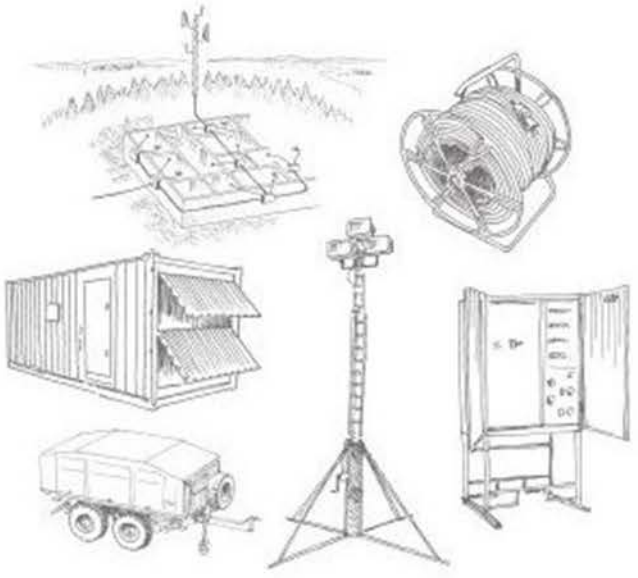
FMV

Excerpts from

"Safe Electrical Products and Systems Handbook"

(H SEPS) Requirements only



2015

FMV Handbook Safe electrical products and systems, H SEPS

Requirement summary

The requirements in H SEPS provide support for requirements in technical specifications and are either marked with bold numbers and a dark yellow background color for mandatory (shall) requirements or a light background color for non-mandatory (should) requirements.

It is recommended that the "shall" requirements are included in the specification.

Each project has to choose requirements based on the current specification. This also applies to the choice of performance levels, i.e. "shall" or "should" for each selected requirement.
The requirements in the handbook are numbered as shown in the example below, where 4.202.01 means:
4 = refers to requirements in H SEPS
202 = chapter 2, section 2
01 = first requirement in section 2

Technical systems or products including electricity, or equipment that are to be connected to electrical systems, constitute a complex area with comprehensive legislation and implementation of international and national standards.

H SEPS is a compilation of basic requirements to meet the Swedish National Electrical Safety Board and the Swedish Work Environment Authority regulations regarding electrical safety.

The tables below are consistent with the chapter numbering in H SEPS.

2.2 Electrical installation

4.202.01	The requirements of the Swedish Regulations for Electrical Installations **shall** be fulfilled.
4.202.02	Established standards for high and low voltage installations **shall** be applied.
4.202.03	Electrical installation work **shall** be carried out by, or under the supervision of, an authorised electrical contractor[1].
4.202.04	Electrical installation work **shall** be checked in accordance with applicable standards.
4.202.05	Fulfilment of all the above requirements **shall** be documented.

2.3 Electrical products (equipment)

4.203.01	The requirements of the Swedish Regulations for Electrical Products **shall** be fulfilled.
4.203.02	Established product standards or harmonised standards **shall** be applied.

[1] An authorised electrical contractor certified by the Swedish National Electrical Safety Board c.f. http://www.elsakerhetsverket.se/en/start-english/authorisation-as-electrical-contractor/.

4.203.03	Electrical products **shall** have a CE marking.
4.203.04	An EC/EEA Declaration of Conformity **shall** be provided.
4.203.05	Fulfilment of all the above requirements **shall** be documented.

3.4 Machines

4.304.01	The Swedish Work Environment Authority's regulations on machinery (AFS 2008:3) **shall** be adhered to.
4.304.02	A harmonised standard for the electrical parts of machinery **shall** be applied.
4.304.03	Electrical machinery **shall** be CE marked.
4.304.04	An EC/EEA Declaration of Conformity **shall** be provided.
4.304.05	Fulfilment of all the above requirements **shall** be documented in accordance with a relevant harmonised standard.

4.1 Procurement of electrical products/systems

4.401.01	The technical specification **shall** establish which electrical installation or electrical product to be procured.
4.404.02	The technical specification **shall**, if required by legislation, include CE marking requirements.
4.404.03	The technical specification **shall** include a specific requirement stating that the supplier will demonstrate, by documentation, which standards intended to be applied in the design, installation and inspection phases. This documentation is to be submitted to FMV before the start of the design phase.

5.1 Systems for public electrical distribution in Sweden

4.501.01	Technical systems or electrical products **shall** be designed for TN-S 230/400 V AC 50 Hz systems (there may be exceptions for certain systems or products).
4.501.02	Product documentation shall include technical data that enables analysis of each product's electrical load profile. Comments: What is primarily intended here is each product's load profile including affecting factors introduced by the electrical environment. See also the requirements in section 12.4, "Leakage currents and mains filters" (4.124.01 – 02).

6.1 FMV Design rules for Swedish Armed Forces´ electrical installations in field environments (FMEAF)

4.601.01	Technical systems or electrical products that are to be used in a field environment **shall** fulfil the FMEAF ("Swedish Armed Forces' electrical installations in field environments") requirements in FMV Designregel ("FMV Design Rules") with regards to • Earthing. • Generating sets and connected equipment. • The output configuration and impedance (Z) of generating sets. • Residual current devices in systems. • Electrical contractors. Comment: For advice, contact the Electrical Safety support function at FMV or FMV's Electrical Safety Advisory Board.

6.3 Electrical products for field environment

4.603.01	The requirements (FMEAF) in 4.601.01 above **shall** be fulfilled.
4.603.02	The requirements in 4.203.01 – 4.203.05 above **shall** be fulfilled.

6.3.1 Transportable generator sets

4.603.03	The requirements (FMEAF) in 4.601.01 above **shall** be fulfilled.
4.603.04	The requirements (machinery) in above 4.304.01 – 4.304.05 **shall** be fulfilled.

6.3.2 Transportable distribution boxes

4.603.04 [2]	The requirements (FMEAF) in 4.601.01 above **shall** be fulfilled.
4.603.05	The requirements in 4.203.01 – 4.203.05 **shall** be fulfilled.
4.603.06	Portable power distribution boxes **shall** have: • A robust design that withstands the mechanical wear created by for example transportation. • Tie down points. • Protection from water ingress during transportation. • Connectors located where they are protected from the climatic environment. • A design that prevents unauthorised connecting and disconnecting of connectors.

[2] The requirement numbers are duplicated also in the Swedish edition.

	• At least two connection points for earthing cables.

6.3.3 Cord sets – cable length and area

4.603.07	The requirements (FMEAF) in 4.601.01 **shall** be fulfilled.
4.603.08	The requirements in 4.203.01 – 4.203.05 **shall** be fulfilled.
4.603.09	To avoid unnecessarily large variation in connection cabling (e.g. for function containers, cabins and tents), FMV **shall** provide details of suitable connection cables and earthing cables with earthing rods.

6.5 Interface connection boxes intake ports etc.

4.605.01	The equipment **shall** include at least one connection point for an earthing cable and earthing rod and one earthling cable. The earthing cable **shall** be permanently connected to the equipment or be possible to connect by trained personnel.
4.605.02	The connection bay's input connector (e.g. for function containers and cabins) **shall** be rated at at least 32 A, thereby enabling the use of protective devices with a 300 mA rated residual operating current. Comment: Inputs rated below 20 A require protective devices with a 30 mA rated residual operating current.
4.605.03	If the connection bay has a hatch/door, it **shall** be possible to close this without damaging the connected cables. Comments: – Open, protruding doors present a risk of injury. – In certain cases, electrical equipment cannot withstand extreme weather conditions even if the protective enclosure requirements have been fulfilled.
4.605.04	If the input connector is rated at 63 A or higher, the incoming cables **shall** be suspended with a strain relief to prevent intermittent connection.
4.605.05	The connection bay **shall** include a 230 V power socket marked "Endast för service och underhåll" ("For service and maintenance only").
4.605.06	To avoid possible operating problems, each technical system or product **shall** have its own leakage current protection device. Comment: For advice, contact the Electrical Safety support person at FMV or FMV's Electrical Safety Advisory Board.

6.5.1 Lighting fixtures for permanent installation

4.605.07	Electrical products that include any form of lighting **shall**, in addition to having the correct enclosure rating, also have strengthened mounting brackets to

	withstand dynamic loads caused by transportation.
4.605.08	The requirements in 4.203.01 – 4.203.05 **shall** be fulfilled.

6.5.2 Lighting towers and lighting kits

4.605.09	To withstand the winds to which they are exposed, lighting masts **shall** have the necessary anchoring devices.
4.605.10	Lighting kits **shall** have devices for suspension or temporary mounting.
4.605.11	The requirements in 4.203.01 – 4.203.05 above **shall** be satisfied.

7.3 Equipment for military use

4.703.01	If a supplier refers to its own risk assessment with regard to electrical safety instead of to harmonised standards, the product in question **shall**, without having a CE Mark, be handled in accordance with the principles applying to CE marking.

7.4 Products procured outside the EU

4.704.01	Electrical products released on the European market **shall** have CE markings even if they are produced outside the EU.

7.5 Fulfillment of regulatory requirements

4.705.01	Products with a CE marking **shall** each have an EC/EEA Declaration of Conformity.

7.8 Control and verification of delivered electrical products

4.708.01	By documentation (inspection requirements included therein), the supplier **shall** be able to demonstrate: • Which standards form the basis of the electrical design. • How, and based on which standard(s), inspections have been carried out. • How the inspections were documented.

8.6 Benefits of harmonized standards

4.806.01	The supplier **shall** apply an internationally harmonised or Swedish standard for design, production and inspection. Comment: Use of the supplier's own risk assessments is to be avoided.
4.806.02	The supplier **shall** issue, in Swedish or English, an EC/EEA Declaration of Conformity and other electrical inspection documentation with respect to the electrical design.

9.5 Management of electrical risks

4.905.01	The supplier **shall** apply an internationally harmonised or Swedish standard for design, production and inspection. Comment: Applying an internationally harmonised or Swedish standard adresses the electrical risks.
4.905.02	If, during procurement, FMV presented design requirements entailing electrical risks that are not taken care of by a internationally harmonised or Swedish standard, the supplier **shall**, with documentation, demonstrate that the electrical risks have been taken care of, e.g. by applying specific military standards.

10.3.5 Isolation equipment

4.103.01	Protective devices for basic electrical protection **shall** be in accordance with a suitable product standard.
4.103.02	Electrical products that are to be used in a field environment **shall** fulfil the specific temperature, environmental and other military-specific requirements that the operations of the Swedish Armed Forces (FM) require for basic electrical protection.
4.103.03	It **shall** be possible to disconnect the electrical supply. Comment: This requirement is fulfilled by requiring the use of established standards.

11.2 General requirements for residual current devices (RCD) and residual current operated circuit breakers with integral overcurrent protection (RCBO)

4.112.01	A residual current operated circuit breaker with integral overcurrent protection (RCBO) and/or a residual current device (RCD) **shall** be provided as additional protection.
4.112.02	RCBOs and RCDs **shall** be of type A (alternating and pulsating direct current) and the total amount of leakage current for each circuit may not exceed ⅓ of the rated residual operating current of the connected equipment.
4.112.03	RCBOs and RCDs **shall** withstand encountered transients without tripping.
4.112.04	RCBOs and RCDs **shall** fulfil specified environmental and temperature requirements.
4.112.05	RCBOs and RCDs **shall** fulfil the disconnection requirement for electrical work.
4.112.06	To provide enhanced operational reliability, an RCBO **shall** be installed in each individual final circuit instead of an RCD that is common to the entire distribution board.
4.112.07	For RCBOs and RCDs, product documentation in the form of selectivity tables and other technical information **shall** be provided.

11.3 Residual current devices

4.113.01	Each residual current device (RCD) **shall** fulfil a current product standard and be designed for the correct frequency and operating voltage. Comment: Observation of the above is particularly important as RCDs are installed in special technical systems or electrical products where operating voltages and frequency are not 230/400 V, 50 Hz.
4.113.02	RCDs **shall** be of type A.
4.113.03	Any RCD installed as, for example, installation-wide protection in a function container, **shall** have a rating of 100 mA and, in each outgoing final circuit, being followed by a 30 mA RCBO.

11.4 Residual current operated circuit breakers with integral overcurrent protection

4.114.01	Each residual current operated circuit breaker with integral overcurrent protection (RCBO) **shall** satisfy a current product standard and be designed for the correct frequency and operating voltage. Remarks: Observation of the above is particularly important as RCDs/RCBOs are installed in special technical systems or electrical products where operating voltages and frequency are not 230/400 V, 50 Hz.
4.114.02	RCBOs **shall** be of type A.
4.114.03	Any RCBO installed as, for example, common protection in a function container **shall** have a rating of 100 mA and, in each outgoing final circuit, being followed by a 30 mA RCBO.

12.4 Leakage currents and line filters

4.124.01	The sum of the leakage currents in a product (e.g. a function container) **shall** not entail negative consequences for the protective devices of the supply distribution network. Comment: For advice contact the Electrical Safety support person at FMV or FMV's Electrical Safety Advisory Board.
4.124.02	EMC protection (e.g. mains filters) **shall** have a rating that does not generate abnormally high leakage currents in field operation or storage. Note that a residual current device or a residual current operated circuit breaker with integral overcurrent protection with a rated fault current of 30 mA can trip at as low current as around 22 – 25 mA.