GREEN CHOICE PHILIPPINES

NELP-GCP 20240038
PVC PIPES AND FITTINGS

1. ENVIRONMENTAL SCENARIO

PVC or polyvinyl chloride, also known as polyvinyl or vinyl, is the world's third most widely produced synthetic polymer after polyethylene and propylene. (Putrawan, et. al., 2022) It comes in two basic forms — rigid or unplasticized, abbreviated to PVC-U, and flexible. In particular, PVC-U has a wide variety of uses in urban and rural water supply schemes, spray irrigation, deep tube wells and land drainage schemes. Due to its corrosion- and abrasion-resistance, lack of taste and odor, and smooth interior surface, PVC is suitable for drinking water supply piping and waste water piping (PVC4Pipes, 2021). These pipes are not damaged by special equipment used for clearing blocked pipes and are resistant to damage from sharp-edged backfill materials.

PVC pipes can be used above or below ground for transport of various substances but are most commonly used for transporting water (New England Institute of Technology [NEIT], 2021). With a high strength to weight ratio, manufacturers can use less material to achieve the same strength as other plastic and conventional pipe materials. Additionally, the material allows long sections of pipes to be made, minimizing the number of joints and subsequently reducing assembly costs. PVC pipes also have long-term durability in comparison to alternative piping materials, making PVC cost-effective and low maintenance.

In the Philippines, especially the highly-urbanized areas, continue to suffer from poor air quality. While the country struggles to implement laws and regulations that cater to a better living environment for its citizens, critical gas emissions continue to soar even after the Clean Air Act of 1999 was enacted. Risks of exposure to hazardous chemicals such as lead and mercury are especially high as these areas are densely populated, with a huge volume of transient workers on a daily basis.

The regulated use of heavy metals based on the national standards and adoption of clean manufacturing technologies must be taken into consideration in the development of ecolabelling criteria to combat the impacts in processing the PVC pipes and fittings. Additionally, options for end-of-life process of PVC pipes are a concern, considering the fact that landfilling remains the primary option for firms in the Philippines. It may be favorable to have market players in the PVC industry to set a recycling scheme for the products that they put out to the market, and ensure that they take the most cost-efficient and environmentally-preferable program and incorporate it into their process.

This product criteria will be limited to rigid or unplasticized PVC pipes and fittings. More commonly known as PVC-Us, these pipes do not use plasticizers such as phthalates. Plasticizers are additives that increase the plasticity or decrease the viscosity of a material (Von Moody, 2004). Along with the product life cycle, this criteria also considers the product lifetime extension of PVC pipes and fittings.

2. DEFINITION OF TERMS

Abbreviations	Definition
DENR	Department of Environmental and Natural Resources
DTI-BPS	Department of Trade and Industry – Bureau of Philippine Standards
EDC	Ethyl dichloride; Chlorinated carbons used to make VCM
PVC	Polyvinyl chloride; Produced from polymerization of VCM.
PVC-U	Unplasticized polyvinyl chloride; Thermoplastic material derived from common salt and fossil fuels
PNS	Philippine National Standards Contains list of standards for all products in the Philippines aimed to standardize activities and ensure manufacture, production, and distribution of quality products for the protection of the consumers
VCM	Vinyl chloride monomer; Also known as vinyl chloride or chloroethene. Main raw material for the production of PVC. A colorless, flammable gas in its natural state.

3. SCOPE

These criteria apply to unplasticized PVC or PVC-U pipes and fittings for potable, sewer, drain, waste or vent, drainage, conduit or ducting, and agriculture or irrigation applications manufactured from ethylene-based PVC resin used in exterior, interior, and underground construction systems. This means that no plasticizers such as phthalates are used during production.

4. GREEN CHOICE PHILIPPINES REQUIREMENTS

To carry the Green Choice Philippines Seal of Approval, a product must meet the following requirements.

4.1 Quality Criteria

CRITERIA	VALIDATION METHOD
4.1.1 Product Quality The product should conform to the mandatory DTI-BPS standards on PVC pipes and fittings wherever applicable. a. PNS 65 Unplasticized polyvinyl chloride (PVC-U) pipes for potable water supply — Specification b. PNS 14 Unplasticized polyvinyl chloride (PVC-U) electrical conduit — Specification c. PNS 1950 Plastic piping systems for soil and waste discharge (low and high temperature) inside buildings — Unplasticized polyvinyl chloride (PVC-U)	The applicant shall submit proof of compliance to the Philippine Standards or Import Commodity Clearance (ICC) certification schemes.
4.1.2 Marking and Labelling Requirements The product shall be marked with an appropriate plastic resin identification code, “uPVC”, or “PVC-U”.	The applicant shall provide a product sample or prototype of its existing for visual inspection of actual marking or labels.
4.1.3 Additional Labelling Requirements Labels, markings, or stickers of the resin identification code or “uPVC” marking shall be made of the same material as the parts to which they are affixed. Any other marking and labelling shall not prohibit recycling. Labels and markings shall be visible.	The applicant shall provide a product sample or prototype of its existing for visual inspection of actual marking or labels.

4.2 Environmental and Social Criteria

CRITERIA	VALIDATION METHOD
4.2.1. Environmental Regulations The production, transport and disposal processes of the product shall meet applicable environmental requirements.	The applicant shall submit the updated applicable documents/proof listed: a. Republic Act No. 9275: Philippine Clean Water Act i. Discharge Permit ii. LLDA permit (if applicable) b. Republic Act No. 8749: Philippine Clean Air Act of 1999 i. Authority to Construct Air Pollution Sources ii. Permit-to-Operate (PTO) for all air pollution sources c. Republic Act No. 9003: Ecological Solid Waste Management Act of 2000 i. Waste Management Plan or System d. Republic Act No. 6969: Toxic Substances & Hazardous & Nuclear Wastes Content i. Record on safety data and the pre-manufacture and pre-importation requirements. ii. Hazardous Waste Generator Registration Certificate iii. TSD Registration Certificate iv. HW Transporter Registration Certificate e. Presidential Decree No. 1586: Environmental Impact Statement System i. Environmental Compliance Certificate (ECC) / Certificate of Non-Coverage (CNC) ii. Compliance Monitoring Report (CMR) f. DAO 2014-02 i. Self-Monitoring Report (SMR) ii. Pollution Control Officer Accreditation Certificate g. Other equivalent international regulations
4.2.2 Source of VCM VCM should be manufactured from a non-mercury and non-acetylene process.	The applicant shall submit a declaration letter from the supplier of VCM with supporting documents (e.g. test results) stating that the manufacturing process of VCM meets such requirements.

CRITERIA	VALIDATION METHOD
4.2.3 Hazardous Substances The product shall not exceed the maximum allowable level, in mg/L, for the following substances: a. Arsenic b. Cadmium c. Chromium d. Lead e. Mercury The maximum allowable level for the hazardous substances is specified in Annex 1	The applicant shall submit a portfolio and statement in writing signed by the Chief Executive Officer or counterpart of the company and shall be accompanied by the relevant documentation, including relevant laboratory test results and/or safety data sheet (SDS). For potable water supply, certification can be based on the PNS 65:2018.
4.2.4 Manual for Installation, Use, Maintenance and Disposal The product shall have an instruction manual relating to the proper installation, use, maintenance, disassembly, disposal and recycling (if applicable) process that serves as a guide for the builders.	The applicant shall submit an instruction manual containing the installation, use, maintenance, disassembly, and recommended recycling and disposal processes.
4.2.5 Take Back System The producer shall establish the scope of the take back system and the action plan for the recovered products.	The applicant shall submit the take back system action plan.
4.2.6 Label and Consumer Education As vinyl chloride monomer (VCM) is the primary raw material of the product, a label stating “WARNING: DO NOT BURN ON DISPOSAL” shall be included; or The producer shall formulate and provide IEC strategy and materials explaining that the burning of the product during disposal causes health hazards.	The applicant shall submit evidence of their compliance to the specified requirements.
4.2.7 Occupational Safety and HealthStandards (OSHS) The producer shall institute OSH measures in the manufacturing of the product.	The applicant shall submit proof of establishment registration under Rule 1020 of OSHS from the Department of Labor and Employment and the OSH program.

5. PERIOD OF VALIDITY

The product criteria is valid for three (3) years from the date of its approval unless otherwise revised or withdrawn by the NELP-GCP Board, if proven necessary at any period of time.

6. TECHNICAL COMMITTEE MEMBERS

Institution	Member and Alternative
DTI-BPS	Engr. Czerr Cruz
DOST-ITDI	Dr. Marissa Paglicawan Dr. Persia Ada N. de Yro
UP-Diliman	Dr. Terrence Tumolva
PHILGBC	Arch. Christopher de la Cruz Mr. John Reniel Englis
NAMPAP	Engr. Joenel Gallago
PRII	Ms. Marlene Arcenas Ms. Mary Rose Castro Ms. Kristel Franco

7. REFERENCES

ASEAN Vinyl Council. (2018). AVC Progress Report 2018. [PowerPoint Slides]. ASEAN Vinyl Council. Retrieved 2 May 2023, from http://aseanvinyl.com/wp-content/uploads/2018/09/AVC-Progress_Pipe-Perf-2018_15-21-Aug-2018-present-r1.pdf

DAO 2014-02. (2014, February). Department of Environment and Natural Resources -Environmental Management Bureau. https://ncr.emb.gov.ph/wp-content/uploads/2016/06/DAO-no.-2014-02.pdf

Department of Environment and Natural Resources [DENR]. (2021). 1,082 Solid Waste Management Plans Approved by NSWMC. [Online] Available: https://www.denr.gov.ph/index.php/news-events/press-releases/2681-1-082-solid-waste-management-plans-approved-by-nswmc

Department of Trade and Industry. Bureau of Philippine Standards. Who we are. [Online] Standards and Conformance Portal. Retrieved 19 April 2023, from https://bps.dti.gov.ph/about-us/about-the-bureau-of-philippine-standards-dti-bps

European Council of Vinyl Manufacturers. (2021). Vinyl Chloride Monomer (VCM) production. Retrieved 18 April 2023, from ECVM website: https://pvc.org/about-pvc/vinyl-chloride-monomer-vcm-production/

Everard, M. (2019). Twenty Years of the Polyvinyl Chloride Sustainability Challenges. Journal of Vinyl and Additive Technology. doi:10.1002/vnl.21754

Government Procurement Policy Board. List of Philippine National Standards (Construction Materials) for Mandatory Implementation. Retrieved 18 April 2023, from https://www.gppb.gov.ph/laws/laws/CPESGuidelines2011/Annex12.pdf

Green Building Council Australia. Literature Review and Best Practice Guidelines for the Life Cycle of PVC Building Products. Retrieved from https://www.gbca.org.au/uploads/156/2716/Literature%20Review%20and%20Best%20Practice%20Guidelines%20for%20the%20Life%20Cycle%20of%20PVC%20Building%20Products.pdf

Janajreh, I., Alshrah, M., Zamzam, S. (2015) Mechanical recycling of PVC plastic waste streams from cable industry: A case study, Sustainable Cities and Society, Volume 18, 2015, Pages 13-20, ISSN 2210-6707. https://doi.org/10.1016/j.scs.2015.05.003. Retrieved 19 April 2023 from https://www.sciencedirect.com/science/article/pii/S2210670715000530

Japan Environment Association. (2021). Certification Criteria Category B-1 PVC Pipes for Sewage or Vent. Eco Mark Product Category No. 138. Retrieved 22 May 2023, from https://www.ecomark.jp/nintei/index_en.html

New England Institute of Technology. (2021). The 5 Types of Plumbing Pipes. Retrieved 17 April 2023, from https://www.neit.edu/blog/the-5-types-of-plumbing-pipes

Presidential Decree No. 1586. (1978, June). Official Gazette. https://www.officialgazette.gov.ph/1978/06/11/presidential-decree-no-1586-s-1978/

Philippine National Standards (2019). PNS 14 Unplasticized polyvinyl chloride (PVC-U) electrical conduit — Specification

Philippine National Standards (2010). PNS 1950 Plastic piping systems for soil and waste discharge (low and high temperature) inside buildings — Unplasticized polyvinyl chloride (PVC-U)

Philippine National Standards (2018). PNS 65 Unplasticized polyvinyl chloride (PVC-U) pipes for potable water supply — Specification

Plastics Industry Pipe Association (PIPA) of Australia. PVC Guidelines, Verification Guidance for Best Environmental Practice PVC Pipe and Fittings. Retrieved from https://pipa.com.au/wp-content/uploads/2020/10/PIPA-POP106-Verification-Guidance-for-Best-Environmental-Practice-PVC-Pipe-and-Fittings-1.0.pdf

Plastic Pipe and Fittings Association. 2008/2009. PVC Piping Systems for Commercial and Industrial Applications: Design Guide [Online]. Available: https://www.ppfahome.org/resource/resmgr/pdf/PVC_Design_Guide_Approved.pdf

Putrawan, I., Indarto, A., Octavia, Y. (2022). Thermal stabilization of polyvinyl chloride by calcium and zinc carboxylates derived from byproduct of palm oil refining, Heliyon Volume 8, 2022, e10079, ISSN 24058440, https://doi.org/10.1016/j.heliyon.2022.e10079. Retrieved 18 April 2023, from https://www.cell.com/heliyon/pdf/S2405-8440(22)01367-6.pdf

PVC4Pipes. (2021). PVC pipe categories. Retrieved 17 April 2023, from PVC4Pipes website: https://pvc4pipes.com/pvc-pipes/pvc-pipe-categories/

Republic Act No. 4850 Section 4(d) Discharge permit. (1966, July). Laguna Lake Development Authority. https://llda.gov.ph/discharge-permit-dp-new/

Republic Act No. 9003. (2004, March). Official Gazette. https://lawphil.net/statutes/repacts/ra2001/ra_9003_2001.html

Republic Act No. 9275 Section 14 Discharge Permits, Article Two, Chapter 2. (2004, March). Official Gazette. https://lawphil.net/statutes/repacts/ra2004/ra_9275_2004.html

Republic Act No. 11058. (2019, November). Official Gazette. https://www.officialgazette.gov.ph/downloads/2018/12dec/20181206-IRR-RA-11058-RRD.pdf

Rule XIX. Permit Regulations of Implementing Rules and Regulations of R.A 8749-DAO-2000-81. (2000, November). DENR-EMB-Pollution Adjudication Board. https://pab.emb.gov.ph/wp-content/uploads/2017/07/RA-8749-IRR-DAO-2000-81.pdf

Section 4. Presidential Proclamation of Environmentally Critical Areas and Projects of PD 1586. (1978, June). DENR-Environmental Management Breau. https://emb.gov.ph/wp-content/uploads/2015/09/PD-1586.pdf

Section 10. Duties and Responsibilities of Accredited PCO of DAO-2014-02. (2014, February). DENR-Environmental Management Breau. https://ncr.emb.gov.ph/wp-content/uploads/2016/06/DAO-no.-2014-02.pdf

Section 12. Reporting of DAO-2014-02. (2014, February). DENR-Environmental Management Breau. https://ncr.emb.gov.ph/wp-content/uploads/2016/06/DAO-no.-2014-02.pdf

Section 38. Prescribed fees for Hazardous and nuclear wastes of Implementing Rules and Regulations of R.A. 6969. (1992, July). Philippine National Trade Repository. https://www.pntr.gov.ph/wp-content/uploads/2021/04/IRR-6969.pdf

Sustainable Solutions Corporation. (2017). 2017 Life Cycle Assessment (LCA) of PVC Water and Sewer Pipe and Comparative Sustainability Analysis of Pipe Materials. [Online] https://www.uni-bell.org/files/Reports/Life_Cycle_Assessment_of_PVC_Water_and_Sewer_Pipe_and_Comparative_Sustainability_Analysis_of_Pipe_Materials.pdf

Tamayao-Kieke, M., Gotera, K. Soriano, V., Chan, M., Mallari, A. (2020) Life Cycle Analysis of PVC Pipe and Fitting in the Philippines – Final Report. Accessed on 17 July 2023.

Thailand Environment Institute. (2015). Green Label Product Unplasticized Polyvinyl Chloride Pipes for Drinking Water. Retrieved 24 October 2023, from https://www.tei.or.th/greenlabel/en/download/TGL-103-15.pdf

Vinyl Chloride Monomer; SDS No. 75-01-4 [Online]. Shintech Louisiana, LLC. Houston, TX. January 8, 2016. https://www.shintech.com/UserFiles/files/Safety-Data-Vinyl-Chloride-Monomer.pdf (accessed 4/18/2023)

VinylPlus. (2017). PVC recycling technologies. Page 11 – 19. Retrieved 19 April 2023, from https://vinylplus.eu/wp-content/uploads/2017/02/VinylPlus_PVC_recycling_tech_20092017.pdf

Von Moody, Howard L. Needles, 10 - Polyvinyl Chloride Plastisol Coating, Editor(s): Von Moody, Howard L. Needles, In Plastics Design Library, Tufted Carpet, William Andrew Publishing, 2004, Pages 115-123, ISBN 9781884207990, https://doi.org/10.1016/B978-188420799-0.50011-7. Retrieved 17 April 2023, from https://www.sciencedirect.com/science/article/pii/B9781884207990500117

Vynova Group. Bio-circular PVC. Retrieved 2 May 2023, from https://www.vynova-group.com/bio-circular-pvc

Westlake Vinnolit. Vinnolit GreenVin® bio-attributed PVC. Retrieved 2 May 2023, from https://www.westlakevinnolit.com/en/greenvin-pvc-bio-attributed-en/

Annex 1. Maximum Allowable Level for Hazardous Substances

Substance	Maximum Allowable Level, mg/L
Arsenic	0.01
Cadmium	0.003
Chromium	0.05
Lead	0.01
Mercury	0.001

Adopted from PNS 65:2018 Unplasticized Poly(vinyl chloride) (PVC-U) Pipes for Potable Water Supply - Specification