



Window requirements for forestry machines

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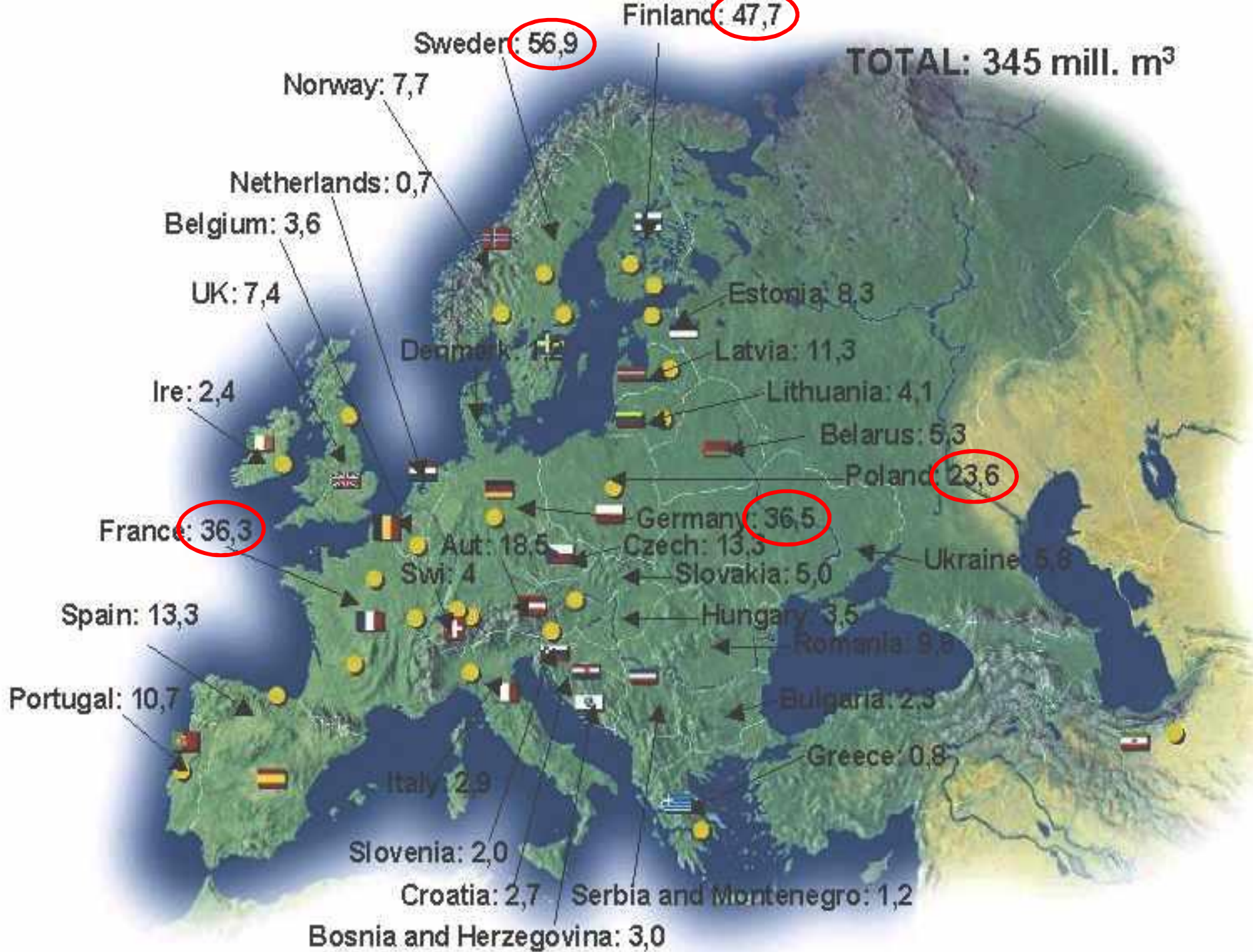
Basic requirements for machine

- Machine directive 2006/42/EC
- ISO 11850 Machinery for forestry – Self-propelled machinery – Safety requirements (EN 14861)
- ISO 8083 Machinery for forestry – Falling-object protective structures
- ISO 8084 Machinery for forestry – Operator protective structures
- ISO 10263-5 Earth moving machinery – Operator enclosure environment – Part 5: Windscreen defrosting system test method
- Forest machines are not under Tractor directive
=> Road requirements for windows varies


= > PROBLEMS


Why Road requirements is needed?

- Some countries forest machines are driven on road to transfer different working sites
- Specially done in Germany, Sweden, Austria, France and Finland
- Long distance transports are done with trailer
- Sometimes registration is needed for insurance reasons or for bank loan
- Current approvals for 12 mm clear polycarbonate:
 - ANSI 26.1 Z (AS 4)
 - Germany national approval (~D –number)



Forestry Products

643K WHEELED FELLER BUNCHER
141 kW (189 net hp) 

843K WHEELED FELLER BUNCHER
181 kW (243 net hp) 


540G-III CABLE SKIDDER
96 kW (129 SAE gross hp) 


640h CABLE SKIDDER
128 kW (172 SAE gross hp) 

548G-III GRAPPLE SKIDDER
96 kW (129 SAE gross hp) 

648h GRAPPLE SKIDDER
128 kW (172 SAE gross hp) 

748h GRAPPLE SKIDDER
141 kW (193 SAE gross hp) 

848h GRAPPLE SKIDDER
149 kW (200 SAE gross hp) 

335D KNUCKLEBOOM
129 kW (173 hp) 

437D KNUCKLEBOOM
129 kW (173 hp) 


703JH TRACKED HARVESTER
135 kW (181 hp) 

753JH TRACKED HARVESTER
180 kW (241 hp) 

759JH TRACKED HARVESTER
180 kW (241 hp) 


903KH TRACKED HARVESTER
224 kW (300 hp) 


909KH TRACKED HARVESTER
224 kW (300 hp) 

903K TRACKED FELLER BUNCHER
224 kW (300 net peak power) 

909K TRACKED FELLER BUNCHER
224 kW (300 net peak power) 

953K TRACKED FELLER BUNCHER
246 kW (330 net peak power) 

959K TRACKED FELLER BUNCHER
246 kW (330 net peak power) 


1070E WHEELED HARVESTER
136 kW (182 hp) 

1170E WHEELED HARVESTER
145 kW (194 hp) 

1270E WHEELED HARVESTER
170 kW (228 hp) 

1470E WHEELED HARVESTER
190 kW (225 hp) 

810E FORWARDER
95 kW (127 hp) 

1010E FORWARDER
115.5 kW (155 hp) 

1110E FORWARDER
136 kW (183 hp) 

1210E FORWARDER
136 kW (183 hp) 

1510E FORWARDER
145 kW (195 hp) 

1910E FORWARDER
186 kW (249 SAE hp) 

1490D ECO III ENERGY WOOD HARVESTER
136 kW (182 hp) 

2154D SWING MACHINE/ROAD BUILDER
125 kW (168 hp) 

2454D SWING MACHINE/ROAD BUILDER
145 kW (194 hp) 

2954D SWING MACHINE/ROAD BUILDER
145 kW (194 hp) 

3754D SWING MACHINE/ROAD BUILDER
220 kW (296 hp) 

2154D SWING MACHINE/PROCESSOR
125 kW (168 net hp) 

2454D SWING MACHINE/PROCESSOR
145 kW (194 net hp) 

2954D SWING MACHINE/PROCESSOR
145 kW (194 net hp) 

2154D SWING MACHINE/DELIMBER
125 kW (168 SAE net hp) 

2454D SWING MACHINE/DELIMBER
145 kW (194 SAE net hp) 

2154D SWING MACHINE/LOG LOADER
125 kW (168 hp) 


2454D SWING MACHINE/LOG LOADER
145 kW (194 hp) 

2954D SWING MACHINE/LOG LOADER
145 kW (194 hp) 

3754D SWING MACHINE/LOG LOADER
220 kW (296 hp) 

753J TRACKED FELLER BUNCHER
180 kW (241 hp) 

759J TRACKED FELLER BUNCHER
180 kW (241 hp) 

 Manufactured in Joensuu Finland





Wheel Loader Harvesters

770D

1070E

1170E

1270E

1470E



LET'S TAKE A LOOK...

Forwarders

- 810E
- 1010E
- 1110E
- 1210E
- 1510E
- 1910E



SOME VIDEO...

Window protection ISO 8084 OPS

4.3 Procedure

4.3.1 Slowly apply the force (5 mm/s max., to approximate static loading) from the test object normal to the exterior surface under test until this applied force attains a value of 17 800 N. Sustain the force at this value for 1 min before releasing it.

4.3.2 In the case of open-mesh material, apply the loading such that the projection of the line of force passes through the centre of the mesh opening.

5.1 Test acceptance

When the test is performed anywhere on the OPS, the DLV, in accordance with ISO 3164, shall not be entered by any part of the OPS or the test object, and the major diameter of the test object shall not pass through the surface under test.

Frontscheibe (front window)



Belastung der Scheibenmitte bei Testende
(loading of the centre at end of test)

Window protection against logs #1



Window protection against logs #2



Window protection against logs #3



Window protection against logs #4



ISO 8083 FOPS

4.3 Test procedure

4.3.3 Raise the drop test object vertically to a height above the position indicated in 4.3.1 and 4.3.2 to develop an energy of 5 800 J or 11 600 J based on the mass of an object shaped as shown in figure 1. Two energy levels are given : national authorities may choose the level of requirement according to local conditions such as log size, etc. The drop test object shall be aimed to impact at a location on the FOPS to produce the maximum deflection.



Nach dem Auftreffen des Fallkörpers auf das FOPS-Gitter- Ansicht von der Unterseite
(After the drop of the falling object on the FOPS-grid – view from down side)

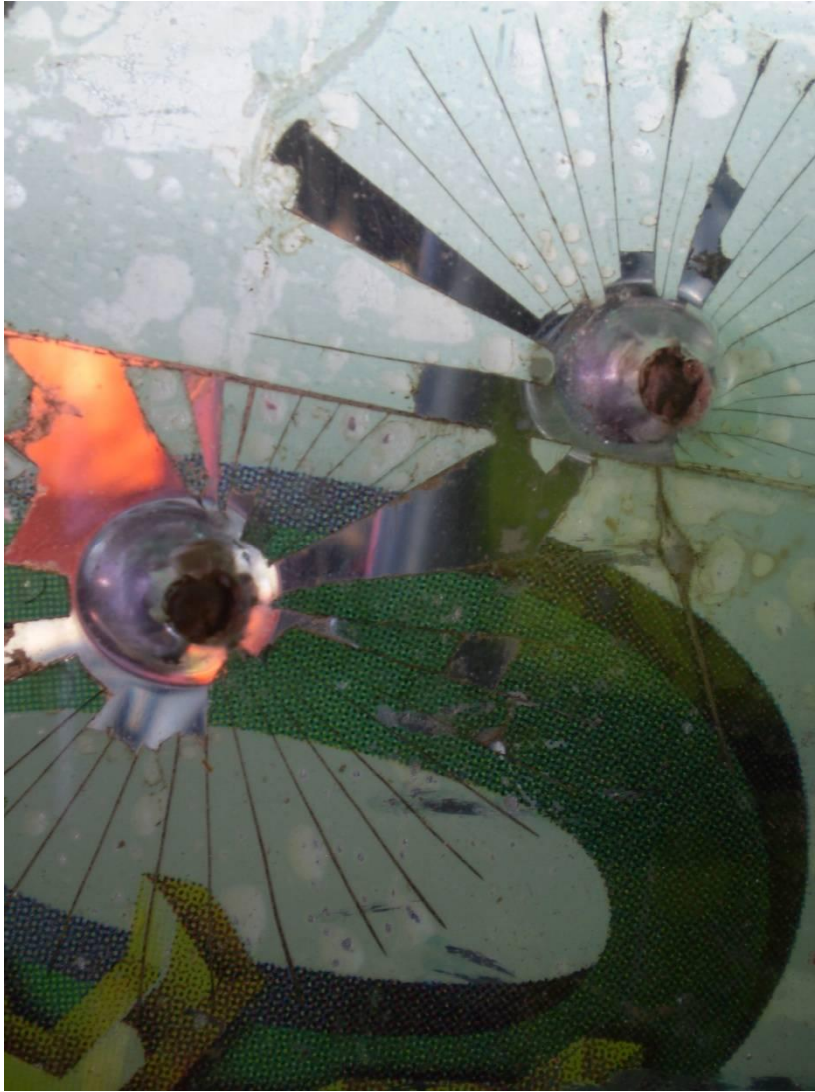
5.1 Protective properties

The protective properties of the FOPS system shall be estimated by the ability of the cabin or protective structure to retain its safety zone intact after the impact. The DLV as defined in 3.2 and specified in 4.2.1 shall not be entered by any part of the protective structure under the first or subsequent impact of the drop test object. If the drop test object penetrates the DLV, the FOPS shall be deemed to have failed.



Riffle bullet?

It is a deere, for sure?



Other risks like broken chain

What is chain shot

Chain does break during sawing

1-3 chain links loose and fly

Even 450 m/s speed measured

Link/object rotation speed even 400.000 rpm,
one piece

58 000 – 200 000 rpm if more than one chain

98 % of chain shots do not hit cabin

Risk for operator and other persons outside
cabin

Piece of chain, no full penetration (12 mm)

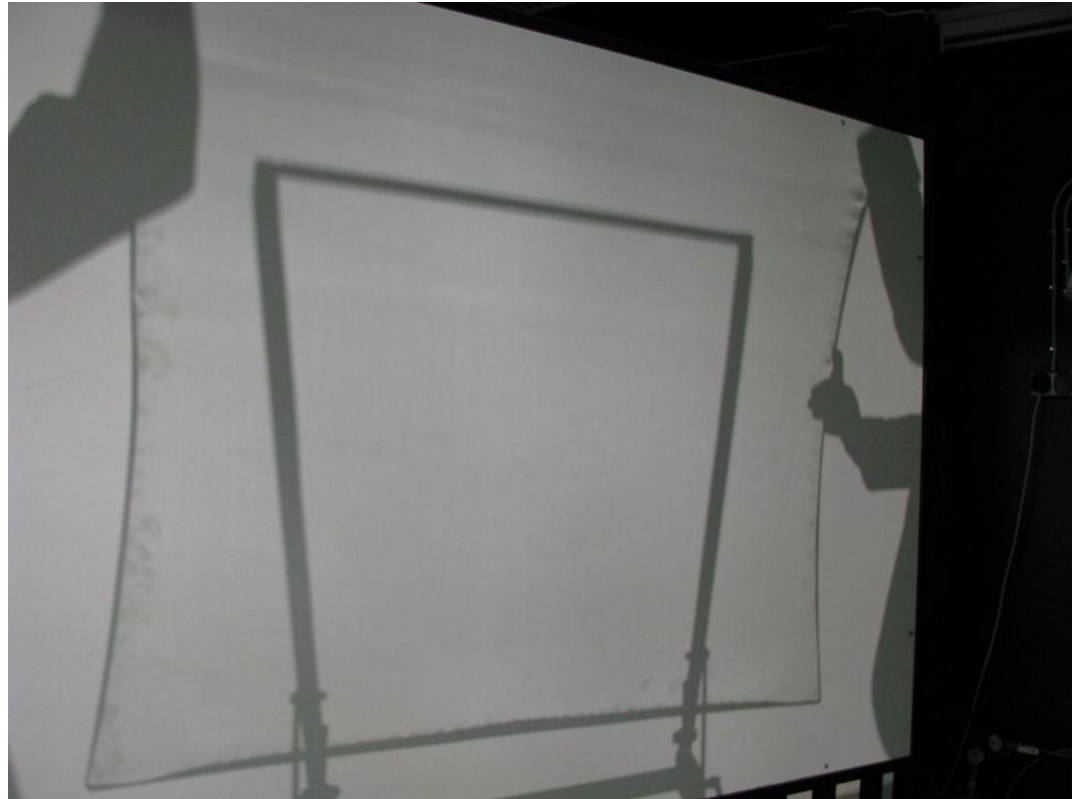


Optics ECE 43 R

Old 12 mm polycarbonate



4 + 4 mm laminated standard, preferred optics



Problems with polycarbonate (12 mm)

- All broken glasses have had different structure than OPS tests
- Scratches from metal wipers parts
- Deeper scratches than hard coating => certain washing liquids have been harmful for carbonate (currently not recognized as a problem)
- Stone impacts not really but ... other hard particles
- Polishing is not acceptable (hair type scratches)
- Earlier some problems with gluing and coating
- Optics
- Noise?
- Direct sun heat (IR-radiation)
- Poor heat transfer (de-frosting time)
- Secondary exit is needed (carbonate won't break)!
- Cabin fire, increased burning material in case of cabin fire

BUT

=> ONLY MATERIAL WHICH IS ACCEPTED FOR FOREST APPLICATIONS



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