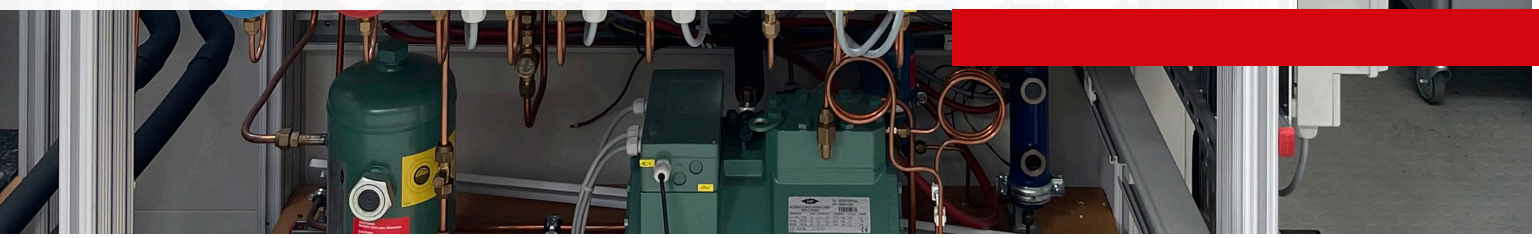
Safety Standards for Refrigeration and Air Conditioning in the Philippines.

Standards Development and Adoption for the Safe Introduction of Future Friendly Alternatives



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Abbreviations

ANSI	American National Standards Institutes
ASHRAE	American Society of Heating Refrigeration and Air conditioning Engineers
BPS	Bureau of Philippine Standards
CCC	Climate Change Commission
CCO	Chemical Control Order
DENR	Department of Environment and Natural Resources
DOE	Department of Energy
DTI	Department of Trade and Industry
ERTLS	Energy Research and Testing Laboratory Services
GWP	Global Warming Potential
HCFC	Hydorchlorofluorocarbon
HFC	Hydrofluorcarbon
HFO	Hydrofluoro-olefin
HVAC	Heating Ventilation Air Conditioning
ICC	Import Commodity Clearance
IEC	International Electrical Commission
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
MEPS	Minimum Energy Performance Standard
MRV	Monitoring, Reporting and Verification
NC	National Certificate
MVE	Monitoring, Verification and Enforcement
NDC	Nationally Determined Contribution
NOU	National Ozone Unit
ODS	Ozone Depleting Substance
PELP	Philippine Energy Labelling Program
POD	Philippine Ozone Desk
PNS	Philippine National Standard
PS	Philippine Standard
RAC	Refrigeration and air conditioning
RACHP	Refrigeration Air Conditioning and Heat Pumps
TEAP	Technology and Economic Assessment Panel of the Montreal Protocol
TESDA	Technical Education and Skills Development Authority
TGFA	Total Gross Floor Area
TVET	Technical and Vocational Education and Training
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

In implementing the Cool Contributions fighting Climate Change or C4 I&II project, the Philippines remains unique in terms of project activities related to safety standards in refrigeration, air conditioning and heat pumps (RACHP). The Philippines among the C4 I&II partner countries is a participating member of specific RACHP standardization subcommittees of the International Electrotechnical Commission (IEC) and has an active National Committee (NC) working on standards development, standards adoption and standards promotion.

Product safety regulations in the Philippines are based on specific product safety standards of the IEC which were adopted as Philippine National Standards (PNS). The country is also a voting member of relevant environmental standards committee of the International Organization for Standardization (ISO).

This report provides the experience of the Philippines in adopting as PNS, international safety standards in air conditioning, refrigeration and heat pumps. Given local manufacturing capabilities on RAC appliances and equipment, the Philippines always used the vertical product standards IEC 60335-2-24 and IEC 60335-2-40 as basis of technical regulations over cooling appliances. With the implementation of the C4 I&II project, adoption of the horizontal standards ISO 5149 series of standards and ISO 817 for refrigerants was initiated and used as reference in assessing conformities to facilities, equipment, products and persons.

In preparation to the gradual transition to low GWP refrigerants specifically natural refrigerants as part of the compliance mechanism of the Kigali Amendments to the Montreal Protocol, the Philippines unlike its regional neighbors in Southeast Asia relied on these standard specifications to gradually and safely introduce alternative substances to the Philippine market, based on standards conformity instead of arbitrary restrictions related to refrigerant flammability, toxicity or pressure.

1

INTRODUCTION

1 Introduction

BACKGROUND OF THE PROJECT

The Cool Contributions fighting Climate Change or C4 I&II is a global project of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the International Climate Initiative (IKI). In the first phase (C4 I) was implemented on behalf of the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) from 2016 to 2021. The second phase (C4 II) has been implemented on behalf of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) from 2021 - 2025.

The project aims to promote an international control of fluorinated gases (F-gases) in the refrigeration and air conditioning (RAC) sector as part of the Nationally Determined Contribution (NDC) of partner countries to the Paris Agreements. F-gases particularly hydrofluorocarbons (HFC) are potent greenhouse gases (GHG) with high global warming potential (GWP) are commonly used as refrigerants or cooling agents in RAC appliances, equipment and systems.

The C4 I project was implemented in six (6) partner countries namely Cuba, Costa Rica, Grenada, Iran, Vietnam and the Philippines. During the second phase, C4 II has been working with three (3) partner countries namely Costa Rica, Grenada and the Philippines. In the Philippines the project has been implemented in partnership with the Climate Change Commission (CCC) the focal agency to the Paris Agreements, the Department of Environment and Natural Resources (DENR), the focal agency to the Montreal Protocol and the Department of Energy (DOE) with a mandate on the overall energy policy and strategy for the country. As part of the RAC sector mitigation strategy for the Philippines, the project supports the control of direct emissions from the use of high GWP refrigerants and the improvement of energy performance of RAC appliances, equipment and systems through the use of natural refrigerants. Feasible options for natural refrigerants include hydrocarbons, ammonia and carbon dioxide (CO_2).

Kigali amendments to the Montreal Protocol was signed by parties including the Philippines in 2016 to support the call for global climate action to limit temperature rise to 2°C under the Paris Agreement. With the Paris Agreements ratified by the Philippines, the ratification process for the Kigali amendments has to commence. Once ratified, the Kigali Amendments can provide additional reinforcement to the Paris Agreements to achieve greater mitigation potential and at the same time achieve the sustainable development goals. The Philippines ratified the Kigali Amendments in 2022 and in preparation for the ratification, the Chemical Control Order for [1] F-gas Control Regulation was released in 2021.

The prior decisions of the Montreal Protocol have provided guidance on the phase-out of Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs) through quota licensing systems and specific enabling activities for stakeholders within the lifecycle of these chemicals. These strategies have been proven effective within its scope of compliance. The mature compliance mechanism of the Montreal Protocol is also foreseen as an effective mitigation strategy that can be adopted towards a phase-down of HFCs in line with the commitments to the Paris Agreements.

As part of this compliance mechanism, growth of emissions occurred due to the shift of industries towards HFCs as ODS alternatives. The Paris Agreements in 2015, was a call for action that was realized by the Montreal Protocol to integrate climate protection in its existing ozone protection activities through the Kigali Amendment.

HFC SUBSTANCES FOR PHASE-DOWN BY THE KIGALI AMENDMENTS OF THE MONTREAL PROTOCOL

On its 28th Meeting of Parties of the Montreal Protocol in Kigali, Rwanda, parties agreed to include HFCs as one of its controlled substances for phase-down. The addition of these non-ODS but high GWP chemical substances is generally referred to as the Kigali Amendments of the Montreal Protocol.

The covered substances are specified in the Annex F of the amended draft of the Montreal Protocol which is also presented in the Table 1.

Table 1: Annex F of the Kigali Amendments to the Montreal Protocol

Group	Substances for Phase-down		100-Year GWP
Group I	CHF_2 CHF_2	HFC-134	1100
	CHF_2 FCF_3	HFC-134a	1430
	CHF_2 $FCHF_2$	HFC-143	353
	CHF_2 CH_2 CF_3	HFC-245fa	1030
	CF3 CH_2 CF_2 CH_3	HFC-365mfc	794
	CF3 $CHFCF_3$	HFC-227ea	3220
	CH_2 FCF_3 CF_3	HFC-236cb	1340
	CHF_2 $CHFCF_3$	HFC-236ea	1370
	CF_3 CH_2CF_3	HFC-236fa	9810
	CH_2 FCF_2CHF_3	HFC-245ca	693
	CF_3 $CHFCHFCF_2CF_3$	HFC-43-10mee	1640
	CH_2 F_2	HFC-32	675
	CHF_2 CF_3	HFC-125	3500
	CH_3 CF_3	HFC-143a	4470
	CH_3 F	HFC-41	92
	CH_2FCH_2F	HFC-152	53
	CH_3CHF2	HFC-152a	124
Group II	CHF_3	HFC-23	14800

The substances covered by the new Annex F of the Montreal Protocol are pure compounds, guidelines for the phase-down of blends were published by the Ozone Secretariat in 2017. Zeotropic and Azeotropic Blends that has a component covered by the phase-down under the Kigali amendments will also be phased-down. In Table 2 are the refrigerant blends covered by the phase-down.

Zeotropic blends are composed of two or more refrigerants whose equilibrium vapor and liquid phase compositions are not the same at any pressure below critical pressure. Azeotropic blends are composed of two or more refrigerants whose equilibrium vapor and liquid phase composition are the same at a specific pressure but may be different at other conditions.

Table 2: Zeotropic and Azeotropic Blends for phase-down in the Kigali Amendments to the Montreal Protocol (CITATION from UNEP Ozonaction)

Zeotropic Blends			Azeotropic Blends
R401a, R401b, R402b, R403a, R403b, R404a, R407a, R407c, R407f, R408a, R409a, R409b, R410a, R411a, R412a, R413a, R415a, R415b, R416a, R417a, R418a, R419a, R420a, R421a,	R421b, R422a, R423a, R424a, R425a, R426a, R427a, R428a, R429a, R430a, R431a, R432a, R433a, R433b, R433c, R434a, R435a, R436a, R437a, R438a, R439a, R440a,	R442a, R444a, R444b, R445a, R446, R447a, R448a, R449a, R449b, R450a, R451a, R452a, R452b, R453a, R454a, R454b, R456a, R457a, R458a, R459a, R459b, R461a, R462a	R502, R507a, R508a, R508b, R510a, R511a, R512a, R513a, R513b, R514a, R515a, R516a

THE ROLE OF STANDARDS IN CLIMATE CHANGE MITIGATION AND ADAPTATION

The Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) working group on mitigation, the use of standards, either as voluntary standards or as regulation, is an effective policy option for reducing GHG emissions. Chapters 9, 10 and 12 of IPCC AR5 on mitigation has extensively discussed the use of standards in the identification of robust mitigation options highlighting its feasibility for implementation for both developed and developing countries.

Table 12.4 of Chapter 12 on human settlements have provided an overview of the applicability of standards as mitigation policy option across sectors. These includes standards on energy efficiency for buildings, transport and industry. Standards are also mitigation options for the use of fuels in energy generation as detailed in Chapter 7 and 8.

Design standards are also recommended in AR5 by considering the reduction of direct and indirect GHG emissions in buildings, transportation, and the use of materials in industry for new designs of products, equipment systems and building retrofits. The need to adapt to variable climatic conditions through design changes and new developments are also recommended to be considered in the adoption of new standards.

Chapter 9 on buildings has provided robust evidence on the significance of heating, ventilation and air conditioning (HVAC) in climate change adaptation and mitigation. Buildings contribute to a significant amount of F-gas emissions and chapter 9.3.6 specifically discussed the role of halocarbons.

Chapter 10 on industry have provided robust evidences that demand for cooling from industry due to variability in ambient temperature is expected both as an adaptation strategy and a significant opportunity for mitigation. Ensuring constant temperature for product quality and safety in the food industry through refrigeration and the prevention of heat stress detrimental to human health through air conditioning are concrete evidences of the expected growth in the RAC sector.

Strategies proposed to be part of a mitigation strategy of an NDC of a party must take into consideration the ability of a country to adopt the related standards applicable to that option. Technology options with robust evidence and high agreement is already presented in AR5 of the IPCC but these options have to be adapted based on local conditions. Local conditions can range from unique climatic conditions or socioeconomic conditions that can become barriers in technology adoption and mainstreaming.

The safe and effective introduction of these low emission technologies for mitigation by parties to the Paris Agreement can be a challenge in the absence of standards which serves as guidelines and specifications to ensure its safe and effective introduction and mainstreaming. The socioeconomic capacity or specifically competence of personnel needed to operationalize these options may also become a barrier. These issues were discussed in the technical working groups and technical committees.

RACHP STANDARDS AFFECTED BY THE KIGALI AMENDMENTS OF THE MONTREAL PROTOCOL ON RACHP

On 17 May 2017, the Technology and Economic Assessment Panel (TEAP) of the Montreal Protocol published Decision XXVIII/4 Task Force Report on Safety Standards[1] which identified the applicable standards affected by the Kigali Amendments to the Montreal Protocol [2].

The TEAP report released in 2017 provided a comprehensive overview of the international process for standards development that will be affected by an eventual phase-down of HFCs. The report also provided the safety and health implications of the use of low to zero GWP refrigerants in Refrigeration, Air Conditioning and Heat Pumps (RACHP). With respect to health and safety, the TEAP report was not limited to the issue of flammability of alternatives but also on the toxicity of the substances in terms of its chronic and acute health effects.

The table below is a matrix of the specific standards published by the International Organization for Standardization (ISO) and the International Electro-technical Commission (IEC) related to the safety and environmental impacts of RACHP subsectors. However, the standards are limited to group safety standards and product safety standards published by ISO and IEC.

Table 3: ISO and IEC Standards that will require revisions to allow greater market penetration of Low GWP refrigerants [2].

Refrigeration Air Conditioning and Heat Pump Subsectors	IEC 60335-2-11	IEC 60335-2-24	IEC 60335-2-40	IEC 60335-2-89	ISO 13043	ISO 20854	ISO 5149-1	ISO 5149-2	ISO 5149-3	ISO 5149-4
Domestic Refrigeration		*					*	*	*	*
Commercial Refrigeration				*			*	*	*	*
Industrial Systems							*	*	*	*
Transport Refrigeration							*	*	*	*
Air-to-air Air Conditioners & Heat Pumps			*				*	*	*	*
Water heating heat pumps			*				*	*	*	*
Heat pump tumble driers	*						*	*	*	*
Chillers							*	*	*	*
Vehicle air conditioning					*					*
Refrigerated containers						*	*	*	*	*

* Group safety standard, * Product safety standard

ISO/IEC Guide 51:2014 Safety aspects – guidelines for their inclusion in standards has classified safety standards into the following types: basic safety standards; group safety standards; product safety standards; and standards containing safety aspects.

1 https://ozone.unep.org/sites/default/files/2019-05/TEAP-XXVIII_4-TF-Report-May2017.pdf

Basic safety standards specify fundamental concepts, principles and requirements with regard to general safety aspects applicable to a wide range of products and systems. Group safety standards contain safety aspects applicable to several products or systems or a family of similar products or system and can deal with multiple standards committees with reference to basic safety standards as far as possible. Product safety standards are specific to a product or system or a family products or systems tackled within the scope of a single committee and referring to basic safety standards as far as possible [2].

The TEAP Task Force Report on Safety Standards was focused on the standards development process as implemented under ISO and IEC. Processes adopted by regional standards development bodies such as the European Standard (EN) and the European Committee for Electro-technical Standardization (CENELEC) or national standardization process as implemented in the American National Standards Institute (ANSI) or the standards published through the process of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) were not included.

Relevant safety standards mentioned by the TEAP Task Force Report includes:

- IEC 60079 series Explosive atmospheres;
- IEC 60335-2-11 Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for tumble dryers;
- IEC 60335-2-24 Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers;
- IEC 60335-2-34 Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors;
- IEC 60335-2-40 Safety of household and similar electrical appliances – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers;
- IEC 60335-2-89 Household and similar electrical appliances – Safety – Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor;
- IEC 60335-2-104 Household and similar electrical appliances – Safety – Part 2-104: Particular requirements for appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment;
- ISO 817 Refrigerants – Designation system and safety classification;
- ISO 5149-1 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria;
- ISO 5149-2 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation;
- ISO 5149-3 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site;
- ISO 5149-4 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 4: Operation, maintenance, repair and recovery;
- ISO 13043 Road vehicles – Refrigerant systems used in mobile air conditioning systems (MAC) – Safety requirements;
- ISO CD 20854 Freight Container – Thermal containers – Safety standard for refrigerating systems using flammable refrigerants – Requirements for design and operation; and
- ISO/IEC Guide 51:2014 Safety aspects – Guidelines for their inclusion in standards

The TEAP Task Force Report on Safety Standards recognizes that the standards development process by each party to the Montreal Protocol will vary depending on national circumstances. Parties can directly adopt the ISO or IEC standards as it is or rely on a regional standards body to make modification on the ISO or IEC standard prior to adopting it locally. Countries can also make minor modification of the standard based on local conditions and domestic situations.

Any standard development, adoption or modification process is both a technical and political process. Interests from various stakeholders affected by specifications of the standards in development or review provides inputs to retain or block efforts to change the specification towards their own advantage and interest.

2

THE PHILIPPINE EXPERIENCE IN LOW GWP RACHP STANDARDS ADOPTION AND DEVELOPMENT

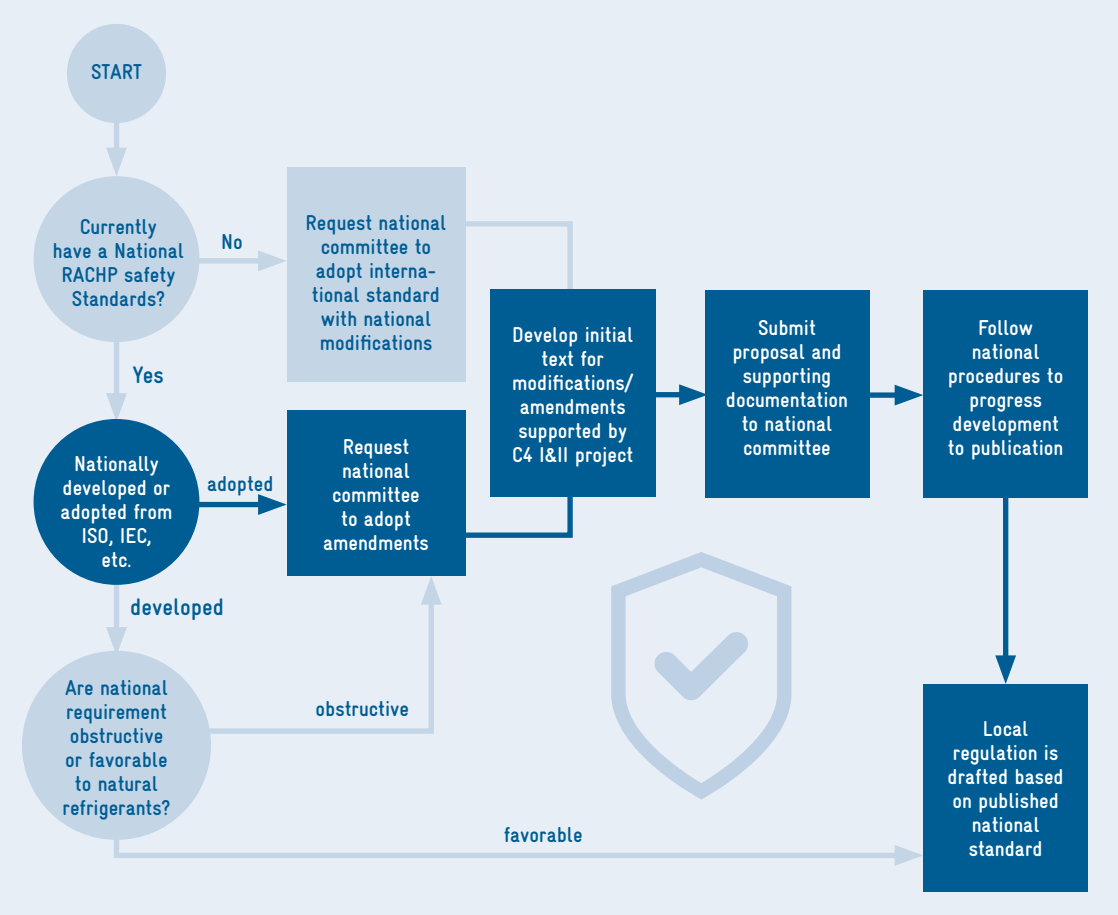
2 The Philippine Experience in Low GWP RACHP Standards Adoption and Development

OBJECTIVES OF THE STANDARDS ADOPTION AND DEVELOPMENT ACTIVITY

With technical support from the C4 I&II project, the standards development activity was initiated in consultation with the Philippine Ozone Desk, the national ozone unit (NOU) of the Philippines, which is seeking guidance on using specific ISO, IEC and other standards such as ASHRAE and ANSI in establishing a regulatory framework for the phase-down of HFCs. The ozone unit is under the jurisdiction of the Environmental Management Bureau (EMB) of the DENR which represents the Philippines as a party to the Montreal Protocol.

It is recognized that adopting, modifying or establishing standards, norms or codes is an effective mitigation strategy as part of the NDC. In order to provide a robust basis for the adoption of new and emerging technologies as part of the mitigation strategy, aspects related to its design, safety and environmental impacts must conform to accepted standards. Figure 1 provides a process flow on how countries can adopt international standards or develop its own safety standards. The Philippine process is highlighted in red.

Figure 1: Process Flow of Standards Adoption in the Philippines



Natural refrigerants such as ammonia and hydrocarbons are feasible replacement of HFC refrigerants considering its climate impacts and technical feasibility. However, a significant barrier towards its market introduction and mainstreaming has been related to its health and safety aspects. Natural refrigerants such as hydrocarbons (HC) and ammonia (NH_3) have known hazards related to its flammability and toxicity respectively. In the prior chapter, standards at the international level set by ISO and IEC are established to set control specification for its safe use and market introduction. The established controls that are defined in ISO and IEC standards will maximize not only its environmental benefits but also the energy performance of RAC systems. Conformity of RACHP to these global standards will ensure its safe market introduction and mainstreaming.

The Standards Adoption and Development for the Safe Use of Low GWP RACHP is a series of technical working group meetings supported by the C4 I&II project to adopt significant safety and environmental standards that will serve as a framework for the safe introduction of low GWP refrigerants and RACHP to the local markets.

The standards can serve as reference for regulation related to the various aspects of refrigeration and air conditioning in the Philippines through Monitoring, Verification and Enforcement (MVE) systems. The framework for implementation of activities was based on the recommendation of the TEAP Task Force Report on Safety Standards published by the Montreal Protocol.

PHILIPPINE NATIONAL STANDARDS BODY

The Bureau of Philippine Standards (BPS) of the Department of Trade and Industry (DTI) took the lead in the standards adoption process in line with its legal mandate on consumer protection and as the main body on standards of the Philippines. The DTI-BPS represents the Philippines in the World Trade Organization (WTO) and international standards body such as the ISO and IEC. The BPS is the main coordinating body of the ISO and IEC National Committees of the Philippines. Overall supervision of the process was undertaken by the Standards Development Division of DTI-BPS.

The BPS Technical Committee on Cooking, Heating and Household Appliances (BPS TC 23/30) was mobilized in the standards adoption and development process. The process allowed the initial linkages between the ozone unit and the national standards body which the Kigali amendments have recognized the need further institutional strengthening and capacity building.

In addition, significant stakeholders who may be affected by an eventual phase-down of HFC refrigerants in the RAC sector and those who can provide maximum contribution in the sustainable growth of the RAC sector in the Philippines were also invited to form the Ad Hoc Technical Working Group 5 on Refrigeration. BPS TC 23/30 was mobilized as the official national committee representing the Philippines to the IEC SC 61D and also part of IEC TC 61.

The activity supported the adoption of the following ISO standards as Philippine National Standards:

ISO 817 Refrigerants – Designation system and safety classification;
ISO 5149-1 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria;
ISO 5149-2 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation;
ISO 5149-3 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site; [3]
ISO 5149-4 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 4: Operation, maintenance, repair and recovery;

As a reference point, technical guidance was provided by the C4 I&II project given the updates present in the European Regional Standard EN 378 series which was updated in 2016 and other critical safety and environmental issues that needs to be addressed for the wider use of natural refrigerants.
During the adoption process, not all recommendations were considered due to several factors. A major reason is the direct adoption and prior publication of the IEC 60079 series of standards on explosive atmospheres. All standards within the series of IEC 60079 are published as PNS. Additional work was done in reviewing the validity and applicability of IEC 60079 specifications as referenced by ISO 5149 or ISO 817 during the TWG and TC deliberation processes. It is also significant to note that IEC product standards such as IEC 60335-2-40 and IEC 60335-2-24 are adopted as PNS and are used as basis for new regulations.

PNS IEC 60079 SERIES ON EXPLOSIVE ATMOSPHERES

IEC 60079 series of standards on explosive atmospheres were initially published as PNS prior to undertaking the standards development activity for ISO 5149 and ISO 817. The following IEC 60079 standards were initially adopted as PNS significant to the standards development activity:

IEC 60079-0 Equipment general requirements;
IEC 60079-7 Equipment protection by increased safety;
IEC 60079-10-1 Classification of areas – Explosive gas atmospheres;
IEC 60079-15 Equipment protection by type of protection;
IEC 60079-13 Equipment protection by pressurized room and artificial ventilation.

The adoption of the IEC ATEX standards used as normative reference in the ISO 5149 series of standards as PNS enables a robust regulatory framework for adopting specified criteria to be integrated in applicable national regulation. Specifications in the ATEX standards can allow the further use of natural refrigerants for extensive applications.

However, the context in which the IEC 60079 series of standards were adopted was to allow greater application of oil and gas products entering the Philippine market or produced by local refineries and gas plants. The initial objective was to allow greater application of petroleum and gas products such as hydrocarbons beyond its conventional use as fuel (DTI-BPS, 2018).

ESTABLISHMENT OF REGULAR CONSULTATIONS ON SAFETY STANDARDS

The adoption and development by the Philippines of standards in the Refrigeration, Air Conditioning and Heat Pump (RACHP) sector is an opportunity for the country to reduce its GHG emissions and pursue a path towards low carbon development. Decision XVIII/4 of the Kigali amendments recommends the liaison or coordination with entities concerned with the development of safety standards on the use of low GWP alternatives particularly in the refrigeration and air conditioning sector in a country such as the Philippines, to safely introduce RACHP systems using natural refrigerants.

It has to be considered that both the development and adoption of standards, is a complex and difficult process that requires stakeholder consensus and eventual agreement among those who can be affected by changes in specification. Standards once developed and published at the national level remains voluntary, unless the regulatory agency with the specific mandate agrees to establish a policy or regulation towards mandatory conformity to the standard. In addition, a conformity assessment infrastructure is also essential in the monitoring, verification and enforcement (MVE) of standard specifications for industry and the general public to ensure adequate control of health and safety hazards and eventual reduction in GHG emissions.

Regulating the multiple aspects of refrigeration and air conditioning in the Philippines involves the mandates of various government regulatory agencies. Currently, the regulation of various aspects of relevant standards identified by the TEAP Safety Task Force on Low GWP RACHP is not limited to the standards body or the national ozone unit. Coordination among the broader range of policy and enforcement agencies working on various aspects and components of RACHP and refrigerants is still necessary.

Citing the horizontal safety standards of ISO 817 and the ISO 5149 series, the table below provides an overview of the various government regulatory agencies that can have a mandate over specific requirements and specifications of the standard.

In addition to the CCC, the DENR, the DOE and DTI, other ministries also need to be informed of the adoption of these standards as PNS such as the Bureau of Fire Protection (BFP) of the Department of Interior and Local Government (DILG), several bureaus of the Department of Public Works and Highways (DPWH), the Occupational Safety and Health Center (OSHC) under the Department of Labor and Employment and the Technical Education and Skills Development Authority (TESDA).

Table 4 provides an overview of the possible regulatory agencies, but the list is not exhaustive, given continuous updates in legislations, new policy and regulatory entities can be established that may affect the compliance of RACHP systems to safety, environmental or performance requirements.

Table 4: Regulatory agencies that have a mandate or mandates over specific requirements and specification specified in the ISO 817 and ISO 5149 series of standards

Standard	Regulatory Agency
ISO 817	• Philippine Ozone Desk, Environmental Management Bureau, DENR • Bureau of Philippine Standards, DTI • Occupational Health and Safety Center, DOLE • Disease Prevention and Control Bureau, DOH • Oil Industry Management Bureau, DOE
ISO 5149-1	• Bureau of Fire Protection, DILG • Bureau of Design, DPWH • Occupational Health and Safety Center, DOLE
ISO 5149-2	• Bureau of Philippine Standards, DTI • Metals Industry Research and Development Center, DOST • Bureau of Fire, DILG • Bureau of Design, DPWH • Occupational Health and Safety Center, DOLE
ISO 5149-3	• Technical Education and Skills Development Authority • Environmental Management Bureau, DENR • Fair Trade Enforcement Bureau, DTI • Technical Services, DPWH • Occupational Safety and Health Center, DOLE
ISO 5149-4	• Environmental Management Bureau, DENR • Fair Trade Enforcement Bureau, DTI • Technical Education and Skills Development Authority • Technical Services, DPWH • Occupational Safety and Health Center, DOLE

AD HOC TECHNICAL WORKING GROUP 5 ON REFRIGERATION

3 Ad Hoc Technical Working Group 5 on Refrigeration

An Ad Hoc Technical Working Group 5 on Refrigeration was established by the BPS TC 23/30 or the Technical Committee on Household Cooking and Heating Appliances as a special Technical Working Group (TWG) focusing the adoption of the four (4) ISO 5149 and ISO 817 standards.

The process was supervised by the DTI-BPS which provided guidelines and control over the discussions and proposals for modification. Any disagreements raised during the Ad Hoc TWG were raised to the BPS TC 23/30 for final decision. Technical personnel from the DTI-BPS documents and moderates the process.

Once the draft is agreed by members of the Ad Hoc TWG members, the draft standard is raised as an agenda item in the TC which further deliberate specific technical details proposed in the TWG before it is recommended for publication as a PNS.

ISO 817:2014 – REFRIGERANTS – CLASSIFICATION AND SAFETY DESIGNATION

In preparation for a comprehensive review of the sector the first step was to adopt ISO 817:2014 which is the version that specifies the safety designations. The standard is not a RACHP standard but a standard on refrigerants for various cooling applications.

Table 5: Toxicity and Flammability Matrix for Designation of Refrigerant Class

Class	Lower Toxicity	Higher Toxicity
No flame propagation	A1	A1
Lower flammability	A2L	A2L
Flammable	A2	A2
Higher flammable	A3	A3

ISO 817:2014 is a horizontal safety standard that can be applied to RAC subsectors. It provides an unambiguous system for assigning designations to refrigerants. It establishes a system for assigning a safety classification of refrigerants based on toxicity and flammability data and provides a means of determining the acceptable concentration limits. Tables listing the refrigerant designations, safety classifications and the refrigerant concentration limits are included based on data made available ISO 817 classifies refrigerants as either A which is low toxicity or B higher toxicity. Refrigerants are also given a number from 1 to 3 to determine its flammability. The Toxicity and Flammability Matrix for Designation of Refrigerant Safety Class is specified in Table 5.

The concept of Acute Toxicity Exposure Limits (ATEL) for toxicity, Lower Flammability Limits (LFL) and Refrigerant Concentration Limits (RCL) was defined in the standard.

On 18 August 2017, ISO 817:2014 was directly adopted as a Philippine National Standard by Ad Hoc Technical Working Group 5 on Refrigeration at Subic Bay Metropolitan Authority, Zambales, Philippines. No concerns were noted on the adoption of the ISO 817:2014 standard as a PNS. Direct adoption was agreed by the Ad Hoc TWG and the TC 23/30.

ISO 5149-1:2014 COR. 1:2015 – REFRIGERATING SYSTEMS AND HEAT PUMPS – SAFETY AND ENVIRONMENTAL REQUIREMENTS – PART 1: DEFINITIONS, CLASSIFICATION AND SELECTION CRITERIA

The value of product safety standards was highlighted in the adoption of ISO 5149-1 including its 2015 corrigenda. Part 1 was initially reviewed on 17 August 2017 in Subic, Zambales while its 2015 corrigenda was discussed and reviewed on 27 October in Sta. Rosa City, Laguna.

It was noted that members of BPS TC 23/30 as voting of members of IEC SC 61D have a specific bias towards unitary air conditioners for household use and reference to specifications of IEC 60335-2-40 was constantly put forward as part of the technical discussions. Multiple emphasis was made that ISO 5149 is a horizontal safety standard and that IEC 60035-2-40 as a product safety standard and is only a subset of ISO 5149.

Proposal for minor modifications on Clause 6.2 was contested, and new wording were drafted to reach a common understanding that product safety standards which have specific guidelines on charge size calculations and limitations will remain as the final specification for the specific product in question.

Typographical errors were noted in the ISO standards such as the conflicting acronyms used for both Ozone Depletion Potential and Oxygen Deprivation Potential which are both referred to as ODP.

In the 2015 corrigenda of the standard, the concept of Quantity Limit for Minimum Ventilation (QLMV) and Quantity Limit with Absent Ventilation (QLAV) was discussed. The TWG acknowledged weakness of technician training and the introduction of QLMV and QLAV estimation for specific occupancies still needs to be studied further. Capacity building related to these concepts can still be provided by the C4 I&II project as part of its work plan.

ISO 5149-2:2014 – REFRIGERATING SYSTEMS AND HEAT PUMPS – SAFETY AND ENVIRONMENTAL REQUIREMENTS – PART 2: DESIGN

Part 2 of ISO 5149 was the last standard that was put on review and reading was conducted on 18 December 2017 at the Valero Grand Suites in Makati.

Highlights of the meeting include:

The extensive reference to IEC standards on explosive atmospheres have been noted. The members of the BPS TC 23/30 have noted that the IEC 60079 series of standards is already locally adopted as PNS and are valid normative references for the ISO 5149 series of standards;
There is currently a lack of full manufacturing capability in the Philippines related to refrigeration and air conditioning parts and components. It was discussed that most refrigeration systems ranging from small self-contained appliances to large HVAC systems have components that are imported. Local manufacturing has been limited to product and system assembly;
Local manufacturers pointed out that their individual quality management systems ensure conformity to ISO/IEC specifications of parts and components through vendor accreditation, incoming parts inspection, in-process quality assurance and outgoing quality controls.

ISO 5149-3:2014 – REFRIGERATING SYSTEMS AND HEAT PUMPS – SAFETY AND ENVIRONMENTAL REQUIREMENTS – PART 3: INSTALLATION

The third part of the standard was put on review on 27 October 2017 at the Seda Nuvali Hotel, Sta. Rosa, Laguna. The TWG was attended by RACTAP members who were formally involved in the writing and publication of the latest revision of the RAC Code of Practice published by the DENR-EMB.

The latest version of the RAC Code of Practice was published in April 2013, a year prior to the global publication of the ISO 5149 series of standard. It was noted that there is an urgent need to revise the RAC Code of Practice in alignment with the standard.

The Building Code and the Fire Code of the Philippines were identified as possible policy instruments that can ensure conformity during the installation process. However, some rules may need to be revised and updated to ensure conformity with the standards. The role of the Technical Education and Skills Development Authority (TESDA) was also highlighted in ensuring that the RAC technician certification process will eventually conform with the specifications of ISO 5149-3.

ISO 5149-4:2014 – REFRIGERATING SYSTEMS AND HEAT PUMPS – SAFETY AND ENVIRONMENTAL REQUIREMENTS – PART 4: OPERATION, MAINTENANCE, REPAIR AND RECOVERY

The fourth part of the standard was read and reviewed on 21 November 2017 at the City Grand Garden Hotel in Makati City. The fourth part of the standard was evaluated as the most significant for the Philippines for a number of reasons which include: existence of RACHP installations already operational; lack of regulatory framework to implement standards conformity for operational facilities; some of the standard clauses are supposed to be implemented by the national ozone unit through the issuance of DENR Administrative Order No. 25 Series 2013 (DENR DAO 2013-25) Revised Regulation on the Chemical Control Order for Ozone Depleting Substances.

It was noted during the TWG meeting that the development of the DENR DAO 2013-25 was not aligned to the standards but relied solely on the previous guidelines provided by the Montreal Protocol to comply with the phase-out schedule of CFC and HCFC. DAO 2013-25 does not cover HFC as controlled substances. ISO 5149-4 recommends applying the standard specification for all fluorinated refrigerants in RACHP systems which is significant in the HFC phase-down under the Kigali amendments of the Montreal Protocol.

National regulations based on adopted global RAC safety standards

A standard once adopted as PNS and published remains voluntary. But once a regulation refers to a standard, the standard becomes a mandatory requirement. For RAC companies, this becomes a compliance obligation as part of their quality system to ensure that products and services supplied in the market are compliant.

Conformity assessment to the standard must be undertaken. Conformity assessment is defined as all the activities completed to determine if a product or service meets specific requirements, usually contained in a standard . This can be performed through testing, inspection, certification, peer review and other globally accepted techniques using best practice guidance from the ISO and IEC.

In the Philippines, a number of regulations have referred to standards as a basis for regulation and a means to determine conformity has been established including testing, inspection and certification related to specific aspects needed to ensure the entry of low GWP refrigerant alternatives to the Philippine market. These include product safety regulations, technician qualification regulation, energy efficiency and licensing systems under the national ozone unit.

2 https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/casco_guide.pdf

CONFORMITY TO RAC APPLIANCE SAFETY STANDARDS

Refrigerators and room air conditioners are covered by mandatory product certification. These household appliances are regulated through DTI Administrative Order No. 01 Series of 2022 which is the New Technical Regulation Concerning the Mandator Product Certification of Energy Consuming Products. The regulation refers to IEC 60335-2-24 for refrigerators and ice-making appliances and IEC 60335-2-40 for air conditioners and dehumidifiers as criteria for product safety prior to market introduction. Conformity assessment of products is undertaken through inspection, audit and sampling of products for mandatory safety tests based on PNS IEC 60335-1, -2-24 and -2-40 [4].

In consultation with stakeholders the regulated air conditioners below 50,000 KJ/hr with a rated voltage not more than 250 V for single phase and 600 V for all other types. These covers both self-contained window-type units and split-type units (wall-mounted, floor-standing, cassette-type and ceiling suspended). While refrigerating appliances with storage capacity of less than 600 liters with rated voltage up to 250 V are covered.

Local manufacturers of these appliances are mandated to comply to the Philippine Standard (PS) Safety and Quality Certification Mark Licensing Scheme while importers adhere to the Import Commodity Clearance (ICC) Certification Mark Scheme. Figure 2 provides the product marking of conforming products under the technical regulation.

The conformity assessment process has already allowed the issuance of PS Marks and ICC Marks for Refrigerators, Freezers and Ice Makers using R600a as refrigerant as specified in the standard. Following the same conformity assessment process, air conditioners using R290 as refrigerant can be certified as intrinsically safe prior to its entry to the Philippine market as long as it is with the limits of the standard specification. However, RAC appliances containing ODS refrigerant is already banned for use for new products as of 2021.

Figure 2: Marking in a RAC Appliance issued by DTI-BPS through a Product Certification Scheme

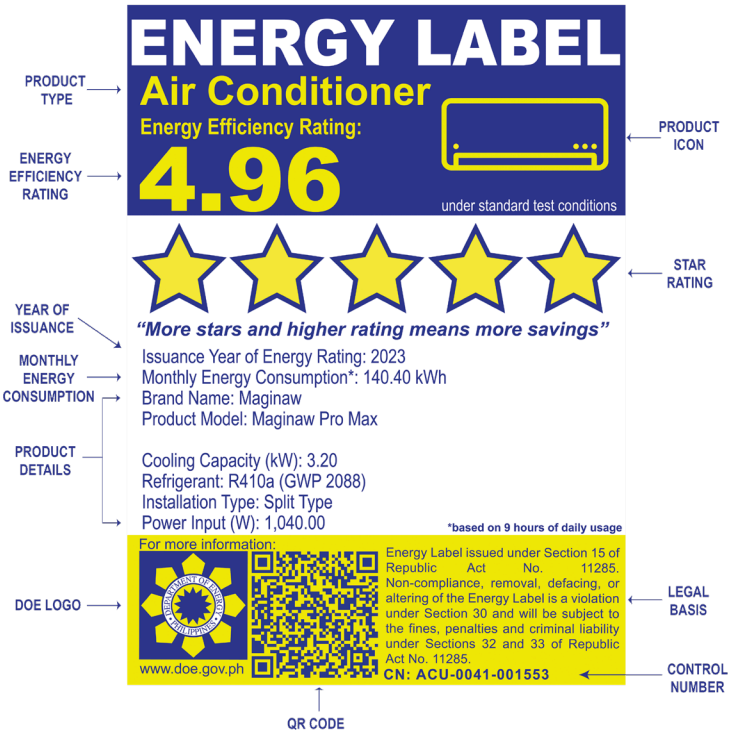
CONFORMITY TO RAC APPLIANCE ENERGY PERFORMANCE STANDARDS

The Philippines utilizes adopted international standards in setting the performance requirements of RAC appliances within the same scope as product safety standards. Though not covered in the list of standards recommended, as part of the Philippine Energy Label Program (PELP), the Philippines has adopted ISO 5151 and ISO 16358-1 for the energy performance testing of room air conditioners with cooling capacity below 14 KW and IEC 62552 parts 1, 2 and 3 for household refrigerating appliances that are below 600 L (DTI, 2022).

The results of performance tests based on these standards are translated into the energy performance rating of the regulated product. The product is evaluated based on the set Minimum Energy Performance Standard (MEPS) for room air conditioners and refrigerators in order to allow entry into the Philippine market regardless of type of the flammability of the refrigerant. However, RAC appliances containing ODS refrigerant is already banned for use for new products as of 2021.

The energy label for an air conditioner is seen in Figure 3[3].

Figure 3: New Philippine Energy Label



BUILDING DESIGN, INSTALLATION AND OPERATIONS OF RAC SYSTEMS

In 2020, the DOE updated the Guidelines on the Energy Conserving Design of Buildings[4]. It was acknowledged that cooling is a significant contributor to the energy demand of buildings and minimum performance standards were set for all air-conditioned buildings with at least 112.5 kVA of designed total connected electrical loads or has at least 10,000 square meters (m2) Total Gross Floor Area (TGFA) [5]

PNS ISO 5149 was utilized as one of the reference standards in setting minimum compliance requirements in the development of the guidelines particularly related to safety related to the use of HVAC and Refrigerating systems. Though specified as a guideline, this is still considered an energy regulation in the Philippines through the issuance of DOE Department Circular 2020-12-0026[5] [6].

The guideline did not set any restriction on the use of flammable or other specific types of refrigerants allowing the wider use of natural refrigerants in buildings. The specification set in the guidelines are in the process of integration in the Philippine Green Building Code.

3 The New Philippine Energy Label | Department of Energy Philippines (doe.gov.ph)
4 dc2020-12-0026 guidelines.PDF (doe.gov.ph)
5 dc2020-12-0026.PDF (doe.gov.ph)

COMPETENCE OF PERSONS WORKING ON RACHP SYSTEMS

For personnel working on RACHP Systems, a National Certificate (NC) issued by TESDA is evidence of competence that the worker has undergone training, assessment and certificate under based on the Technical and Vocational Education and Training (TVET) system.

In 2020, the RACHP training regulations were updated and expanded which utilized PNS ISO 817 and PNS ISO 5149. The annexes of the IEC standards which specified servicing practices for flammable refrigerants were integrated in the local training regulations.

For succeeding updates in the training regulations, the GIZ Fit for Green Cooling Modules will be used in agreement with TESDA. GIZ Fit for Green Cooling is a qualification and certification scheme focusing on the training infrastructure required to train RAC technicians on the handling of natural refrigerants. It is designed according to international standards but can be adapted to national contexts and integrated in country-specific structures.

In 2018, after the standards were the basis for a demonstration training on R290 implemented through the C4 I&II Project. Figure 4 demonstrates proper brazing in conformity with international standards.

Figure 4: R290 Demonstration Training

STANDARD REFERENCE IN HFC CONTROL REGULATION

In preparation for the ratification by the Philippines of the Kigali Amendments to Montreal Protocol, a Chemical Control Order (CCO) on HFCs was drafted to address the phase-down schedule set and other requirements set by the international agreement as part of its compliance mechanism[6].

The NOU was able to refer to PNS ISO 817 on the toxicity requirements set by international standards for alternatives and potential replacements for HFCs and PNS ISO 5149-4 for the recovery of refrigerants from existing systems.

6 https://pod.emb.gov.ph/wp-content/uploads/2021/10/DAO_2021-31_Chemical-Control-Order-for-HFCs.pdf

4

CONCLUSIONS

4 Conclusions

The Philippines has adopted ISO 817 and the ISO 5149 series of standards with minor modifications as a PNS. However, the challenge lies in ensuring conformity to the standards through an adequate regulatory infrastructure based on the mandates of government regulatory agencies.

The need to adopt ISO 817 and ISO 5149 was brought about by the anticipated compliance to the Kigali Amendments to the Montreal Protocol. The Philippines ratified the agreement, but the standards development activity has brought together extensive information about the local stakeholders of RACHP.

6 Latest amendment or corrigenda may not be included in the list

5

REFERENCES

5 References

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[2] UNEP TEAP, "Decision XXVIII/4 Task Force Report Safety Standards for Flammable Low Global Warming Potential Refrigerants," UNEP, Nairobi, 2017.

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[4] Department of Trade and Industry, "Department Administrative Order 2022-01 The New Technical Regulation Concerning the Mandatory Product Certification of Energy Consuming Products," [Online]. Available: https://www.dti.gov.ph/resources/laws-and-policies/department-administrative-orders/page/2

[5] Department of Energy, "Guidelines on Energy Conserving Design of Buildings - 2020 Edition," 2020. [Online]. Available: https://www.doe.gov.ph/sites/default/files/pdf/issuances/dc2020-12-0026%20guidelines.PDF?withshield=1

[6] Department of Energy, "Department Circular 2020-12-0026 Adoption of the Guidelines on Energy Conserving Design of Building," 22 December 2020. [Online]. Available: https://www.doe.gov.ph/sites/default/files/pdf/issuances/dc2020-12-0026.PDF?withshield=1

Notes

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