Part B: Product group definition | Combat Vehicles | Part B #26-004

This Part B conforms to the ACLCA PCR Open Standard version 1.0 (May 2022) at the following level:
☐ 1 Transparency ☒ 2 Procurement ☐ 3 Data source

Initiated by	Government of Canada, Public Services and Procurement Canada (https://www.canada.ca/en/public-services-procurement.html); Department of National Defence (https://www.canada.ca/en/department-national-defence/corporate/organizational-structure/assistant-deputy-minister-materiel.html)		
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Public notices of development/ outreach	• Public notice on the Sustainable Minds website announcing the update to the PCR on September 26, 2025: http://www.sustainableminds.com/transparency-report-program/part-b • Email announcement on September 26, 2025 and October 3, 2025 to mailing lists of LCA professionals and combat vehicle manufacturers and component suppliers requesting participation on the PCR committee. • Email announcement on July 8, 2026 to the same mailing lists requesting public comment.		
Non-participating parties	All interested parties who requested participation were invited to join the working group.		
New Part B?	Yes	**Part B version number**	1.0
Publication date	August 27, 2026		
Validity period	08/27/2026 – 08/26/2031		
Expected renewal schedule	Sustainable Minds intends to notify the working group and post update/renewal information on its website approximately four months prior to expiration to determine update, extension, or expiration options for this Part B.		

1. Product group

Name	Combat vehicles
Description	A combat vehicle can be broadly categorized as a vehicle that contains an armoured hull in its base platform. Combat vehicles engage directly with the enemy. They fight and typically employ direct fire weapons and manoeuvre. They include armour, infantry and direct fire units. They can also provide fire support, operational assistance and enablers to combat elements through designated command and control and fire support relationships. Each vehicle is structured around a base platform, which provides the core structural and functional characteristics, including the hull, drivetrain, crew cabin, mobility, communications, navigation, and basic protection. Combat vehicles may be outfitted with a variety of additional systems depending on their specific operational role. Examples of additional systems include weaponry, sensors, engineering tools, or medical equipment.
Exclusions	This PCR does not support: • Standalone additional systems (i.e., without the vehicle base platform included) • Unarmoured vehicles (commonly referred to as B-fleet vehicles)

	• Government-furnished materials (i.e., systems that may be attached to a vehicle but not made or purchased by the manufacturer of the vehicle)
Geographic representativeness	Products sold or maintained primarily in North America and used globally
Product-specific terms	This PCR uses terms aligned with the Government of Canada and Canada Department of National Defence. • Armour – Protective material, such as steel, composite, or transparent ballistic layers, integrated into or applied to a vehicle to resist ballistic, blast, and fragment threats and protect occupants and critical systems.[1] • Direct fire – Fire delivered at a target that is visible to the firer and engaged using line-of-sight aiming.[2] • Base platform – The fundamental core components of a combat vehicle, providing structural and functional characteristics. The base platform includes the hull, drivetrain, powertrain, crew cabin, mobility, basic communications, navigation, and basic protection. • Additional system – Supplemental functional equipment added to the base platform of a combat vehicle. Examples of additional systems include weaponry, sensors, engineering tools, or medical equipment. • Infantry – Primary combat soldiers responsible for closing with and destroying the enemy.[3] • Main Battle Tank (MBT) – A heavily armoured, tracked combat vehicle designed to serve as the primary direct-fire weapon system in combined arms warfare, integrating high-caliber cannon armament, advanced fire control systems, and substantial protection to engage enemy armoured forces and fortified positions. • Tactical Armoured Patrol Vehicle (TAPV) – A lightly to moderately armoured, wheeled military vehicle designed for reconnaissance, patrol, and security missions, emphasizing crew survivability against small arms fire, mines, and improvised explosive devices (IEDs), while maintaining high mobility on roads and in semi-permissive environments. • Light Armoured Vehicle (LAV) – A wheeled armoured fighting vehicle characterized by moderate protection and high operational mobility, designed to transport infantry, conduct reconnaissance, and provide fire support in expeditionary or rapid-deployment operations. • Armoured Combat Support Vehicle (ACSV) – An armoured military vehicle designed to provide direct support to combat operations, including engineering, recovery, medical evacuation, command and control, or logistics functions, while offering protection comparable to frontline combat vehicles operating in the same threat environment. • Tier 1 Supplier – A company that supplies products, components, or services directly to an original equipment manufacturer (OEM) and is contractually responsible for delivering finished or near-finished systems that meet the OEM's technical, quality, and delivery requirements. • Controlled equipment – Military or dual-use material whose possession, transfer, use, or disposition is subject to legal, regulatory, or policy restrictions imposed by a national authority or international regime due to its tactical capability, sensitivity, security classification, or potential for misuse, and therefore require formal accountability and control throughout their life cycle. • Special handling – A set of mandatory procedures, controls, and authorizations applied to controlled equipment at end of life to ensure its secure decommissioning, demilitarization, disposal, or transfer, in accordance with security policy, national regulations, and applicable export controls.

2. Program operator responsibilities

Existing PCRs, EPDs, or LCAs	• This Part B shall be used in conjunction with Sustainable Minds Part A: LCA calculation rules and report requirements (version 4.0). • Relevant PCRs: o International EPD System. PCR for Industrial Trucks. Version 1.0.0. 2026:01. February 17, 2026. https://environdec.com/pcr-library/PCR%202026:01%20v1.0.0 o International EPD System. PCR for Passenger Cars. Version 1.0.2. 2024:02. August 9, 2024. https://environdec.com/pcr-library/pcr_30d0eef5-9d45-4641-6e9d-08da5dd0027d

[1] North Atlantic Treaty Organization Standardization Office. Protection levels for occupants of armoured vehicles (Standard No. STANAG 4569, Edition 4 / AEP-55, Edition D).
[2] North Atlantic Treaty Organization Standardization Office. Glossary of Terms and Definitions (AAP-06, Edition 2019.
[3] Government of Canada. Careers. Infanteer. https://forces.ca/en/career/infanteer/

	• Underlying LCA: LCA for Armoured Combat Support Vehicle, 2026. Primary data was provided by a combat vehicle manufacturer. Preliminary results from the LCA were used to identify and address gaps in prescribed requirements, particularly for defining the: o inclusion of capital goods and infrastructure; o minimum disclosure threshold for dataset contribution; o allocation approach; o life-cycle scenario default assumptions; o prescribed datasets; and o sensitivity analyses needed. The LCA was reviewed internally to ensure it meets the requirements of ISO 14044. Assumptions and limitations associated with the underlying LCA results used to inform aspects of this PCR include: o the primary data inputs available from the manufacturer for processes under their control and those associated with their suppliers; and o the proxies selected when matching secondary datasets were not identified. The generic datasets used in the LCA are considered good quality when considering technology, time period, geography, and other indicators of representativeness, but actual impacts from suppliers, transport carriers, and local waste processing may vary. The LCA's impact assessment categories do not represent all possible environmental impact categories; and the characterization factors used within the impact assessment methodology contain varying levels of uncertainty. The LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.
Justification for new Part B if relevant non-expired PCR exists	No existing PCRs for combat vehicles were identified.
Harmonization activities pursued	Sustainable Minds announced the creation of this product group definition to other program operators, LCA analysts, and manufacturers via email, and posted an update on its website. No other PCRs for combat vehicles nor their upstream components were identified. Therefore, no harmonization activities were necessary.

3. Functional performance

The vehicle shall meet the applicable Canadian Motor Vehicle Safety Standards (CMVSS) of the Motor Vehicle Safety Regulations (MVSR), or the demonstrated regional or national equivalent (e.g., United States Federal Motor Vehicle Standards (FMVSS)), unless exempt within regulations or superseded by a military requirement.

Other relevant vehicle-specific standards and requirements are commonly listed in procurement documents.

4. System boundary

System boundary

The EPD system boundary shall be specified as cradle-to-grave. The modules considered in the LCA shall be described in brief as per "System boundaries" outlined in PCR Part A section 5.2. Module D shall not be declared. It should be apparent as to what processes are considered in each module per the module descriptions in PCR Part A section 6. The system boundary shall be clearly disclosed in the EPD.

EPD system boundary options	Extraction and upstream production	Transport to factory	Manufacturing	Transport to customer acceptance site	Installation/Operational readiness	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Dismantling	Transport	Waste processing	Disposal of waste	Recovery
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Cradle to grave	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND
Note – MND = module not declared; X = module included																	

This PCR considers capital goods and infrastructure to be any equipment, building, or supporting system which is used to support the combat vehicle product system and has a lifetime of at least five years or could be reasonably allocated to at least 1,000 combat vehicles or other similar products. If capital goods

	and infrastructure are likely to have allocated impacts less than the defined cut-off threshold, they may be excluded from the system boundary. Capital goods and infrastructure that have allocated impacts larger than the defined cut-off threshold shall be included in the system boundary, where feasible. The EPD shall specify which category(ies) of capital goods and infrastructure items (equipment, buildings, or supporting systems) were included and excluded from the analysis. The scope of this PCR excludes repair and refurbishment activities arising from hostile engagements and related operational incidents.

5. Functional unit

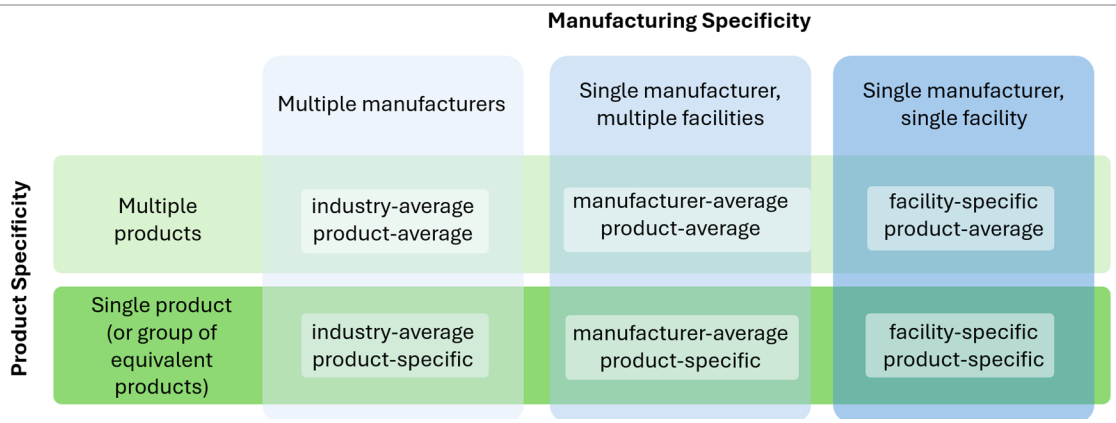
Unit	The functional unit shall be one combat vehicle in operation over a period of 25 years. Combat vehicles engage directly with the enemy. They fight and typically employ direct fire weapons and manoeuvre. They shall fulfill the performance attributes defined in the life cycle stages and scenario (section 7.3). Appropriate considerations for maintenance, repair, refurbishment, and other necessary activities shall be included over the full time period of the functional unit. If a vehicle is expected to last longer than 25 years, then no fractional accounting of the vehicle or related activities is allowed.
Rationale	The specific operational function of combat vehicles varies considerably. Quantifying the potential environmental impacts associated with a single vehicle will facilitate ease of calculation for manufacturers and understanding for EPD audiences. A 25-year time period is a typical requirement for government purchasing contracts.

6. Data quality and required data

Required background datasets	The default data selection criteria and datasets in Appendix A shall be used to represent relevant processes in the product system. For secondary datasets not specified in Appendix A, datasets used for calculations shall, if available: • have been updated within the last 10 years; • accurately represent the geography in which the unit process occurs; • appropriately represent the technology depicted in the unit process; and • employ allocation procedures appropriate to the system under study. Deviations shall be justified and based on the premise that another dataset is more representative of the specific process. The quality of the secondary data used shall be evaluated using the method described in the ACLCA Assessing Data Quality of Background Life Cycle Inventory Datasets.[4]

7. Additional rules to support methodological consistency

1. TR/EPD types



Industry-average EPDs and manufacturer-average EPDs shall not be created using this PCR. The following EPD types may be created using this PCR, as defined in the ACLCA Guidance for Determining EPD Types and Calculating and Communicating Data Specificity Through the Supply Chain[5].

- Facility-specific/product-average
- Facility-specific/product-specific

[4] American Center for Life Cycle Assessment. Assessing Data Quality of Background Life Cycle Inventory Datasets. Available at https://www.aclca.org/initiatives#PCR-Open-Standard

[5] American Center for Life Cycle Assessment. Guidance for Determining EPD Types and Calculating and Communicating Data Specificity Through the Supply Chain. 2025. Available at https://www.aclca.org/initiatives#PCR-Open-Standard.

	If a manufacturer produces the same vehicle in or at multiple facilities, the results of each facility-specific product may be disclosed separately in the same EPD. The EPD shall prominently include the following text with the results: "Per the ACLCA Guidance for Determining EPD Types and Calculating and Communicating Data Specificity Through the Supply Chain v1, this set of EPD results is facility-specific and [choose one of: product-average, product-specific]. Supply-chain-specificity [choose one of: =, ≥] X%." If the EPD reports multiple sets of results, each set of results shall be labeled separately.
2. Additional rules to Part A	• EPDs shall disclose the LCA software and version used for modelling, and the database name(s) and version(s) used. • EPDs that use secondary data for any unit process that contributes 30% or more to any disclosed environmental impact category shall disclose the data source (database name and version, LCA modelling software type and version implemented, dataset name, dataset geography, dataset age, and dataset allocation method). This criterion applies to the LCI dataset being used, and not the actual unit process data being reported by the manufacturer. Materials considered confidential may be reported as "proprietary ingredient" along with the database name and version. • EPDs shall disclose the following information for the subject product system, if applicable and not confidential: o The vehicle classification as a Main Battle Tank, Tactical Armoured Patrol Vehicle, Light Armoured Vehicle, Armoured Combat Support Vehicle, or other type with justification that it does not fit one of the four specified classifications o Primary energy type(s) (e.g., fossil fuel, biofuel, electricity, hydrogen, etc.) o Primary operational fuel type per the Canada Defence Administrative Order Directive 3014-0, Fuels and Lubricants[6], which is aligned with NATO fuel designation standards, where applicable. o Energy capacity (fuel: litres; electricity: kWh; others: as applicable) o Energy consumption rate (fuel: litres/km, electricity: kWh/km; others: as applicable) o Lubrication type and capacity (litres) o Basic vehicle weight (kg) o Dimensions (length, width, and height) (m) o Highway speed (km/h) o Off-road speed (km/h) o Highway range (km) o Off-road range (km) • Nothing in this PCR is intended to require disclosure of classified information or information restricted under applicable controlled goods regulations. EPDs created from this PCR shall not contain information that is classified, controlled, or otherwise prohibited from public release. • Any hazardous substances contained in the product shall be disclosed. For EPDs including products sold in Canada and the United States, the following regulations and data sources shall be considered when identifying hazardous substances. EPDs covering other countries should consider relevant standards or regulations in that market. o Environment Canada, National Pollutant Release Inventory (NPRI) http://www.ec.gc.ca/inrp-npri/ o Canadian Environmental Protection Act (CEPA, 1999) – Schedule 1: Toxic substances list o Canada Prohibition of Certain Toxic Substances Regulations, 2025, https://www.canada.ca/en/environment-climate-change/services/management-toxic-substances/prohibition-certain-toxic-substances-regulations-2025.html o EPCRA 313 Toxic Release Inventory Reporting (US) http://www2.epa.gov/toxics-release-inventory-tri-program o 40 CFR 50 Protection of Environment - Part 50: National Primary and Secondary Ambient Air Quality Standards (U.S.) https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr50_main_02.tpl
3. Default life cycle stages and scenario	This section contains requirements and default assumptions for each life cycle stage. Any deviations from the default assumptions shall be based on primary data. **Extraction and upstream production (A1)** This module shall include: • Extraction and production of raw materials for vehicle components and the production of supplied components that are not internally manufactured • Recycling/refurbishment processes of secondary or reused materials/component inputs from other product life cycles (recycling processes necessary to prepare the material for use in the combat vehicle system shall be included regardless of where the activity takes place);

[6] https://www.canada.ca/en/department-national-defence/corporate/policies-standards/defence-administrative-orders-directives/3000-series/3014/3014-0-fuels-and-lubricants.html#int

- Generation of electricity and production of fuels, steam, and other energy carriers used in the module; and
- Management of waste generated in the module.

Relevant processes not listed above should also be included.
A minimum of 99% of the total mass of the declared product shall be included, subject to the existing cut-off requirements in the Sustainable Minds PCR Part A. In addition, the following materials/components shall be included in the analysis regardless of the cut-off threshold (does not apply to controlled equipment):

- Printed circuit boards and their associated housing and components;
- Basic communications equipment; and
- Power storage and generation equipment.

To increase the accuracy of EPDs, manufacturers should prefer to use primary data from Tier 1 suppliers whenever practical. Therefore, EPD owners shall request primary life cycle inventory data from Tier 1 suppliers that cumulatively contribute at least 80% of the vehicle mass. Evidence of these requests and the suppliers' responses (where available) shall be provided to the EPD verifier upon the verifier's request.

Facility-specific data from activity upstream of the EPD owner shall be used for processes which cumulatively contribute at least 50% to the total disclosed global warming potential (from cradle to grave). In situations where facility-specific data is not available for the upstream processes, and such a facility is required to report to the Canada Greenhouse Gas Reporting Program[7] or the US EPA Greenhouse Gas Reporting Program[8], the EPD shall disclose in the Additional Environmental Information section: the carbon intensity of the facility and/or the quartile in which the facility resides where benchmarks have been published. Carbon intensity shall be calculated by dividing the emissions reported to the respective GHGRP by facility production based on the same time period as the EPD data collection period.

When a published ENERGY STAR Energy Performance Indicator[9] is available for an upstream material or component, the EPD shall disclose in the Additional Environmental Information section: the ENERGY STAR Energy Performance Score for the facility in which the upstream material or component was manufactured, and the reporting period of the underlying data, if the score exists.

When materials used in the product are represented by secondary data, the electricity grid profile of the dataset should be adapted to the source country or region, if known and possible with the selected dataset. Average datasets with "Global" or "Rest of World" average electricity profiles may only be used if the material source location is unknown or adapting the electricity grid is not possible.

For all upstream processing, the material utilization rate (i.e., the degree of utilized material of the total amount needed for producing a part) shall be considered. If the material utilization rate is not available from upstream suppliers, the rate shall be estimated for all relevant calculations if not already included in the background dataset being used.

Transport to factory (A2)

All transportation, including inter-facility transport prior to the material/component being shipped to the vehicle production site shall be included. In cases where the EPD owner maintains multiple suppliers for the same material or part, the life cycle inventory and impact assessment results shall reflect a weighted average transportation distance from the multiple suppliers for each mode of transport used. To simplify the calculation for those with many suppliers for the same material or part, suppliers which provide less than 5%, by mass or by volume, of a particular material or part may be excluded from the calculation of weighted average transport distance, subject to existing cut-off requirements in the Sustainable Minds PCR Part A.

If the location of a material/part supplier is unknown, transport distances listed in Table 1 shall be used for inbound raw material transportation to manufacturing facilities located in North America. For manufacturing facilities located outside of North America, other appropriate transportation distances and mode(s) shall be used where primary data is unavailable.

[7] Government of Canada. Greenhouse Gas Reporting Program data search. Available at https://climate-change.canada.ca/facility-emissions/
[8] US Environmental Protection Agency. Find and Use GHGRP Data. Available at https://www.epa.gov/ghgreporting/find-and-use-ghgrp-data
[9] Energy Star. Buy Clean Procurement and ENERGY STAR. Available at https://www.energystar.gov/industrial_plants/energy_star_plant_certification/buy_clean_procurement_and_energy_star_0

In cases where the source country/region is known and not the specific supplier location within the country/region, the default distances in Table 1 may be used as a portion of a custom scenario (for example, if a component is known to come from another continent, adding sea transport to the default transport legs in Table 1 may be appropriate).

Table 1. Material transportation distances to production site to be used in the absence of primary data

Note	Rail	Truck
Default material distances where no primary source data is available	2,175 km	635 km

Manufacturing (A3)

This module shall include all relevant activities that occur at the final vehicle manufacturing/assembly facility.

Routine factory acceptance or functional tests performed on most or all vehicles shall also be included, such as routine engine & operational tests, in-plant or track tests, electrical diagnostic testing, etc. The energy and fuel used for these tests are not typically tracked separately and often included in overall facility operational data.

All consumable materials delivered with the vehicle (e.g., fuel, hydraulic fluid, transmission fluid, lubricant, coolant, refrigerant, initial electrical traction battery charge) and their upstream extraction, processing, and transportation activities shall be included.

The following hierarchy of allocation methods shall be followed for co-product allocation:

1. Allocation shall be avoided, if possible, by dividing the process to be allocated into subprocesses and collecting the inventory data for each subprocess. For Combat Vehicle manufacturing, this may include inventory data for steel forming, welding, fitting/assembly, finishing/painting, quality assurance, and other relevant subprocesses. The method of subdivision may be based on engineering calculations if not directly measured.
2. If allocation cannot be avoided, the inventory data should be partitioned between the different co-products in a way that reflects the underlying physical relationships between them, i.e. allocation should reflect the way in which the inventory data changes if the quantities of delivered co-products change. Justification shall be provided which explains the inability of the manufacturer to avoid allocation through subdivision. For example, if electricity consumption cannot be subdivided in the manufacturing facility, it might be allocated based on the number of vehicles produced.
3. Economic allocation shall not be used for co-product allocation unless primary data shows a substantial difference in the economic value of co-products made at the facility. If economic allocation is used, a sensitivity analysis exploring the influence of the choice of economic value shall be included in the LCA report and a summary shall be included in the EPD.

Carbon offsets shall not be considered in the inventory. These refer to credits purchased for processes not under the control of the purchaser. For example, the owner of a coal-fired power plant might buy carbon credits that support the planting of forests. While these activities can be accounted for on a corporate level, they shall not be applied to the product LCA or EPD.

Market-based renewable electricity purchases shall not be considered in the inventory. Market-based renewable electricity purchases can have various forms and while these activities can be accounted for on a corporate level, they shall not be applied to the product LCA or EPD.

On-site renewable electricity may be included in the inventory if any RECs generated from the on-site generation have not been sold to a third party and the generated electricity is used by the manufacturing facility. When renewable electricity is included, the electricity shall be allocated to all products serviced by the utility meter on which the renewable system is attached (i.e., not disproportionately to a subset of products).

In the absence of primary data, manufacturers shall assume the transport distance from the production site to waste processing or disposal is 32 km. Outside of North America, other appropriate regional or national assumptions may be used.

When used, packaging often contributes much less than 1% of the mass, energy, and environmental impacts of final combat vehicle products. Therefore, unless otherwise justified (e.g., it is expected to

exceed the cut-off requirements of the Sustainable Minds PCR Part A), packaging may be omitted from the analysis.

Finally, the impacts from manufacturing personnel, research and development activities, Reliability, Availability, Maintainability, Durability (RAMD) testing, and business travel shall be excluded, as they are very difficult to quantify and are considered to be insignificant in the overall life cycle performance of a combat vehicle.

Transport to site (A4)

Transport from the manufacturing site to the military base/depot shall be included and be based on primary data. Multiple legs of distribution and storage may occur. If multiple base/depot sites exist, then a weighted average scenario shall be used. Transport to a subsequent deployment or combat zone is excluded from the system boundary. Recognizing that multimodal transport may be needed, the following information shall be disclosed for each transport leg:

- Mode of transport (air, rail, truck, barge, deep sea, etc.)
- Assumed transport vehicle type
- Average number of combat vehicles in one trip
- Transport distance (km)
- Whether the transport vehicle is assumed to return empty
- Fuel type used in the assumed transport vehicle
- Fuel efficiency of the assumed transport vehicle (liters/100 km)

Installation/Operational readiness (A5)

After the combat vehicle is delivered to the customer, additional inspections, testing, or other activities may be performed to prepare it for regular operations. This module shall include, as applicable, any ancillary materials, energy and/or water consumption, and disposal of waste materials related to these readiness activities.

As these activities may be widely variable depending on the type of combat vehicle and its intended use, the EPD shall disclose the activity(ies) and the associated quantity of input(s)/output(s) assumed.

Add-on armour installation

Add-on armour is typically added to the vehicle prior to deployment to a conflict zone. A vehicle may operate for years without add-on armour during typical training operations. In some cases, requirements specific to add-on armour are listed in the life cycle stages below.

All add-on armour systems included in the declared combat vehicle configuration shall be accounted for in the inventory. The following five standard add-on armour system categories should be considered when applicable to the vehicle:

- Ceramic ballistic armour – enhances hull protection against aerial and kinetic threats;
- Slat armour – provides stand-off protection against rocket-propelled grenades;
- Hull protection kit – improves resistance to improvised explosive devices (IEDs) and side-blast effects;
- Mine blast and underbelly protection – protects occupants from anti-tank mines and underbody explosions; and
- Crew ballistic shields – provides protection against small-arms fire.

Where any of the above systems are not included in the declared vehicle configuration, this shall be explicitly stated in the EPD. Any additional add-on armour systems not covered by the categories above (e.g., explosive reactive armour or active protection systems) shall be separately inventoried and disclosed.

The following default energy assumptions shall be used for installation of add-on armour unless primary data are available:

- Electricity – 8.4 kWh[10] for a pneumatic wrench plus 18.7 kWh[11] for use of an overhead crane
- Propane – 2.8 kg for 1 hour of forklift operation

[10] Estimate based on an assumption of 12.5 hours use of a 1/2" pneumatic impact wrench that consumes an average 3.75 ft^3/min and compressed air generation of 18 kW/100 ft^3/min.
[11] Estimate based on a 5-ton overhead crane used for 3 hours with motor ratings and time load factors as follows: bridge motor – 1.6 kW / 10%; trolley motor – 0.8 kW / 10%; hoist motor – 7.5 kW / 80%.

Product reference service life

This Part B uses a product reference service life (RSL) of 25 years. All use stage activity and impacts shall be counted for the full RSL period.

The rationale for this RSL is based on typical expected service life as specified in vehicle procurement contracts. Also, these are not commercial vehicles (which are designed to maximize use over time), so a mission-focused function over a period of time (instead of distance or run-time) is more reflective of actual service life of non-commercial combat vehicles.

Specific use stage activities may vary by vehicle. The default information in Table 2 should be used to quantify the relevant use stage activities. If the manufacturer has more typical or detailed information about use of the vehicle, it may be used in place of the defaults. In that case, the manufacturer-specific information shall be disclosed.

Table 2. Use stage scenario information by vehicle type

Vehicle type	Distance traveled per year (km)	On-road/ Off-road ratio	% of RSL with add-on armour*
Main Battle Tanks	740	10% / 90%	100%
Tactical Armoured Patrol Vehicles	865	60% / 40%	15%
Light Armoured Vehicles	1,440	20% / 80%	20%
Armoured Combat Support Vehicles	1,900	50% / 50%	15%
* The on-road/off-road ratio shall be consistently applied to operations both with and without add-on armour installed.			

Use or application of the vehicle (B1)

Any activity related to combat vehicle use and not included in modules B2-B7 shall be included in this module. If none, this may be reported as zero.

Maintenance (B2)

Combat vehicles require regular periodic maintenance, such as changes of engine oil, transmission fluid, coolant, refrigerant, battery, brake pads, tires, tracks, track pads, road wheels, engine rebuild, track system rebuild, vehicle washing, etc. Maintenance activities shall be based on manufacturer recommended maintenance schedules and/or customer standard maintenance procedures[12].

A minimum of one sandblast & repainting event shall be assumed during the RSL of the vehicle. Unless primary data are available, the following application rates of blasting medium and coating[13] per vehicle surface area treated shall be assumed (these include waste/overspray waste):

- Steel grit blast medium: 0.8 kg/m^2 (net consumption[14])
- Epoxy-based primer: 0.17 liters/m^2
- Polyurethane-based topcoat: 0.21 liters/m^2

The EPD shall disclose considered maintenance activities and their associated frequency, the materials and/or energy consumed per event, and the quantity per event and per RSL.

If primary data or relevant datasets are unavailable for the primer and topcoat, these should be modeled using the following component proxies, by mass[15]:

- Primer: 35% epoxy resin; 32% calcium carbonate; 10% titanium dioxide; 10% zinc oxide; 8% phosphoric acid; 5% polyamide
- Topcoat: 45% polyurethane resin; 30% calcium carbonate; 10% acrylic; 10% iron oxide; 5% titanium dioxide

Repair (B3)

Repair activities should be limited to inherent component failures instead of non-inherent failures (e.g., a part that leaks due to normal use would be an inherent failure whereas parts that leak due to accidents or external factors are non-inherent).

Components of the combat vehicle could fail during the service life of the vehicle. EPD owners shall estimate repairs or replacements of vehicle components during the RSL based on original equipment manufacturer failure rates. The number of component repairs or replacements shall be calculated to

account for the use scenarios defined in Table 2. Estimates should be based on the manufacturer's failure rate predictive analysis.

The EPD shall disclose considered repair activities and their associated frequency, the materials and/or energy consumed per event, and the quantity per event and per RSL.

Replacement (B4)

Most combat vehicles are expected to last the full RSL period. For vehicles that are not designed to last the full RSL period, replacements for the duration of the RSL must be counted proportionally to the nearest hundredth of a product. For example, if a vehicle is expected to last 12 years, then 1.08 replacement vehicles must be included for the 25-year period (13 remaining years in the RSL divided by the 12-year expected life of the vehicle). Replacements shall include the sum of impacts from modules A1-A5 and C1-C4 multiplied by the number of replacements. The number of replacements, if applicable, shall be disclosed in the EPD.

Refurbishment (B5)

Refurbishment activities beyond those already considered in maintenance and repair are not anticipated as part of the service life of the combat vehicle. Refurbishment does not include upgrades that add new or enhance existing capabilities to the vehicle. Unless otherwise justified, refurbishment activity may be assumed to be zero.

The EPD shall disclose considered refurbishment activities and their associated inputs and outputs for each activity.

Operational energy use (B6)

Combat vehicles use energy during their operations. Upstream or "well-to-wheel" and direct emissions activities shall be considered when quantifying operational energy use impacts.

The EPD shall disclose the type and quantity of energy/fuel consumed over the RSL period. Unless an alternative energy/fuel type is required for the vehicle, the EPD shall assume ultra-low sulfur diesel fuel is used during normal operations.

Several parameters can significantly influence the operational energy use (B6) module, including annual travel distance, operational context (e.g., garrison use, peacekeeping missions, or high-intensity exercises), the share of on-road versus off-road operation, and real-world fuel consumption. Actual fuel consumption may differ from manufacturer-reported values due to combat load, idling, terrain, and duty cycle conditions.

The EPD shall disclose the fuel consumption rates (liters or kWh per 100 km) for the following conditions used to calculate the B6 results:

- On road, without armour
- On road, with armour
- Off road, without armour
- Off road, with armour

Additional fuel is consumed when operating the vehicle after add-on armour is installed due to its additional mass. The impacts of the additional fuel consumption shall be included in the results based on the default percent of the RSL that the armour is installed on the vehicle as specified in Table 2.

[12] Discussions during the PCR development made it clear that manufacturers will always have recommended maintenance schedules for their vehicles that should be used as activity input data in this stage, and in case there are not or if the customer prefers to see their own maintenance procedures reflected in the EPD, the customer data can be used as an alternative.
[13] Based on guidance contained in MIL-DTL-53072H, Specification for Chemical Agent Resistant Coating System Application Procedures and Quality Control Inspection, US Department of Defense, 28 August 2024.The application amounts are expected to achieve ~2.0 dry mil thickness primer coat and ~2.5 dry mil thickness topcoat assuming 45% volume solids and 65% spray efficiency.
[14] Assumes a gross application rate of 40 kg/m2 and grit reuse rate of 50 applications (2% loss rate).
[15] The default coating proxies are intended to represent common coating material classes for military coating products where specific coating datasets are unavailable. The primer proxy is based on the material class described in MIL-DTL-53022, which covers lead- and chromate-free corrosion-inhibiting epoxy primers. The topcoat proxy is based on the material class described in MIL-DTL-53039, which covers polyurethane coatings for military tactical equipment. The proxy constituents represent common coating material classes: epoxy or polyurethane binder, curing resin, anticorrosive pigment, color pigment, and mineral filler. The zinc oxide and phosphoric acid inputs are used as a stoichiometric proxy for zinc phosphate anticorrosive pigment where a zinc phosphate LCI dataset is unavailable. The specified mass fractions are not intended to reproduce a particular formulation, but to provide a transparent, reproducible default composition that can be modeled with commonly available LCI datasets.

Operational water use (B7)

Most water used for coolant comes pre-mixed with other chemicals and is included in the manufacturing (A3) and maintenance (B2) phases. Typically, no other significant water use is associated with vehicle operations. Unless otherwise applicable, operational water use may be assumed to be zero.

Combat vehicles might consume water during their operations. If applicable, the EPD shall disclose the quantity of water consumed over the RSL period.

End of life

The end of life shall focus on conversion of the vehicle to waste. This can occur in several steps.:

1) Demilitarization – involves the mutilation/destruction of controlled equipment to ensure they cannot be reverse engineered. Depending on the type of equipment, activities might include smelting, cutting with metal displacement; other types of cutting; breaking; punching (perforation or slashing); shredding; neutralizing with chemical agents; crushing; or shattering/pulverizing.
2) Weapons removal – vehicle hulls are stripped of weapon systems including turrets, add-on armour; electronic, electrical, fuel, oil and hydraulic components; tires, axle and wheel assemblies; transmissions, transfer gear boxes, power packs and associated drive train components.
3) Fluid drainage – fuel, oil, grease, coolants, and other liquids are drained from the vehicle and disposed in accordance with local regulations.
4) Gas decompression – all compressed gas tanks or lines are released and/or removed.
5) Fire extinguishing systems decommissioning – fire extinguishing systems are often decommissioned by qualified technicians in accordance with local regulations.
6) Refrigerant removal – air conditioning refrigerants are drained and captured for proper disposal or recycling in accordance with local regulations.
7) Hull preparation – the hulls are often cut with torches and/or crushed prior to conversion to scrap metal waste.

While other end-of-life scenarios are possible, such as resale to an authorized country, cannibalisation of parts for other vehicles, or preparation as a monument/artifact, the scenario used in the EPD shall be focused on conversion of the vehicle to waste as that is considered the most common or typical scenario.

Note that activities in the seven end-of-life scenario steps described above may vary and might occur at one or more locations. For consistent reporting in the EPD, the activities should be grouped into the following end-of-life modules.

Dismantling (C1)

This module shall include activities associated with dismantling the vehicle as guided by Steps 1-6 listed above. (Note: Step 7 is counted in module C3 as described below).

The EPD shall describe the activities associated with dismantling of the vehicle. In the absence of primary data, the study shall assume 23.1 Wh/kg electricity for Steps 1-6 above (cumulative).[16]

Transport to waste processing or disposal (C2)

This module shall include transport of the vehicle and its materials, as relevant, to dismantling, waste processing, and/or disposal activities.

In the absence of primary data, EPDs shall assume a default transport distance of 1000 km by flat bed tractor trailer combination truck (as represented by the default dataset in Appendix A) to a dismantling facility unless otherwise justified.

After components are dismantled, EPDs shall assume an additional transport distance of 100 km by tractor trailer truck to a final waste processing/disposal location, unless otherwise justified.

Waste processing (C3)

This module shall include waste processing of materials that need additional processing prior to their use in a subsequent product system and/or prior to final disposal.

[16] Sawyer-Beaulieu S. Gate-to-Gate Life Cycle Inventory Assessment of North American End-of-Life Vehicle Management Processes. University of Windsor. 2009.

In the absence of primary data, the study shall assume 66 Wh/kg electricity for hull preparation via shredding & crushing.[17]

The EPD shall disclose each method of disposal assumed and the associated mass of materials corresponding to each method of disposal. If the EPD owner does not have specific data regarding end-of-life handling, the default values shown in Table 3 shall be used. Hazardous substances should be assumed to be processed per local regulations. Other assumptions shall be justified.

Table 3. Default values for end-of-life handling

Material type	Recycled	Incinerated	Landfilled
Electronics[18]	20%	0%	80%
Batteries[19]	99%	0%	1%
Tires[19]	40%	42%	18%
Glass[19]	25%	13%	62%
Plastics[19]	9%	16%	75%
Metal[20]	95%	0%	5%
Other[21]	0%	0%	100%
Note: Special handling processes (e.g., demilitarization activities) may be excluded from the system boundary. These are difficult to quantify and are unlikely to be significant to the overall results.			

Incineration activities that result in energy recovery, with energy recovery efficiency of at least 60%, shall also be included in this module.

Waste disposal (C4)

This module shall include incineration with energy recovery, with energy recovery efficiency less than 60%, as well as landfill processes associated with disposal of remaining waste material that is not recovered for use in a subsequent product system.

4. Additional data quality requirements

Primary data shall be used to quantify foreground activities that occur under the control of the EPD owner. The activity data shown in Table 4 shall be collected and included in the LCA if relevant to the product system. The acceptable data sources shall be used for such activities, either directly or from aggregated/collated data entered into electronic tracking systems such as Enterprise Resource Planning software.

Table 4. Activity data to be collected and included in the LCA

Activity	Acceptable data source(s)
Electricity consumption	Electricity meter; utility invoice
Fuel consumption	Fuel meter; utility invoice; purchase receipt; submeter engineering estimates based on utility calculations
Water consumption	Water meter; utility invoice; or for un-metered wells or other surface water consumption, estimates based on short-term measurements.
Wastewater	Estimate based on total water consumption minus estimated evaporation (assumes wastewater is not metered)
Wastewater emissions	Estimates based on sample measurements; estimates from regulatory submissions
Materials that become part of the vehicle	Purchase records; bills of materials (supplemented with waste/defect records for make-up materials)

[17] Electricity use for shredding is a proxy assumption based on a waste electronics shredding inventory as cited in JRC durability/reparability documentation(https://eplca.jrc.ec.europa.eu/uploads/JRC_report-Durability_Reusability_Reparability_V05-draft.pdf). The underlying source is Hischier et al. (2007) Life Cycle Inventories of Electric and Electronic Equipment: Production, Use and Disposal.
[18] Kumar A, Holuszko M. Electronic Waste and Existing Processing Routes: A Canadian Perspective. Resources. 04 November 2016. https://www.mdpi.com/2079-9276/5/4/35
[19] US Environmental Protection Agency. Facts and Figures about Materials Waste and Recycling. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling
[20] Jody, B.J. et al. Argonne National Laboratory. End-of-Life Vehicle Recycling: State of the Art of Resource Recovery from Shredder Residue. ANL/ESD/10-8. September 2010. https://publications.anl.gov/anlpubs/2011/02/69114.pdf
[21] Automotive Recyclers of Canada. Roadmap to Increase Recycling of Auto Plastics from End-of-Life Vehicles in Canada, Appendix A: Technical Memorandum #1 Baseline Information. https://autorecyclers.ca/wp-content/uploads/2024/01/Kelleher-et-al-TM1-ARC-Plastics-Roadmap-14March2022-excl-names.pdf

Ancillary materials	Purchase records; estimates based on short-term measurements
Combustion emissions	If measured – from direct measurements; If not measured – estimates from regulatory submissions; proxy emission profile from generic datasets that include combustion; engineering calculations based on government or industry standard emission factors
Process air emissions	If measured – from direct measurements; If not measured – estimates from stoichiometric calculations; estimates from regulatory submissions; estimates from literature; proxy emission profile from generic datasets
Refrigerant leakage	Refrigerant refill receipts; estimates based on average leakage rates provided in Table 2 of the GHG Protocol HFC Tool guidance document[22]; estimates based on assumed US EPA operating loss factors[23];
Solid waste	Truck scale measurement records; Measurements or estimates from waste hauler; estimates based on total mass of purchased materials minus mass of product output; estimates from waste audit conducted within the last five years; estimates based on dumpster capacity, average capacity used, and number of dumpster hauls; estimates for material taken for reuse at another facility; for hazardous waste, actual weights or volumes of containers.

EPDs shall disclose the reporting period for primary and secondary data.

Combat vehicle life cycle impacts are likely to be influenced heavily by upstream steel production and use stage fuel consumption. To address uncertainty in these processes, a sensitivity analysis shall be performed for both steel and use stage fuel impacts. For the sensitivity analysis of steel, the EPD shall present GWP values resulting from a +/- 20% change in the impact of steel (representing at least 90% of the mass of steel in the vehicle). For the sensitivity analysis of fuel, the EPD shall present GWP values resulting from a +/- 50% change in the impact of fuel consumption.

8. Part B development information

Part B review panel	This Part B was reviewed for conformance to ISO 14025:2006 and ACLCA PCR Open Standard v1.0 by the following parties: Hugues Imbeault-Tétreault, ing., M.Sc.A. Chair Groupe AGÉCO hugues.i-tetreault@groupeageco.ca Jack Geibig Ecoform Jgeibig@ecoform.com Beth Cassese, LCACP, CLAR Horizon LCA Services bcassese@horizonlca.com
Open consultation	Sustainable Minds solicited public comments on this Part B from July 8, 2026 – August 7, 2026. This consultation period and list of parties to submit comments were made available to the review panel.
Conflict statement	Funding sources used to develop this Part B were disclosed to the working group during the development process. The policies identified in Sustainable Minds' Program Governance were followed to identify and resolve any potential conflicts of interest.
Sustainable Minds information	This Part B was developed by Sustainable Minds and participating interested parties according to the Sustainable Minds Program Governance available at http://www.sustainableminds.com/transparency-report-program/how-it-works. For questions about this or another Part B, to submit comments on this Part B, or to obtain a template for developing a transparency report, contact us using the information on the following page: http://www.sustainableminds.com/contact-us.

[22] Greenhouse Gas Protocol. Calculating HFC and PFC Emissions from the Manufacturing, Installation, Operation and Disposal of Refrigeration & Airconditioning Equipment (Version 1.0). https://ghgprotocol.org/calculation-tools-and-guidance#cross_sector_tools_id

[23] Inventory of US Greenhouse Gas Emissions and Sinks, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks, uses a 10% operating emissions factor as a default assumption for certain types of air conditioning equipment when calculating national fugitive emissions.

Appendix A: Data sources and quality

The selected secondary datasets used in an EPD for combat vehicles are expected to support high-quality, accurate, comparable, and transparent EPDs as aligned with the ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets. While datasets have been prescribed for the below data types, the bills of materials, manufacturing technologies, and supply chains for combat vehicles are complex. Therefore, there are gaps in what is able to be prescribed, and the significance of the gaps is expected to vary by manufacturer. For all data types, the following goals shall drive dataset selection:

- use of datasets evaluated and supported by the ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets;
- datasets prescribed by this PCR;
- use of publicly available datasets;
- data quality evaluation using the Enhanced Pedigree Matrix;
- avoiding use of proxy datasets; and
- justification of any deviations from the above.

Table A.1. Prescribed datasets for combat vehicle EPDs

Data type	Background inventory database and/or dataset name	Reference / comment
Electricity – USA balancing authority (used to represent foreground processes in A3)	Balancing authority-specific U.S. DOE NETL electricity baseline	ACLCA Guidance recommended; https://www.lcacommons.gov/lca-collaboration/Federal_LCA_Commons/US_electricity_baseline/datasets
Electricity – Canada provincial averages (used to represent foreground processes in A3)	Province-specific datasets from ecoinvent, most recent available	Based on statistics from Government of Canada - Statistics Canada; https://www.statcan.gc.ca/en/start
Electricity – USA average	U.S. DOE NETL electricity baseline national average	ACLCA Guidance recommended; https://www.lcacommons.gov/lca-collaboration/Federal_LCA_Commons/US_electricity_baseline/datasets
Electricity – Canada average	ecoinvent, most recent available national average	Based on statistics from Government of Canada - Statistics Canada; https://www.statcan.gc.ca/en/start
Propane fuel in engines	U.S. EPA-USLCI-GREET dataset Operation of liquefied petroleum gas equipment, industry average: > 56 kW and < 560 kW	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets Recommended www.lcacommons.gov/lca-collaboration/US_Environmental_Protection_Agency/Heavy_equipment_operation/dataset/PROCESS/12ecfd99-a5bd-32bd-8d38-99307d8ef37a
Diesel fuel in engines	U.S. EPA-USLCI-GREET dataset Diesel, combusted in industrial equipment	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets Recommended www.lcacommons.gov/lca-collaboration/Federal_Highway_Administration/mtu_pavement/dataset/PROCESS/d6ad7035-5498-3237-8abd-50e93b1eef89
Gasoline fuel in engines	U.S. EPA-USLCI-GREET dataset Gasoline, combusted in industrial equipment	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets Recommended https://www.lcacommons.gov/lca-collaboration/Federal_Highway_Administration/mtu_pavement/dataset/FLOW/d815ff18-015c-3afb-be18-be03bdf325da
Natural gas fuel in engines	U.S. EPA-USLCI-GREET / USLCI Operation of compressed natural gas equipment; industry average; > 56 kW and < 560 kW	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets recommended https://www.lcacommons.gov/lca-collaboration/US_Environmental_Protection_Agency/Heavy_equipment_operation/dataset/PROCESS/6e687c52-4256-374e-b56f-6520c390a00e
Rail transport	NETL/USLCI dataset Transport, train; diesel powered	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets recommended https://www.lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/dataset/PROCESS/7de9c230-fd0f-3478-be87-f80181132faa
Truck transport	NETL/USLCI dataset Transport, combination truck; diesel powered	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets recommended https://www.lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/dataset/PROCESS/34156f3c-28ef-33db-9ad0-6293a2aa0d52

Barge transport	NETL/USLCI dataset Transport, barge; diesel powered	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets recommended https://www.lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/dataset/PROCESS/c2300fc3-5496-3d12-9135-67dc0ef740c9
Ocean transport	NETL/USLCI dataset Transport, ocean freighter, diesel powered	ACLCA Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets recommended https://www.lcacommons.gov/lca-collaboration/NIST/Building_Systems/dataset/FLOW/6c65fc34-c25e-3eb4-bc92-15bbfc457725
Steel	Steel is expected to be a significant contributor to the environmental impacts of combat vehicles. To improve comparability while maintaining compatibility with commonly available LCA databases and software tools, this PCR does not prescribe a mandatory database or dataset provider for steel. Instead, steel inputs shall be modelled using data that meet the requirements below. The LCA report shall effectively demonstrate that these requirements are met. 1. **Data source hierarchy** For each steel input or steel component category, the LCA practitioner shall select data using the following hierarchy: 1. Product-specific, supplier-specific, or mill-specific data for the steel product used in the declared product, where such data are available and are consistent with the system boundary, allocation rules, and LCIA requirements of this PCR. 2. Verified EPDs or critically reviewed industry-average LCI data representative of the steel product form, production route, and geographic region of supply. 3. Generic secondary LCI datasets representative of the steel product form, production route, and geographic region of supply. The following datasets from the latest version of the LCA Commons database are recommended if generic secondary datasets are used (Note: Additional processing is usually required to transform the purchased steel into the relevant steel components; such processing shall be included in the modelling of steel components): Panel, armour and structural components o Steel; hot rolled coil; at plant - Northern America (https://www.lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/dataset/PROCESS/ac54bc7d-5db5-3b4f-9175-5dd02f678312) Cast components o Steel; billets; at plant - Northern America (https://www.lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/dataset/PROCESS/a591c53f-ce67-41da-b0c1-65b6d91a1a43) Stainless steel o Steel; stainless 304; flat rolled coil - Northern America (https://www.lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/dataset/PROCESS/49f5324b-fc33-36e9-b5af-3c80d73492bd 4. Broader regional or global average steel datasets only where more representative data are not available, with justification and sensitivity or scenario analysis where the steel input contributes greater than or equal to 10% of GWP impact in A1–A3. The most recent global average data from worldsteel is recommended, which is currently available upon request at https://worldsteel.org/wider-sustainability/life-cycle-thinking/lca-lciform/ The use of a lower-ranked data source shall be justified in the LCA report when a higher-ranked data source is known to be available but is not used. **2. Technological representativeness** The selected steel dataset shall represent the steel product form and manufacturing route as closely as practicable. At minimum, the following distinctions shall be maintained: • wrought carbon or low-alloy steel plate, sheet, bar, tube, or profile shall not be modelled using stainless steel, cast iron, or unformed crude steel datasets unless additional forming and processing steps are added; • armour plate, hull panels, and other wrought armour or structural steel components shall be modelled using a dataset representative of hot-rolled plate, sheet, or equivalent wrought low-alloy steel, with additional heat treatment or forming processes included when relevant; • steel castings shall be modelled using data representative of steel foundry casting, including remelting and casting yield losses, or by combining a representative steel input dataset with a representative steel casting process; • stainless steel components shall be modelled using stainless steel data that include chromium, nickel, molybdenum, or other alloying inputs as applicable;	

- cast iron, ductile iron, aluminum, titanium, and other metals shall not be modelled as steel.

Where the specific steelmaking route is known, the dataset shall represent that route, such as basic oxygen furnace, electric arc furnace, direct reduced iron/electric arc furnace, or an applicable route-specific mix. Where the route is unknown, the dataset shall represent the regional market average for the steel product form and region of supply.

3. Geographical representativeness

The selected dataset shall represent the region where the steel was produced, not merely the region where the combat vehicle was assembled. If the country or region of steel production is unknown, the practitioner shall use a dataset representative of the procurement market for the steel product and shall document the assumption in the LCA report.

North American steel production data shall be preferred where the steel is known or reasonably expected to be sourced from North America. Non-North American datasets may be used only where they are more representative of the actual steel supply chain or where North American data are not available.

4. Temporal representativeness

The preferred reporting period is within five years of the EPD reference year. Data older than ten years shall not be used for steel inputs meeting the applicability threshold unless the practitioner demonstrates that no more current representative data are available and performs a sensitivity analysis or data quality discussion in the LCA report.

5. Allocation, recycling, and Module D

Steel datasets used in modules A1–A3 shall be consistent with the allocation and recycling rules of Sustainable Minds Part A this PCR. End-of-life recycling benefits, avoided primary steel credits, avoided burden credits, or net scrap credits shall not be embedded in modules A1–A3.

Datasets that include inseparable end-of-life recycling credits, avoided production credits, or system expansion credits in the product-stage result shall not be used for A1–A3 steel modelling unless the practitioner can document and remove those credits or demonstrate the effect falls below the PCR cut-off threshold.

6. LCIA compatibility and completeness

The selected steel dataset shall support calculation of all environmental indicators required by this PCR. Datasets shall not be used where missing elementary flows, unsupported flow names, or incomplete characterization would materially understate any required indicator.

If a dataset lacks characterization for one or more required indicators, the practitioner shall either select a different dataset, supplement the dataset with inventory information (which shall be documented in the LCA report), or demonstrate that the missing characterization falls below the PCR cut-off threshold.

7. Documentation requirements

For each steel dataset used which contributes greater than or equal to 5% of the total steel mass input, the LCA report shall document:

- steel component category or material input modelled;
- mass of steel represented by the dataset;
- steel type, grade family, or functional category, where known;
- product form, such as plate, sheet, bar, tube, casting, stainless steel, or other form;
- steelmaking route, where known;
- country or region of steel production, where known;
- dataset name, database or source, version, and reporting period;
- allocation and recycling approach used in the dataset;
- whether any end-of-life recycling credit or avoided burden credit is included;
- justification for the selected dataset relative to the hierarchy in this PCR; and
- any limitations, substitutions, or sensitivity analyses performed.

The EPD shall include a summary table identifying the data source type (e.g., supplier-specific data, verified EPD, industry-average LCI, or generic secondary dataset), and for generic datasets, the dataset name, database name and version, steelmaking route, and percent of total steel mass represented by the data set.

8. Scenario analysis

If the cumulative contribution of generic secondary datasets and broader regional average or global data sets contribute at least 50% to A1-A3 GWP results, the LCA report shall include a scenario analysis

	showing results from one or more relevant alternative data sets and a data quality discussion addressing the effect of steel dataset selection.
Aluminum	Primary data from suppliers is preferred. If primary data are unavailable, based on the type of aluminum, use the most recent information from The Aluminum Association. As of publication, this is the Environmental Footprint of Semi-Fabricated Aluminum Products in North America Life Cycle Assessment. January 2022. https://www.aluminum.org/SustainabilityReports, Table 7-5, use the values for consumption mix in market (unless it is known that aluminum is produced in North America, then use the domestic production values). Additional processing is required to transform the purchased aluminum into the relevant aluminum components. This process must also be included in the modelling of aluminum components.