to subordinates, peers and superiors.	10.1 10.2 10.3 10.4	10.1 10.2 10.3 10.4	10.2 10.3 10.4
11. Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and applies these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 11.1 Be knowledgeable with the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of water and wastewater mechanical systems design, construction, operation and maintenance specialization. 11.2 Develops business case and manages financial aspects of the project. 11.3 Prepares reports related to projects. 11.4 Manages supervisors and peers. 11.5 Be knowledgeable with whole-life cycle cost of acquisition, installation, operation, maintenance and retirement of an equipment (cradle to grave).	11.1 11.2 11.3 11.4 11.5	11.1 11.2 11.3 11.4 11.5	11.2 11.3 11.4 11.5

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
12. Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning for mechanical engineering in general and in water and wastewater mechanical systems design, construction, operation and maintenance specialization in particular in the broadest context of technological change. 12.1 Attends training, seminars, conferences and participate in professional organizations that encourage continued learning in the Professional Mechanical Engineering profession. 12.2 Prepares modules for training peers, subordinates and students. 12.3 Organizes seminars, trainings or conferences. 12.4 Supervises or acts as adviser to other Professional Mechanical Engineers. 12.5 Publishes research papers. 12.6 Be a resource speaker at conferences.	12.1 12.2 12.3 12.4 12.5 12.6	12.2 12.3 12.4 12.5 12.6	12.2 12.3 12.4 12.5 12.6
13. Contributes to the development and improvement of mechanical engineering in general and water and wastewater mechanical systems specialized practice in particular. 13.1 Provides significant contributions to science and practice of mechanical engineering and water and wastewater mechanical systems design, construction, operation and maintenance specialization. 13.2 Leads mechanical engineering practice in area of water and wastewater mechanical systems design, construction, operation and maintenance specialization. 13.3 Develops new codes, standards and mechanical engineering practices. 13.4 Develops or applies new water and wastewater mechanical systems design, construction, operations and maintenance principles. 13.5 Contributes to developing and communicating the engineering body of knowledge. 13.6 Contributes professional services for the civic good.	13.1 13.2 13.3 13.4 13.5 13.6	13.1 13.2 13.3 13.4 13.5 13.6	13.1 13.2 13.3 13.4 13.5 13.6
14. Leads and manages significant projects in water and wastewater mechanical systems design, construction, operation and maintenance. 14.1 Interprets project scope. 14.2 Reviews the design outcomes in operation. 14.3 Manages time and progress. 14.4 Reviews the design to achieve acceptance. 14.5 Manages project quality, safety and risk. 14.6 Implements planning and design process. 14.7 Prepares and maintains documentation during the design process. 14.8 Manages work priorities and resources. 14.9 Manages the assets within the operation system.	14.1 14.2 14.3 14.4 14.5 14.6 14.7 14.8 14.9	14.1 14.2 14.3 14.4 14.5 14.6 14.7 14.8 14.9	14.1 14.2 14.3 14.4 14.5 14.6 14.7 14.8 14.9

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Water and Wastewater Mechanical Systems		
	Knowledge, Skills and Values ¹⁶	Application ¹⁷	Degree of Independence ¹⁸
15. Demonstrates Engineering Leadership through highly advanced level of expertise in water and wastewater mechanical systems design, construction, operation and maintenance. 15.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization. 15.2 Promotes the mechanical engineering profession and water and wastewater mechanical systems design, construction, operation and maintenance specialization. 15.3 Establishes mechanical engineering business/organization direction. 15.4 Provides significant mechanical engineering contributions to community. 15.5 Encourages and manages workplace change. 15.6 Motivates and mentors other professional. 15.7 Encourages responsive and sustainable water and wastewater mechanical systems design, construction, operation and maintenance.	15.1 15.2 15.3 15.4 15.6	15.1 15.2 15.3 15.4 15.5 15.6	15.1 15.2 15.3 15.4 15.5 15.6 15.7
16. Manages Engineering Business Organization in water and wastewater mechanical systems design, construction, operation and maintenance specialization. 16.1 Establishes engineering business direction. 16.2 Leads and manages engineering organization. 16.3 Manages a multi-disciplined team. 16.4 Encourages continued professional development.	16.1 16.2 16.3	16.1 16.2 16.3 16.4	16.1 16.2 16.3 16.4
17. Conducts research and development in water and wastewater mechanical systems design, construction, operation and maintenance specialization. 17.1 Identifies opportunities for new or improved processes and/or products. 17.2 Initiates concept development. 17.3 Identifies the resources required for research and development 17.4 Collaborates in the application or potential commercialization of research outcomes.	17.1 17.2 17.3 17.4	17.1 17.2 17.3 17.4	17.1 17.2 17.3 17.4

(7) LINKS BETWEEN QUALIFICATION OUTCOMES TO THE PQF LEVEL 8 DESCRIPTORS FOR THE ADVANCED PROFESSIONAL MECHANICAL ENGINEERING IN CONSTRUCTION AND PROJECT MANAGEMENT

QUALIFICATION TITLE
QUALIFICATION CODE

Advanced Professional Mechanical Engineering in Construction and Project Management
PMEE 80715-7

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Construction and Project Management		
	Knowledge, Skills and Values ¹⁹	Application ²⁰	Degree of Independence ²¹
1. Integrates knowledge of mathematics, physical sciences, Information Technology, in Construction and Project Management. 1.1 Proposes innovations in process design and operations improvement and optimization. 1.2 Develops and continually upgrades proficiency in numerical and computational modeling in solving mechanical engineering problems in construction. 1.3 Keeps abreast with and learns the latest engineering tools, scientific trends and technical applications in electronic and digital platforms. 1.4 Imparts learning to peers.	1.1 1.2	1.1 1.2 1.3	1.3 1.4
2. Identifies, formulates research literature and analyzes complex construction and project management problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. 2.1 Consolidates results of research and technical information in formulating solutions to complex construction and project management processes and adapt these into systems to achieve targets. 2.2 Imparts these technological advances to peers. 2.3 Establishes project standards, operating guidelines, procedures and best practices.	2.1 2.2	2.1 2.2	2.2 2.3
3. Evaluates and develops solutions for complex construction and project management problems and designs systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. 3.1 Consolidates studies made and proposes changes. 3.2 Specializes in construction and project management practice in the Mechanical Engineering Profession. 3.3 Uses technical expertise in designing solutions to applicable complex problems. 3.4 Prepares project proposals, budget and reports related to improvements to construction and project management problems. 3.5 Imparts learning to peers.	3.1 3.2 3.3	3.1 3.2 3.4	3.3 3.4 3.5

¹⁹ Demonstrated highly advanced systematic knowledge and skills in highly specialized and/or complex multi-disciplinary field of learning for complex research and or professional practice and/or for the advancement of learning

²⁰ Applied for professional leadership for innovation, research and/or development management in highly specialized or multi-disciplinary field

²¹ Full independence in individual work and/or in teams of multi-disciplinary and more complex setting that demands leadership for research and creativity for strategic value added. Significant level of expertise-based autonomy and accountability.

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Construction and Project Management		
	Knowledge, Skills and Values ¹⁹	Application ²⁰	Degree of Independence ²¹
4. Conducts investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 4.1 Organizes teams of experts, plans and designs experiments in conducting investigations of complex construction and project management problems. 4.2 Conducts labscale and plant scale trials as may be deemed necessary to validate conclusions. 4.3 Prepares feasibility, reports, implementation plans and makes presentations to the concerned entities on the proposed solutions to the complex construction and project management problems. 4.4 Imparts learning to peers.	4.1 4.2	4.1 4.2 4.3 4.4	4.1 4.2
5. Creates, selects and applies appropriate techniques, resources, and modern construction and project management and IT tools, including prediction and modeling, to solve complex construction and project management problems, with an understanding of the limitations. 5.1 Adapts applicable modern tools and techniques to solve construction and project management problems taking into consideration its limitations. 5.2 Uses experience in conjunction with technical expertise and appropriate modern tools in solving complex construction and project management problems. 5.3 Prepares reports and recommendations and presents these to the concerned entities.	5.1 5.2	5.1 5.2 5.3	5.2 5.3
6. Applies reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to construction and project management specialization practice and solutions to complex construction and project management problems. 6.1 Determines relevant policies, laws, regulations and technical standards both locally and internationally in conjunction with the Advanced Professional Mechanical Engineering Practice in construction and project management. 6.2 Selects specific country regulations on construction and project management specialization practice in implementing solutions to complex construction and project management problems. 6.3 Prepares plans and designs to address construction and project management problems while taking into consideration moral, ethical and environmental concerns. 6.4 Imparts learning to peers.	6.1 6.2 6.3	6.1 6.3 6.4	6.3 6.4

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Construction and Project Management		
	Knowledge, Skills and Values ¹⁹	Application ²⁰	Degree of Independence ²¹
7. Understands and evaluate the sustainability and impact of construction and project management specialization in the solution of complex construction and project management problems in societal and environmental contexts. 1.1 Be knowledgeable with relevant applicable technical and construction and project management standards that can be applied in construction and project management specialization practice. 1.2 Applies green technologies and other upcoming standards. 1.3 Uses gained experience in construction and project management specialization practice to measure impacts on society and environment. 1.4 Conducts research, develops projects and prepares implementation plans to implement and assess advanced professional mechanical engineering works in relation to complex construction and project management problems. 1.5 Imparts learning to peers.	7.1 7.2 7.3	7.2 7.3 7.4 7.5	7.4 7.5
b) Applies ethical principles and commits to professional ethics and responsibilities and norms of advanced professional mechanical engineering practice. 2.1 Utilizes the Mechanical Engineering Code of Ethics and applies and behaves according to this code in professional practice. 2.2 Practices, observes and complies with government, corporate and construction industry policies and regulations. 2.3 Applies ethical principles in conjunction with construction and project management specialization practice incorporating public safety as a priority. 2.4 Exemplifies ethical and moral values through participation in socially relevant projects that contribute to national development. 2.5 Imparts learning to peers. 2.6 Models integrity, morality and ethical practice to upcoming construction project and management engineers.	8.1 8.2 8.3	8.1 8.2 8.3 8.4 8.6	8.5 8.6
c) Functions effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. 3.1 Supervises and manages processes, people and facilities locally or internationally enabling efficiency, improved performance, business profitability and safety. 3.2 Prepares policies, rules, regulations, instructions, procedures, and implements them. 3.3 Trains other mechanical engineers and construction and project management practitioners.	9.1 9.2	9.3	9.2 9.3

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Construction and Project Management		
	Knowledge, Skills and Values ¹⁹	Application ²⁰	Degree of Independence ²¹
d) Communicates effectively on complex construction and project management specialization activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, makes effective presentations, and gives and receives clear instructions. 4.1 Uses the principles of effective communication. 4.2 Consolidates reports and makes presentations to peers and superiors on projects or on assigned endeavors. 4.3 Communicates and coordinates clearly and acts as liaison officer on matters concerning legal or regulatory issues. 4.4 Conducts trainings to subordinates, peers and superiors.	10.1 10.2 10.3	10.1 10.2 10.3 10.4	10.1 10.2 10.3 10.4
e) Demonstrates knowledge and understanding of advanced professional mechanical engineering management principles and economic decision-making and applies these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 5.1 Be knowledgeable with the principles of managing and implementing medium-sized to major projects or tasks as may be deemed necessary in the practice of construction and project management specialization. 5.2 Manages financial aspects of the project. 5.3 Prepares reports related to projects. 5.4 Manages supervisors and peers.	11.1 11.2 11.3	11.1 11.2 11.3 11.4	11.3 11.4
f) Recognizes the need for, and have the preparation and ability to engage in independent and life-long learning for mechanical engineering in particular and Construction and Project Management in particular in the broadest context of technological change. 6.1 Attends trainings, seminars, conferences and participate in professional organizations that encourage continued learning in the Professional Mechanical Engineering profession. 6.2 Prepares modules for training peers, subordinates and students. 6.3 Organizes seminars, trainings or conferences. 6.4 Supervises or acts as adviser to other Mechanical Engineers. 6.5 Publishes research papers.	12.1 12.2	12.2 12.3 12.4	12.2 12.3 12.4 12.5
g) Contributes to the development and improvement of mechanical engineering and construction and project management specialization practice. 7.1 Provides significant contributions to science and practice of mechanical engineering and construction and project management specialization. 7.2 Leads mechanical engineering practice in area of construction and project management specialization.	13.1 13.2	13.4	13.3

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Construction and Project Management		
	Knowledge, Skills and Values ¹⁹	Application ²⁰	Degree of Independence ²¹
7.3 Develops new codes, standards and mechanical engineering practices. 7.4 Develops or applies new construction and project management principles. 7.5 Contributes to developing and communicating the engineering body of knowledge. 7.6 Contributes professional services for the civic good.	13.3 13.4 13.5	13.5 13.6	13.5 13.6
h) Leads and manages significant in construction projects. 8.1 Interprets project scope. 8.2 Reviews the design outcomes in operation. 8.3 Manages time and progress. 8.4 Reviews the design to achieve acceptance. 8.5 Manages project quality, safety and risk. 8.6 Implements planning and design process. 8.7 Prepares and maintains documentation during the construction process. 8.8 Manages work priorities and resources. 8.9 Manages the assets within the operation/system.	14.1 14.2 14.3 14.4	14.3 14.4 14.5 14.6 14.7	14.4 14.5 14.6 14.7 14.8 14.9
i) Demonstrates Engineering Leadership through highly advanced level of expertise in in Construction and Project Management. 9.1 Inspires, motivates and exhibits autonomy and accountability through innovations in his chosen field of specialization. 9.2 Promotes the mechanical engineering profession and construction and project management specialization. 9.3 Establishes mechanical engineering organization direction 9.4 Provides significant mechanical engineering contributions to community. 9.5 Encourages and manages workplace change. 9.6 Motivates and mentors other professional. 9.7 Encourages responsive and sustainable construction and project management practices.	15.1 15.2 15.3 15.4	15.1 15.2 15.3 15.4 15.5 15.6	15.3 15.4 15.5 15.6 15.7
j) Manages Engineering Business Organization in Construction and Project Management . 10.1 Establishes engineering business direction. 10.2 Leads and manages engineering organization. 10.3 Manages a multi-disciplined team. 10.4 Encourages continued professional development.	16.1 16.2	16.1 16.2 16.3 16.4	16.1 16.2 16.3 16.4
k) Conducts research and development in Construction and Project Management.			

ADVANCED PROFESSIONAL PRACTICE OUTCOMES	PQF Level 8		
	Advanced Professional Mechanical Engineering in Construction and Project Management		
	Knowledge, Skills and Values ¹⁹	Application ²⁰	Degree of Independence ²¹
11.1 Identifies opportunities for new or improved processes and/or products.	17.1	17.1	17.1
11.2 Initiates concept development.	17.2	17.2	17.2
11.3 Identifies the resources required for research and development.	17.3	17.3	17.3
11.4 Collaborates in the application or potential commercialization of research outcomes.		17.4	17.4

7. Others