Small Electronic Equipment Repair Shop Solution Guidance

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This solution and guidance material has been developed with the contribution of Innovation Norway for the IOM E-waste Project. The IOM E-waste Project focuses on creating a circular economy for e-waste in displacement settings. Solvoz developed various solutions to support sustainable procurement practices, focusing on the procurement aspect of the e-waste value chain to green humanitarian responses. As part of the Project, Solvoz has developed sustainability and circularity criteria for several product types and services, in consultations with numerous humanitarian and private actors. This is one of the outcomes of this partnership.

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1.1 GUIDANCE FOR SERVICE PROVISION OF REPAIR SHOPS

The following guidance is targeted at organizations and suppliers to fulfil their warranty requirements or organizations that need to contract a repair shop service for small electronic devices such as torches, solar lanterns, and mobile phones to support displaced communities who are the recipients of aid.

1.1.1 Administration

The service provider should be able to keep basic paperwork, quotations, invoices, and tracking of jobs as well as keeping an inventory of clients' equipment and their own. Basics of administration will be given throughout the document.

1.1.2 Repair location

Depending on the service required a mobile service that goes to communities may be required where displaced populations are spread over a wide geographical area. A mobile service requires good communication ensuring the community knows the days and hours when the mobile service is visiting, a regular schedule should be available to the community and followed. A service with one or more fixed locations can allow a more reliable service with access for the community and contracting organizations with regular opening hours.

1.1.3 Type of repairs

It is important to define and agree on the scope and types of repairs that can be undertaken between the repair shop and contractor in an agreement. The contractor and repair shop should agree on a menu of repairs for specific types of products as well labour requirements and spare parts (stocked or on request). Troubleshooting should always be included in time and costs associated with repairs.

Product (brand/model)	Repair	Time	Spart parts required	Tools required	To stock
SP Solar 90	Troubleshoot	30 min	N/A	Screwdrivers, headlamp, blower, multi-meter	N/A
SP Solar 90	Replace battery	15 minutes	NMC	Screwdriver, solder, soldering iron	Yes
SP Solar 90	Replace bulb	10 minutes	LED bulb		Yes

1.1.4 Troubleshooting and quotations

A service provider as part of their service should be able to troubleshoot and provide quotations and time to complete a repair. This is an integral part of a service on which the service level can be measured by the contracting organization.

1.1.5 Warranty

The service provider should be able to guarantee the quality of the specific repair undertaken for a fixed period. Where a repair has failed a short time after, this should be recorded and can be included as a measure of service level.

1.1.6 Service level

The service provider and contracting need to keep track of performance. A simple means is to track the jobs against a performance target. Where no benchmarks initially exist, a simple approach is to track estimates (time and cost) against actual work completed. Overtime

standard jobs can be benchmarked and service levels better defined as well as spare parts requirements.

1.1.7 Spare parts

Time to complete a repair and the success of the repair on having the right spare parts; quality and close matching specifications to the part being replaced. The service provider should ensure that they have a stock of fast-moving spare parts and access to suppliers of parts for more infrequent but expected repair jobs. Where the repair shop is provided with spare parts for the exclusive repair of a specific model or target group then tracking spare parts use is necessary to ensure parts are used as intended.

Product name and description					
Date	Received from/ Issued to	Number In	Number out	Remarks	Signature

1.1.8 Repair tools and test equipment

Essential for a repair shop is the right tools to ensure the client's equipment is not damaged and the repair is carried out as efficiently and effectively as possible. The repair shop should have an inventory of its tools and test equipment as well as a fixed location (tool box or board) for each repair tool and piece of equipment which allows regular inventories to be performed efficiently.

1.1.9 Power requirements

Repair activities require a constant power source. It can be a solar power system with stockage or a classic generator system to ensure the power source.

1.1.10 Security

The repair shop should have a safe and lockable area or cupboard for tools and equipment as well as the client's products under repair. Lockable mobile box if doing offsite repairs.

1.1.11 Training

Staff undertaking repairs must have the specific skill required to repair the product of interest. The repair shop must ensure that staff properly trained. Depending on the type of repairs being undertaken this can mean the staff member has:

1. Have undertaken a formal training with national accreditation or supplier/manufacturer accreditation or independent courses (private, online etc.).
2. Undertaken on the job training under the supervision of a trained staff member and can undertake repairs with supervision.

When assessing a service provider, the repair should be asked the level of training their staff have. In many contexts formal training may not be easily accessible due to cost and availability. Contracting organisations can support local organisations by making training accessible to repair shop staff.

1.1.12 Safe working practices

Safety equipment should be available to staff to reduce work place accidents and harm to staff. Repair works must be done in a well-ventilated condition to avoid prolonged exposure to the hazardous vapours (from cleaning and degreasing agents and from soldering

processes). Repair shops should follow safety guidance from manufacturers of equipment and follow local regulations.

1.1.12.1 PPE requirements

PPE (personal protection equipment) must be available in a repair workshop even though wearing of PPE is not necessary for all repair jobs. Basic PPE includes gloves (protect against heat or cuts), face shields or googles, dust coats or overalls, hearing protectors and face masks (protect against inhaling harmful particles).

1.1.13 Insurance (damage and theft)

Depending on the location and context access to insurance for small businesses may be limited. Microinsurance schemes if available should be encouraged to make the repair shop a more sustainable business and provide assurance for the contracting organisations and the communities equipment under repair.

1.2 SUSTAINABILITY GUIDANCE FOR REPAIR SHOPS

Repair activities themselves are sustainable and circular as they extend the product life-time. However certain practices will allow more sustainable and circular repair works.

1.2.1 Interdiction of dangerous practices

Some repair practices and extraction of recyclable materials are dangerous to the health and the environment. Following activities must not be practiced:

- Disassembly of rechargeable battery cells
- Burning of electric cables and PCBs (printed circuit board)

1.2.2 Toxicity

Repair works sometimes use toxic substances for cleaning, degreasing, and soldering.

- Avoid chlorinated solvents for degreasing and use alcohol-based cleaning and degreasing agents such as isopropyl alcohol.
- Avoid lead-containing soldering irons.

Most repair activities require spare parts and spare parts are subject to the toxicity criteria of sustainability. For all equipment and spare parts used in the workshop the minimise the level of toxic materials as follows:

1.2.2.1 Compliance to EU's RoHS directive or equivalent (most important criterion)

It can be controlled by the presence of CE-marking on a solar lantern. RoHS directive prohibits the use of 10 most toxic substances in electric and electronic equipment. China RoHS II (6 toxic substances) must be complimented for the compliance to EU's RoHS directive. See Annex 1 and 2 for more information.

1.2.2.2 Minimum allowable halogens in electric wires (optional)

It is recommended if open-field burning is of a common practice in the place of solar lantern distribution. Halogenated compounds generate toxic smoke (dioxins) when burned, so the solar lantern must contain none or minimum level of halogens in plastic insulating materials. Avoid PVC (polyvinyl chloride) wires and prefer the PE (polyethylene) or Nylon wires. Suppliers must guarantee the avoidance of halogens.

1.2.2.3 Minimum allowable halogens in plastic (optional)

Same argument as the previous criterion for other plastic parts such as product casing. Avoid PVC casing, and prefer other plastics such as ABS (acrylonitrile butadiene styrene) and PC (polycarbonate) for example. Suppliers must guarantee the avoidance of halogens and the absence of dangerous flame retardant coating (included in 1.2.1.1 and 1.2.1.2 criteria).

1.2.3 Safe storage of dangerous goods

Most repair equipment and spare parts are not dangerous when stocked in a workshop, but a special precaution must be paid to the storage of rechargeable batteries. Batteries should be stored in a well-ventilated and dry area. They should be stored away from direct sunlight, heat sources, and water. Batteries should be stacked so that they're stable and won't be damaged.

1.2.4 Waste management

Waste from repair activities or broken products must be stored in a dry environment in a specialised container (for electrical and electronic equipment) until handed over to an e-waste collector and/or e-waste management company. It is dangerous to disassemble broken products for future recycling at a repair workshop as such an activity requires specialised knowledge and safety codes.

If a large volume of the same product is a subject of repair shop service, it is recommended to keep broken products to source spare parts. Special precaution must be paid to the used rechargeable lithium-ion batteries as most of used and dead li-ion batteries can be “revived” if not damaged. These batteries should be removed from the electrical equipment and handed over to a specialised service provider or a battery recycler and properly stored.

1.3 PROCUREMENT GUIDANCE FOR REPAIR SHOPS

The procurement guidance for repair shops will consider the procurement of services.

When searching for service provider, the buyer will consider the social, ethical, environmental and economics elements.

Those considerations should be judged in the following:

- Service provided and agreed service level
- Application of sustainable principles by suppliers (CSR responsibilities)
- Economic evaluation (pricing mechanism)
- Monitoring mechanism for the service provided

For each part, the guidance provides clear advises and will help the buyer team to develop the award process with recommended supplier selection criteria and weighting system. An example of the weighting and evaluation criteria is available in Annex 6.

1.3.1 Service provision

The requirements for service provision will provide the key criteria for supplier selection. Section 3.1 lists the possible services and expected quality of service level is suggested.

Key to any agreement is the clarification of those different elements, responsibilities of both parties, vendor and contractor and related costs and expected service level.

1.3.2 Supplier qualification and sustainability

In this part we advise the way to assess sustainability related to repair shop service providers, their ethical and social responsibilities and their compliance to commercial activities.

In general, repair shop service providers may not have the same qualification as general product suppliers. However, we recommend to select vendor that have most of the qualification describe below.

1.3.2.1 Registration

The supplier should have an active business registration in its country of operation. The business registration in most countries can be checked against publicly available databases. Similarly, a tax registration for value added taxes (VAT) or goods and services taxes (GST) should be registered to the supplier. This will ensure the buyer organization can deduct taxes if where possible as a charitable organization.

1.3.2.2 Financial audits and outstanding obligations

The buyer should request the audited financial statement of the supplier and information on its major suppliers and customers. A financially secure supplier with many customers is likely to be a lower risk partner to engage with. Service provider with significant outstanding obligations, debt or significant commitments for large contracts compared to the size of the company also pose a risk.

1.3.2.3 Litigation

Companies that are involved in litigation proceedings may pose a risk in being able to fulfil their obligations as well as offer an insight into the organization's reputation.

1.3.2.4 Code of conduct and certification

Many service providers in low- and middle-income countries do not apply for certification due to cost or accessibility to certification processes. Repair shops are typically small or micro businesses that will not have the resources to undertake certification processes. Buyers can support local organizations by not disqualifying them due to a lack of certification and instead support the assessment of the service provider during procurement process by the inclusion of criteria in the supplier evaluation that directly assess sustainability and ethical practices of the vendor.

However where service provider is of a larger size (a franchise or with large number of staff) then certification and signing onto the codes of conduct maybe relevant. There are a number of codes of conduct and standards related to human rights, labor rights, the environment, and anti-corruption; that they roughly fall into roughly three categories:

- Voluntary registration to codes of conduct and practice
- Independent bodies certification and audits
- Buyer assessment or audits

Service provider can demonstrate their intent to be a sustainable organization by voluntarily signing up to a recognized charter, standard or code of conduct. Service providers with engagement in sustainable management can also be found in the UN Global Compact database. The code of conduct clarifies the expectation of supplier/buyer in terms of human rights, labor, environment, and anti-corruption measures. This includes amongst

other principles, no forced or child labor, security and safety of workers, proper wages and benefits, rules on bribery or highlight conflict of interest.

Independent certification normally recognizes independent auditors or conduct audits themselves. The most well-known certification are “Ecovadis”, “B-Corp” or ISO 26000. These certifications are obtained for a fixed period and undertaken by an independent auditor and describe the level of sustainability of the organization.

1.3.2.5 Supplier reputation

An important objective for all buyers is to create savings through their purchasing decisions. Equally important in the decision is to ensure that the service provider that you engage with is a good actor. You should always ask who the buyers main clients are and ask for references and follow up. Similarly asking for recommendations in varied networks for good service providers is a good way to understand the service providers in the market and the operation of the market.

To give some examples of a good actor; a good supplier complies with good labor practices and human rights, does not harm the environment, its ownership is transparent (company directors and investors) and the company is not subject to contravening any embargoes and/or sanctions.

There are a number of databases that are searchable related to corporate and social responsibility, sanctions lists and transparency of companies. A suggested list of databases and relevant guidance can be found in Annex 7. It is always as minimum useful to search online (google the company) in the relevant languages to check the background of the organization.

1.3.3 Economic criteria

Prioritising local service providers should be considered when selecting the vendor for obvious operational convenience and reducing the environmental logistics footprint while supporting local economies.

When considering service level and costs related, there are several pricing methods:

- Replacement and repair under warranty: a device can be replaced/repaired under warranty. Warranty policy needs to be clear for both parties
- Time-based pricing: fixed hourly rate and calculated according to the total number of man-hours the vendor spends
- Device-based pricing: fixed price per device repaired
- Pricing based on device lifetime: repair price is defined according to the age of the device as when it gets older, it may require more repair action
- Maintenance contract: fixed frequency maintenance (e.g. once/year) for a fixed number of devices

1.3.4 Agreements

In general, a service provider agreement duration is 1 year. The longer the contract, better it is for both parties for both parties where a reliable and consistent service can be maintained.

When defining an agreement, both parties need to stipulate:

- Type of device covered by the contract
- Extent of responsibilities to avoid ambiguity by both parties

- Expectation from the buyer (monitoring control)
- Service completion time and level: definition of reasonable time frame repair completion considering the work capacity.
- Compensation: in case the vendor damages the device, delay in service can also warrant compensation
- Price / duration / terms of payment / monitoring mechanism
- Invoicing and payment terms

1.3.5 Monitoring mechanisms

In order to monitor the repairs done and so the related invoices (charges), a mechanism need to be established and applied by both parties.

The contractor needs to identify devices with an identification number (serial number or internal organization asset reference). This would facilitate the identification of device under warranty and those ends of life.

This mechanism requires the usage of a repair card. For each device repaired, the service provider report repair actions, used spare parts and time spend (labor) on this standard card.

This mechanism provides a clear understanding of the work done and the validation of payment process.

APPENDIX 1 SUSTAINABILITY CRITERIA

TOXICITY

The danger of toxic substances in electric and electronic products is widely recognised. The proposed sustainability criteria integrate the most acknowledged standards as criteria. However, the trend to avoid any level of chemical hazard will continue, and it is highly recommended to replace the traditional plasticisers, flame retardants and process chemicals by safer alternatives. GreenScreen® provides detailed up-to-date information on safer chemicals. The list of most commonly used chemical groups in electric and electronic products are provided by TCO certification as TCO Certified Accepted Substance List:

https://tcocertified.com/industry/accepted-substance-list/

Criteria and definitions

Electrical and electronic equipment and its spare-parts

Criteria	Definitions	Source
Complies with EU's RoHS Directive*	Conformance to RoHS Directive: heavy metals (Pb < 1000 ppm, Hg < 1000 ppm, Cd < 100 ppm, Cr(VI) < 1000 ppm), brominated flame retardants (PBB < 1000 ppm, PBDE < 1000 ppm), PVC softener for wire insulation (DEHP < 1000 ppm, BBP < 1000 ppm, DBP < 1000 ppm, DIBP > 1000 ppm).	NSF/ANSI 457 - 2019
List of declarable substances as specified by IEC 62474**	Manufacturer shall list the presence of IEC 62474 declarable substance groups and declarable substances in the product at or above the reporting threshold amounts stated in the IEC 62474 Standard.	NSF/ANSI 457 - 2019
Contains minimum allowable halogens in electric wires	Avoidance of electric cables containing halogenated compounds. Level of chlorine or bromine greater than 5000 ppm, or fluorine greater than 1000 ppm, based on the test method IEC 62321-3-1 and IEC 62321-3-2.	NSF/ANSI 457 - 2019
Contains minimum allowable halogens in plastics	Avoidance of halogenated compounds in plastic parts exceeding 25g. Level of chlorine or bromine greater than 5000 ppm, or fluorine greater than 1000 ppm, based on the test method IEC 62321-3-1 and IEC 62321-3-2. Exemptions for printed circuit boards.	NSF/ANSI 457 - 2019

* Annex 1 provides the basic information on EU's RoHS Directive.

** Annex 2 provides IEC 62474 listed substance information.

Batteries

Criteria	Definitions	Source
Contains minimum level of heavy metals	No more than 0.0005% (5 ppm) of mercury by weight and no more than 0.002% (20 ppm) of cadmium by weight.	EU Battery Directive***
Components with heavy metals clearly marked	Batteries with more than 40 ppm lead, 20 ppm cadmium or 5 ppm mercury must also be marked with the chemical symbol for the metal. Exemptions for fire alarms.	EU Battery Directive***

*** Annex 3 provides the basic information on EU's Battery Directive.

RECYCLABILITY

End-of-life product components can provide a valuable resource to produce a new product by means of recycling. Most commonly recycled materials on the African continent are metals and plastics. Metals have infinite recycling capacity whereas plastics have finite recycling capacity due to the degradation of polymerisation. In addition, metal recycling can take place at a very small and a local scale as small and affordable electric smelters are omnipresent on the African continent. However, recent movement on the contient allows simple plastics such as PET, PE, and PP (sometimes PS) to be recycled as post-consumer resins. The plastic recycling companies and the types of recycled polymers in African are

listed (non-exhaustive list) in the website of ENF Recycling:
https://www.enfrecycling.com/directory/plastic-plant/Africa

Criteria and definitions

Criteria	Definition	Source
Recycled materials used	Manufacturer shall declare the minimum percentage by weight of recycled content in the product and for each of the components as applicable. NSF 457-2019-1 (Article 6-1-1)	NSF/ANSI 457 - 2019
Product components' materials labelled if recyclable	Plastics shall be classified and indicated according to the ASTM International Resin Identification Coding System.	NSF/ANSI 457 - 2019

End-of-life Management

E-waste is an emerging problem worldwide. The humanitarian interventions shall not leave such waste as a negative heritage to the places of interventions as such waste contains hazardous substances that can endanger the human health and the environment. In most developing countries, the capacity to properly treat e-waste exists locally even if limited.

In order to assure the proper treatment of e-waste, international cross-sectorial partnership is necessary. Such a partnership involves manufacturers, suppliers, humanitarian organisations and agencies, as well as the local waste treatment actors, and the integration of the end-of-life management requirement for the humanitarian procurement of electric and electronic products is recommended.

Criteria and definitions

Criteria	Definition	Source
End-of-Life product take-back scheme available	Manufacturers shall provide a nationwide product take-back service for recycling and disposal.	NSF/ANSI 457 - 2019
Service contract with local waste management company	Manufacturers shall contract a local company for the disposal of end-of-life products.	

Reparability

Reparable products contribute significantly to reduce environmental impacts and to develop local economy. The main objective is to provide multiple life stage to a product before reaching its end-of-life by designing the product that facilitates repairing and repurposing. The introduction of reparability in the product design is rather a new concept. Most vigorous effort was taken by France where Reparability Index (measurable indicator) as a consumer indicator was officially introduced to five categories of electronic equipment (smartphones, laptops, televisions, washing machines and lawnmowers) since 2021.

The reparability category of Sustainability Criteria has two sets of criteria; mandatory and recommended, to accommodate manufacturers to adapt in steps. In open-access space, organisations such as ifixit.com provide repair manuals of various electronic equipment. The use of such open-space knowledge database is strongly encouraged particularly for the products procured by humanitarian and aid organisations as it will allow the sharing of repair know-how for those who are remotely located.

Mandatory criteria and definitions

Criteria	Definitions	Source

User manual with trouble shooting guidance available	Manual should be in language(s) accessible to the target population, language level relevant to target group and contain graphic content for ease of use and understanding.	IEC 45554:2020
Availability of spare parts	IEC 62550:2017. Or whereas spare parts are defined as part which can replace a faulty, failed or worn-out replaceable part, the supplier must provide information on the list of spare parts with specifications and how to obtain them. All parts listed in « Frequently replaced parts » must be available as spare parts. If a special tool is required to replace a spare part, such a tool must be provided with the spare part.	IEC 45554:2020
Frequently replaced parts listed	Parts list should provide sufficient information on parts specification to support sourcing.	IEC 45554:2020
Repair manual**** available	Manual should be in language(s) accessible to the target population. The repair manual contains safety procedures, energy specifications, component list, repair tool list, diagnostic procedures, and repair procedures.	IEC 45554:2020

**** Annex 4 provides the list of minimum contents to be included in a repair manual.

Recommended criteria and definitions

Criteria	Definitions	Source
Designed for disassembly	Whereas disassembly is defined as a process whereby an item is taken apart in such a way that it could subsequently be reassembled and made operational (source: IEC 62542 definition), the item must be designed intentionally for repair, material recovery, value retention, and meaningful next use. Disassembly steps and manipulations must be counted and clearly documented.	IEC 45554:2020
Interoperable parts used	Interchangeable parts are parts (or components) that are, for practical purposes, identical. They are made to specifications that ensure that they will fit into any assembly of the same type.	TCO certification
Standard plugs, connectors, and charging solutions used	IEC plugs and connectors (IEC 62196, 60309, 60320, 60906-X, 62180-1-X), IEC charging solutions (IEC63002 based on the USB technologies)	TCO certification
No special tools required for disassembly and repair	Disassembly and repair sequences require only the common tools (listed in IEC 45554 Table A.3), or special tools are provided with the provision of spare parts.	IEC 45554:2020
Upgradeability	Where applicable, updates of firmware and software must be available.	TCO certification

Local Production

Locally produced or assembled products allow quick and local repair shop services, so it would be the ideal in the perspective of the development of a circular economy.

Criteria and definitions

Criteria	Definition	Source
Local production or assembly	A product is manufactured or assembled locally with a certificate of origin as proof.	

ANNEX 2 EU ROHS DIRECTIVE IN A NUTSHELL

EU's RoHS directive regulates the hazardous substances used in the manufacture of electrical and electronic equipment (EEE). It specifies maximum levels of 10 restricted substances that are toxic to the environment (risk of landfill pollution), and are dangerous when exposed during manufacturing, waste treatment, and recycling. These 10 restricted substances and their maximum levels are the following:

- Cadmium (Cd): < 100 ppm
- Lead (Pb): < 1000 ppm
- Mercury (Hg): < 1000 ppm
- Hexavalent Chromium: (Cr VI) < 1000 ppm
- Polybrominated Biphenyls (PBB): < 1000 ppm
- Polybrominated Diphenyl Ethers (PBDE): < 1000 ppm
- Bis(2-Ethylhexyl) phthalate (DEHP): < 1000 ppm
- Benzyl butyl phthalate (BBP): < 1000 ppm
- Dibutyl phthalate (DBP): < 1000 ppm
- Diisobutyl phthalate (DIBP): < 1000 ppm

The scope of the original RoHS was expanded to cover all electrical/electronic equipment, cables, and spare parts with compliance required by July 22, 2019.

The list of exemptions is contained in Annex III and specific exemptions for medical devices and monitoring and control instruments are listed in Annex IV of ROHS II: http://ec.europa.eu/environment/waste/rohs_eee/legis_en.htm.

Permanent exclusions from RoHS include the following: military equipment, space equipment, equipment designed to be part of another piece of equipment falling outside the scope of RoHS, large scale industry tools, large scale fixed installations, means of transport for persons or goods, non-road mobile machinery, active implantable medical devices, photovoltaic panels, equipment for research and development only available business to business.

There are on-going discussions (called RoHS Pack 15) taking place for the possible amendment and inclusion of seven new substances. The seven additional substances being assessed include:

- Beryllium
- Cobalt (dichloride and sulphate)
- Nickel (sulphate and sulfamate)
- Diantimony trioxide
- Indium phosphide
- Medium-Chain Chlorinated Paraffins (MCCPs)
- Tetra-bromobisphenol A (TBBP-A)

ANNEX 3: IEC 62474 DECLARABLE SUBSTANCE LIST IN A NUTSHELL

https://incompliancemag.com/article/the-power-of-iec-62474-for-product-compliance-and-eco-design/

The IEC 62474 Declarable Substance List (DSL) is an internationally recognised and consolidated list of substances that are subject to regulations. The DSL listed substances are considers as potentially present in electrical and electronic products and systems. Manufacturers and suppliers use the DSL in their design and supply chain management to specify and control substances of interest.

Substances on the DSL are declarable, but not always hazardous or restricted. Entries may be included on the DSL because the substances and materials are valuable for recovery. This includes critical raw materials (CRMs) which are starting to appear in regulations that require reporting to assist in recycling.

The DSL and exemption lists are available online from the IEC 62474 database at http://std.iec.ch/iec62474.

ANNEX 4 EU BATTERY DIRECTIVE IN A NUTSHELL

All batteries and accumulators, and waste batteries and accumulators, regardless of type or application, are covered under the EU Battery Directive (2006/66/EC and Amendment 2013/56/EU: https://ec.europa.eu/environment/topics/waste-and-recycling/batteries-and-accumulators_en). The Directive specifies the following:

Chemical symbols shall only be mentioned if batteries contain one or more of the heavy metals above the following limits: 0,0005 % mercury (Hg), 0,002 % cadmium (Cd) or 0,004 % lead (Pb). The chemical symbols must be accompanied by the crossed-out wheeled bin logo.

The capacity label requirement is only applicable for rechargeable, portable and automotive batteries (more information on Regulation (EU) 1103/2010).

The mercury restriction for batteries is less than 0,0005%. An exception is made for button cells: a mercury content less than 2% was allowed until 1 October 2015 (more information on Directive 2013/56/EU).

The mercury restriction for automotive batteries is stated in the End-of-Life Vehicles (ELV) (more information Directive 2000/53/EC).

The cadmium restriction for portable batteries is less than 0,002%. The restriction did not apply to battery packs for cordless power tools until 31 December 2016.

Medical devices/equipment and alarm/emergency systems are excluded for cadmium restrictions.

The EU is preparing new battery regulations which are expected to come into force in 2022 - 2023. The new regulations will envisage a circular economy of batteries and set sustainability requirements by requiring more information to be publicly available, enhanced traceability of batteries, increased recycling and reuse of batteries, and increased use of recycled raw materials. More information can be found:

https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2021)689337

ANNEX 5: REPAIR MANUAL CONTENT RECOMMENDATIONS

Repair manual must be available publicly either on the manufacturer's or the supplier's website, or on the open-source website dedicated for the development of repair culture such as ifixit.com so that repair professionals as well as local suppliers and users have access to such information.

The repair manual does not have specific format or technical requirements, but it is expected to contain the following topics.

SAFETY PROCEDURES

Nothing is more important than safety. The repair manual must provide safety measures to avoid accidental electrocution and other injuries. In addition to the personal safety, the procedures to assure equipment safety must be provided.

ENERGY SPECIFICATIONS

Power, voltage, and current used by the product must be clearly specified.

COMPONENT LIST

In order for a repair person to understand the product, it is essential to provide the list of components and component drawings. In addition, their placement can be shown in diagrams for a better understanding. For products containing multiple active components, it is advised to provide a block diagram as well as wiring and connection diagrams. The list must contain the specifications of the component (if generic component can be used to replace the original broken component) or the product number (if the component is specific to the product) so that a repair person can source a spare part.

LIST OF REQUIRED REPAIR TOOLS

Required repair tools must be clearly named with their specifications if necessary. If a special tool is required, it is the responsibility of the manufacturer to provide such tool(s) to each local supplier.

DIAGNOSTIC AND TESTING PROCEDURES

It is recommended to provide an overall approach to troubleshooting techniques so a repair person can understand the global and logical process of the product. Effective way to present the overall approach is by providing a flow chart with "yes or no" options that leads to identify the cause of fault. It is also helpful to provide testing procedures (if any) to confirm the cause of fault. In addition, if the use of basic test equipment (digital multimeters, capacitance checker, etc) can assure the safety and the diagnostic, it must be listed in the diagnostic section.

REPAIR SEQUENCES AND PROCEDURES

Each repair sequence must contain a specific disassembly sequence to remove the component to be repaired or exchanged and a step-by-step explanation of repair procedures. If applicable, instructions for installation of relevant software and firmware must

be provided. It is also useful to indicate where possible the level of difficulty of each repair sequence so the user will determine if it is self-repairable or not.

ANNEX 6: PROCUREMENT EVALUATION CRITERIA.

Proposed evaluation criteria and weighting for the procurement award process is an example. Your procurement team and tender committee should discuss what are the key requirements for the tender and weighting before formal engagement with suppliers.

REPAIR SHOP

Parameter	Criteria	Weighting Level
Service score	Range of servcies	High
	Service level	High
	Staff experience and skills	High
	Equipment, facilities and security	Medium
Economical score	Service pricing schema	high
	Insurance	Low
	Warranties	Medium
Sustainable criteria	Sustainable and safe working practices	High
	Level of dangerous and toxic material usage	High
	Storage of dangerous materials	High
	Waste management	High
Company reliability	Sustainable engagement (certification, code of conduct or equivalent)	High
	References	Medium
	Financially stable	Medium

ANNEX 7: PROCUREMENT REFERENCES

DUE DILIGENCE CHECKS

For screening the main sources are

- https://sanctionssearch.ofac.treas.gov/
- https://webgate.ec.europa.eu/europeaid/fsd/fsf
- B2B Supplier/
- Buyer Blacklist (SBBL)

Litigation check depends per country whether it is public data and easily accessible.

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Paid databases

- https://www.reprisk.com
- https://www.sustainalytics.com/ basic score is searchable, but again only stock listed companies)
- https://www.msci.com/our-solutions/esg-investing/esg-ratings, (there are many more).

STANDARDS, AUDITS AND CHARTERS

- ISO 2600 & 26001
- Global compact
- Ecovadis
- B-Corp


Solvoz