HOLZ FORSCHUNG AUSTRIA

Wood chips & hog fuel

The standards and classification of fuel properties in this brochure (2013) no longer corresponds to the current status.
The classification into raw material groups can still serve as a guideline.

Introduction

The energetic use of biomass is widely spread in Austria. In order to meet the growing demand for renewable energy through solid biofuels emphasis must be laid on the efficient use of these fuels in the future. Huge differences in quality can be found especially in wood chips and hog fuel, which may lead to lower efficiency in the combustion process and increased maintenance of boilers. Short supply chains and low processing increase the influence of the raw material on the final quality of the fuel.
OENORM C 4005, which was published in 2013, takes this into account by the formation of raw material groups. Still, also the production, transport and storage of the fuel can lead to significant changes in quality.

The examples described should give producers, traders and consumers of wood chips and hog fuel insight into the range of existing fuel qualities and raise awareness for the efficient use of solid biofuels.

The classification of fuel properties is based on the following standards:

OENORM C 4005:2013-02 Wood chips and hog fuel for energetic use in heating appliances with a thermal output over 500 kW

ISO/FDIS 17225-1:2013-05 Solid biofuels - Fuel specifications and classes - Part 1: General requirements

ISO/FDIS 17225-1 is expected to replace the currently valid EN 14961-1 in 2014 as an EN ISO 17225-1 and will require **further adaption of OENORM C 4005**. This adaption mainly affects the particle size classification as well as the content of fine particles, as already can be seen in the comparison of the results according to OENORM C 4005 and ISO/FDIS 17225-1.

The reading of this example collection requires knowledge of the above mentioned standards and does not replace their acquisition.

Explanation

The product declarations of the examples include the following information:

OENORM C 4005 **'traded form' 'raw material group' 'particle size' 'moisture content' 'ash content' 'content of fine particles' 'nitrogen' 'chlorine'**

If no values are given for A, F, N and Cl they correspond to the typical values given in OENORM C 4005 for the respective raw material group. For some examples single properties are not given due to missing analyses; in this case the respective properties are missing for the results of the ISO/FDIS 17225-1 as well.

ISO/FDIS 17225-1 **'traded form' 'raw material class' 'particle size' 'moisture content' 'ash content' 'content of fines' 'bulk density as received' 'nitrogen' 'sulphur' 'chlorine' 'net calorific value as received'**

In case of missing analyses the next property class is given.

Production **'comminution unit' 'screen size' 'post-treatment' 'mixing ratio raw material'**
If no information exists for comminution unit, screen size and post-treatment, 'ns' is given. If no "mixing ratio raw material" is given, the solid biofuel consits to 100% of only one raw material class.

'The register divides each raw material group according to OENORM C 4005'

Raw material group C1

Raw material – origin and source

1.1.1.1 Whole trees without roots, deciduous
1.1.3.1 Stemwood, deciduous
1.1.3.2 Stemwood, coniferous
1.1.3.3 Stemwood, blends and mixtures

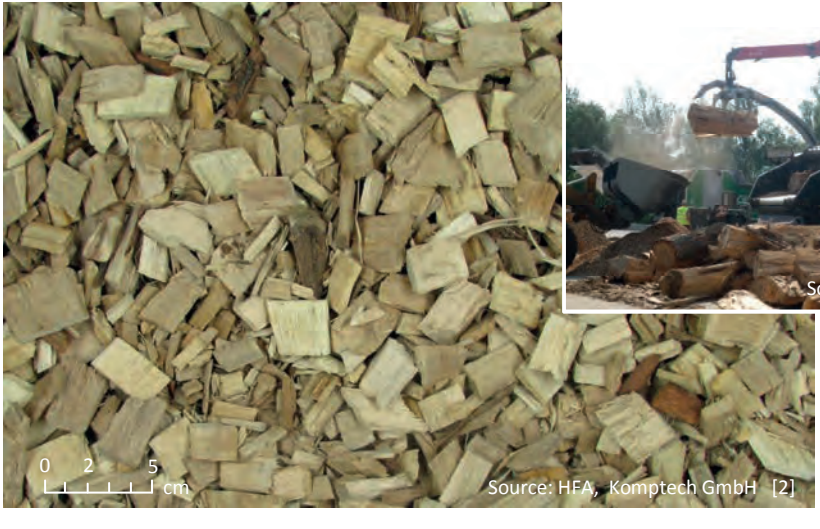
Typical values: A2.0 F15

The examples include mixtures with raw material from C1 or ≤ 25% of the raw material group 1.1.4.3. This raw material group has no or negligible amounts of needles.

C1

OENORM C 4005 wood chips C1 P45B M55

ISO/FDIS 17225-1 wood chips 1.1.3.1 P31 M55 A1.5 F05
production drum chipper 60 mm



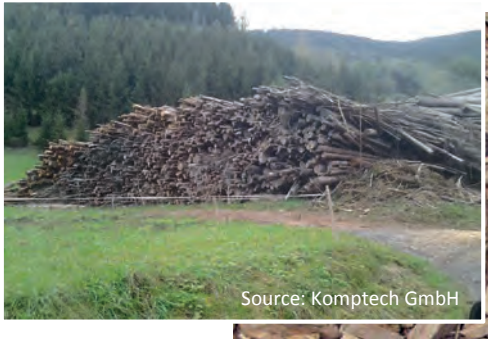
Source: HFA, Komptech GmbH [2]


Source: Komptech GmbH

OENORM C 4005 wood chips C1 P45B M35

ISO/FDIS 17225-1 wood chips 1.1.3.2 P16 M25 A1.0 F10
production drum chipper 45 mm

C1

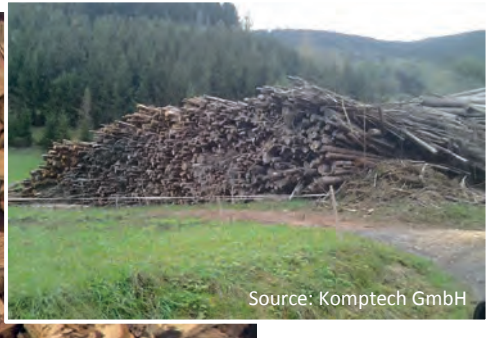


C1

OENORM C 4005 wood chips C1 P63 M35

ISO/FDIS 17225-1 wood chips 1.1.3.2 P31 M30 A0.5 F10
production drum chipper 80 mm

Source: HFA, Komptech GmbH [12]



Source: Komptech GmbH

OENORM C 4005 wood chips C1 P45B M35

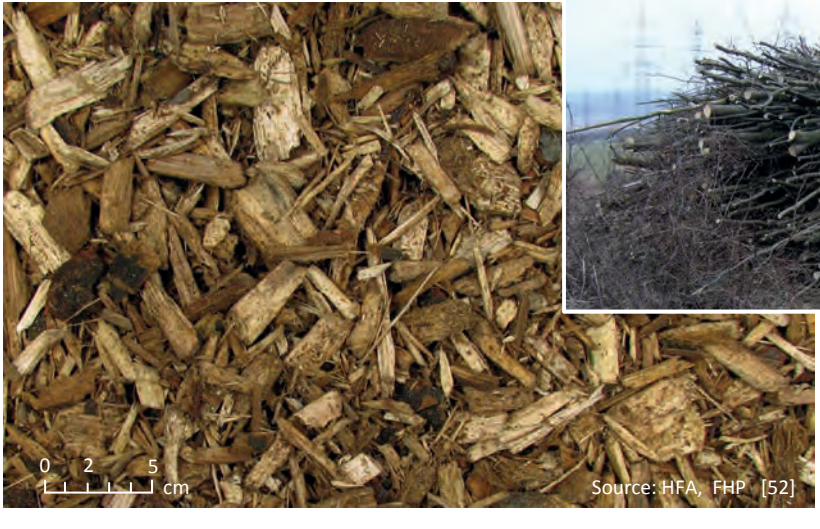
ISO/FDIS 17225-1 wood chips 1.1.3.1 P31 M25 A1.5 F15 BD250 N0.3
production drum chipper 80 mm

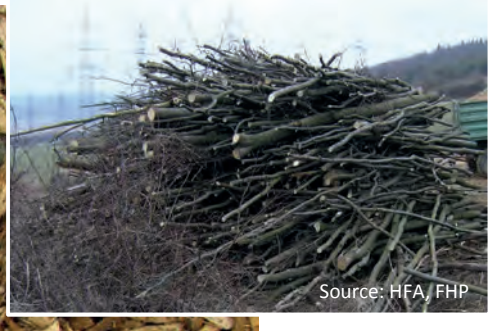
C1

C1

OENORM C 4005 wood chips C1 P63 M45

ISO/FDIS 17225-1 wood chips 1.1.3.1 P31 M40 A2.0 F15 BD350 N0.3 S0.04 Cl0.02
production drum chipper 30 mm





OENORM C 4005 wood chips C1 P63 M55

C1

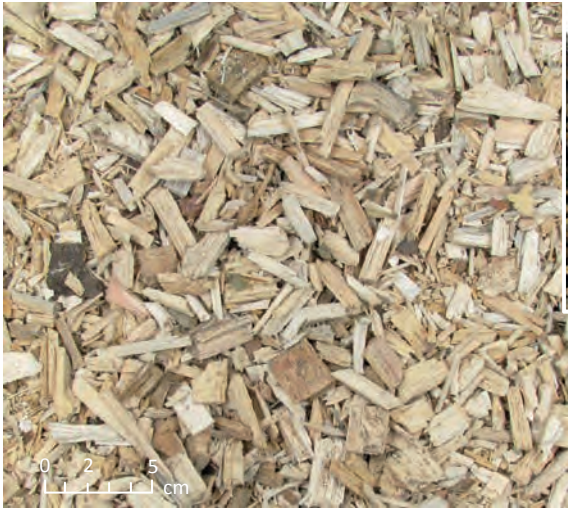
ISO/FDIS 17225-1 wood chips 1.1.1.1 P45 M50 A2.0 F10 BD250 N0.3 S0.03 Cl0.02 Q8.3

production disc chipper

C1

OENORM C 4005 wood chips C1 P45B M45

ISO/FDIS 17225-1 wood chips 1.1.3.2 P16 M40 A0.7 F15 BD250 N0.2 S0.02 Cl0.02
production drum chipper 40 mm



Source: HFA, FHP

Source: HFA, FHP [64]

OENORM C 4005 wood chips C1 P63 M35

C1

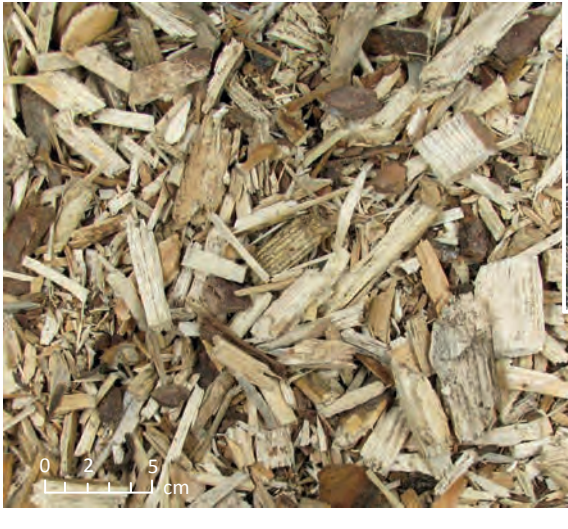
ISO/FDIS 17225-1 wood chips 1.1.3.3 P31 M35 A1.0 F05 BD250 N0.2 S0.02 Cl0.02 Q12.4

production drum chipper 80 mm 50% 1.1.3.1 50% 1.1.3.2

C1

OENORM C 4005 wood chips C1 P45B M35

ISO/FDIS 17225-1 wood chips 1.1.3.2 P45 M30 A1.5 F15 BD250 N0.2 S0.03 Cl0.02
production drum chipper 80 mm

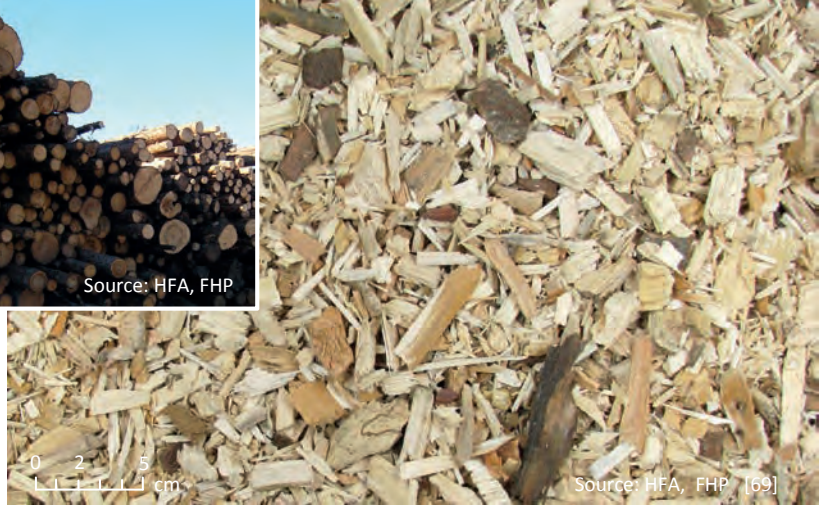


Source: HFA, FHP [68]

OENORM C 4005 wood chips C1 P63 M35

C1

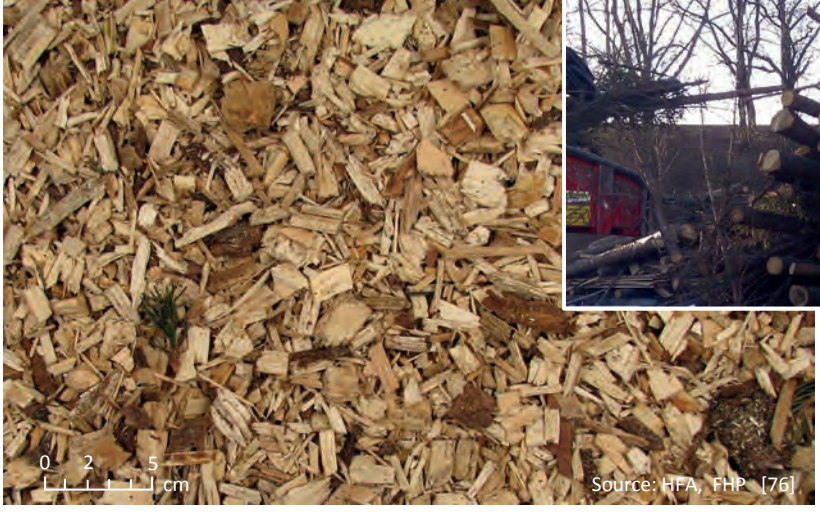
ISO/FDIS 17225-1 wood chips 1.1.3.2 P16 M25 A0.7 F15 BD200 N0.2 S0.02 Cl0.02
production drum chipper 50 mm



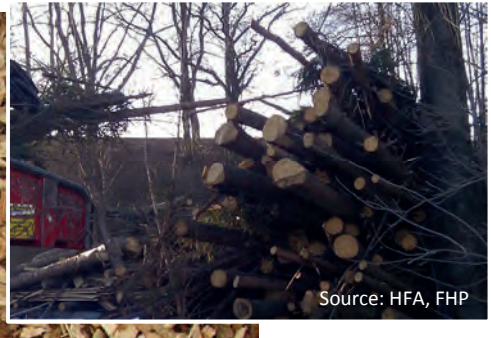
C1

OENORM C 4005 wood chips C1 P45B M45

ISO/FDIS 17225-1 wood chips 1.1.8 P16 M40 A1.0 F15 BD250 N0.2 S0.02 Cl0.02
production drum chipper ns 95% 1.1.3.1 5% 1.1.4.1/1.1.4.3



Source: HFA, FHP [76]

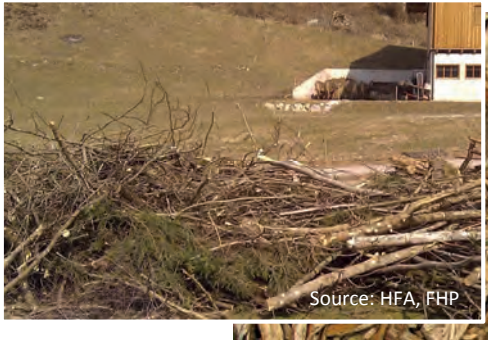


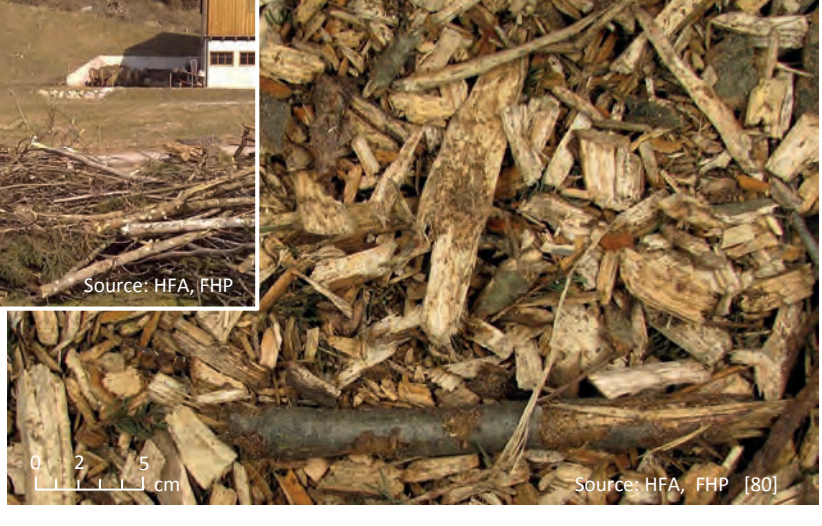
Source: HFA, FHP

OENORM C 4005 wood chips C1 P63 M45

C1

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M40 A2.0 F15 BD300 N0.2 S0.03 Cl0.02
production drum chipper 80 mm 65% 1.1.3.1 10% 1.1.3.2 20% 1.1.4.1/1.1.4.3 5% 1.1.4.2

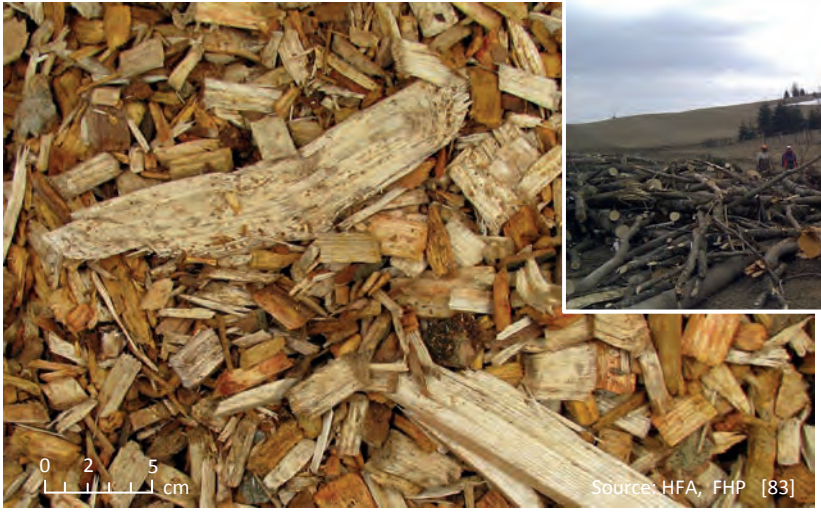


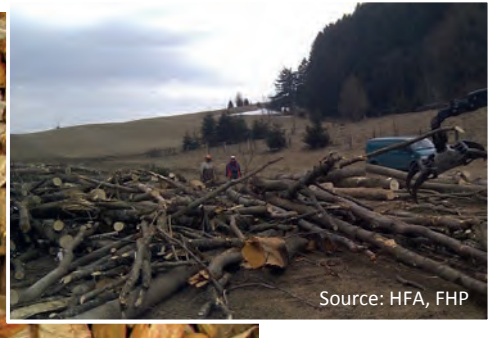


C1

OENORM C 4005 wood chips C1 P63 M45

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M40 A1.5 F05 BD300 N0.2 S0.02 Cl0.02
production drum chipper ns 20% 1.1.1.1 80% 1.1.3.1

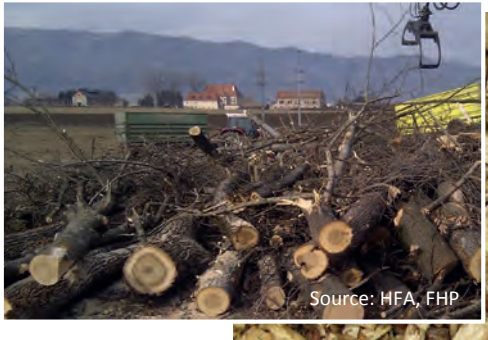




OENORM C 4005 wood chips C1 P63 M55

C1

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M55 A2.0 F10 BD350 N0.2 S0.04 Cl0.02
production drum chipper 100 mm 55% 1.1.1.1 30% 1.1.3.1 15% 1.1.4.1/1.1.4.3


Source: HFA, FHP

Source: HFA, FHP [86]

C1

OENORM C 4005 wood chips C1 P45B M35 F25

ISO/FDIS 17225-1 wood chips 1.1.8 P16 M35 A1.0 F20 BD250 N0.2 S0.02 Cl0.02
production drum chipper ns 90% 1.1.3.1 10% 1.1.4.1/1.1.4.3

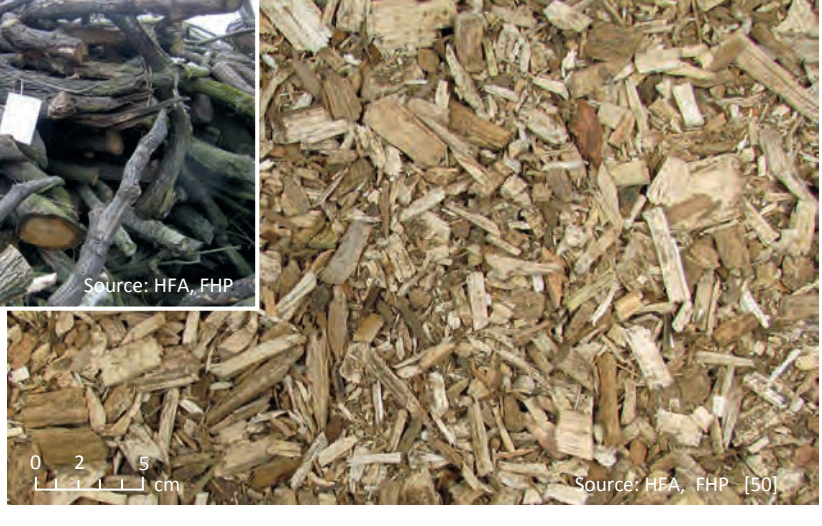
Source: HFA, FHP [75]

Source: HFA, FHP

OENORM C 4005 wood chips C1 P45B M35 A3.0 F25

ISO/FDIS 17225-1 wood chips 1.1.8 P31 M30 A3.0 F20 BD250 S0.03 Cl0.02
production drum chipper 80 mm 90% 1.1.3.1 10% 1.1.4.1/1.1.4.3

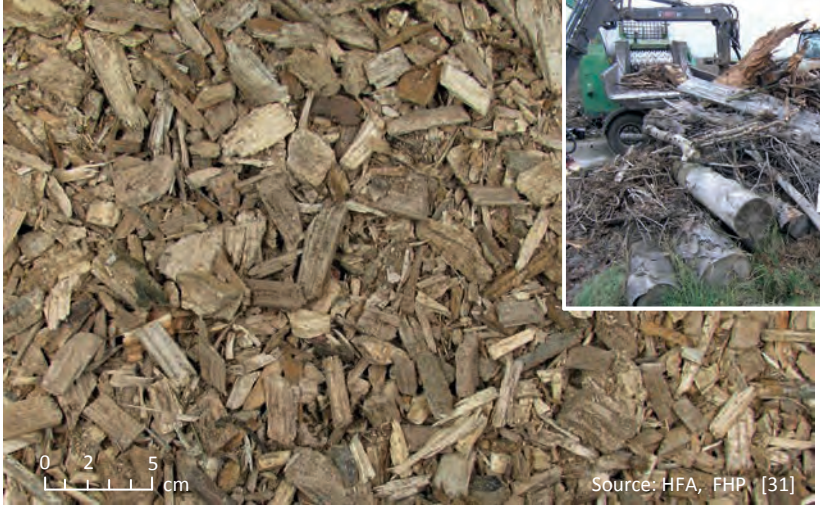
C1



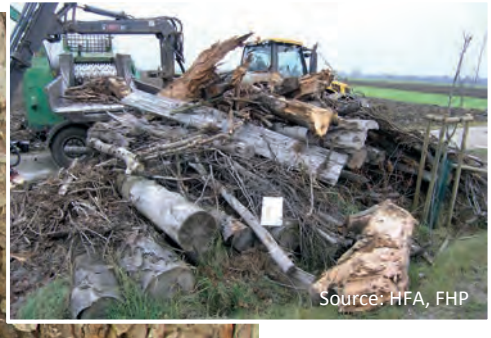
C1

OENORM C 4005 wood chips C1 P45B M35 A5.0

ISO/FDIS 17225-1 wood chips 1.1.8 P31 M30 A5.0 F15 BD350 N0.2 S0.02 Cl0.02
production drum chipper 35 mm 90% 1.1.3.1 10% 1.1.4.1/1.1.4.3



Source: HFA, FHP [31]

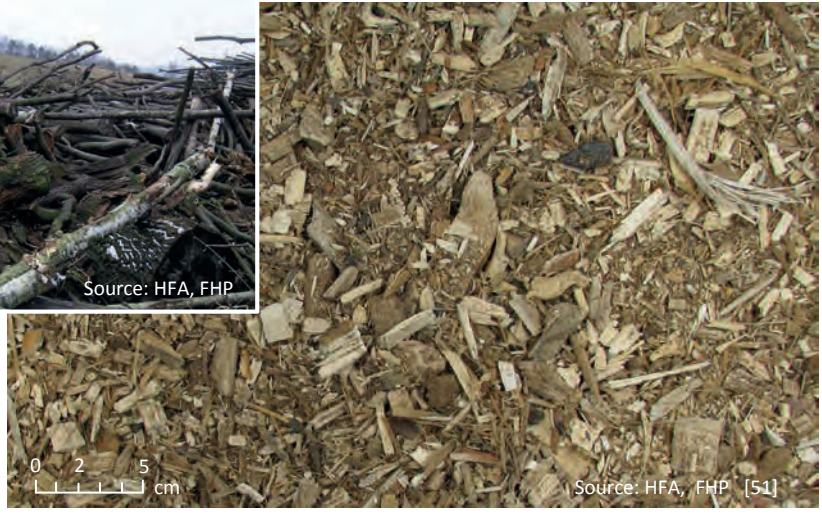


Source: HFA, FHP

OENORM C 4005 wood chips C1 P- M35 A5.0 F- N0.5

ISO/FDIS 17225-1 wood chips 1.1.8 P31 M35 A5.0 F30+ BD250 N0.5 S0.08 Cl0.02
production drum chipper 30 mm 75% 1.1.3.1 25% 1.1.4.1/1.1.4.3

C1



Raw material group C2

C2

Raw material – origin and source

1.1.1.2 Whole trees without roots, coniferous
1.1.4.3 Logging residues, deciduous, stored

Typical values: A3.0 F15

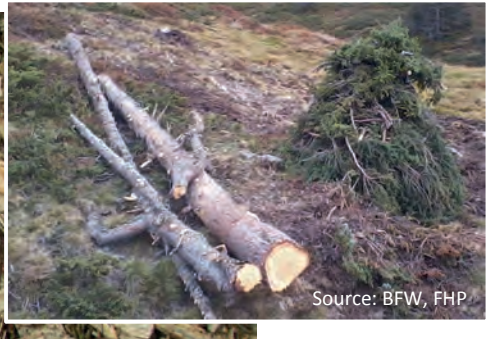
The examples include mixtures with raw material from C1, C2 or ≤ 25% of the raw material classes 1.1.4.1, 1.1.4.2, 1.1.4. The overall share of coniferous wood with a branch diameter < 4 cm is 25%.

OENORM C 4005 wood chips C2 P100 M55

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M50 F10
production drum chipper 80x100 mm 75% 1.1.3.2 25% 1.1.4.2

C2

Source: HFA, BFW, FHP [122]



Source: BFW, FHP

OENORM C 4005 wood chips C2 P45B M35

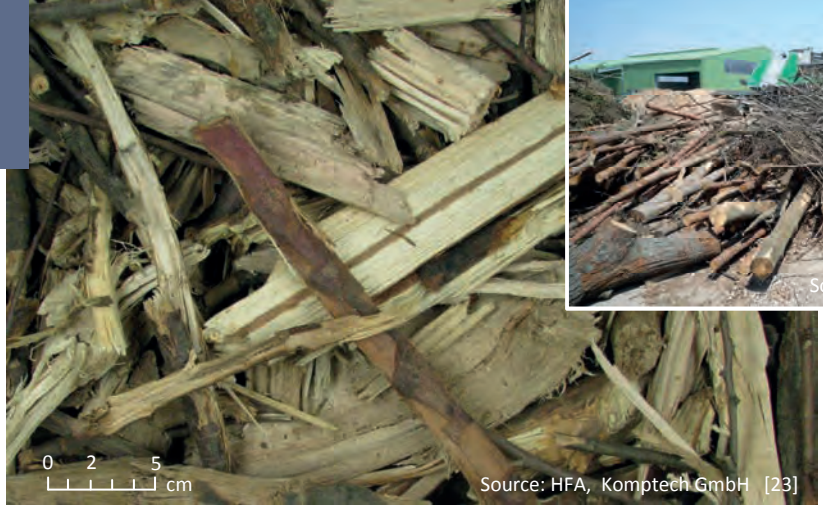
ISO/FDIS 17225-1 wood chips 1.1.4.3 P45 M25 F10
production drum chipper 80 mm

C2

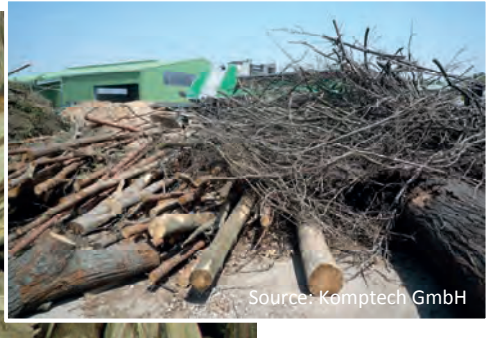
OENORM C 4005 hogfuel C2 P- M35

ISO/FDIS 17225-1 hogfuel 1.1.4.3 P300 M25 A2.0 F05 Q14.1
production shredder XL post-treatment

C2



Source: HFA, Komptech GmbH [23]

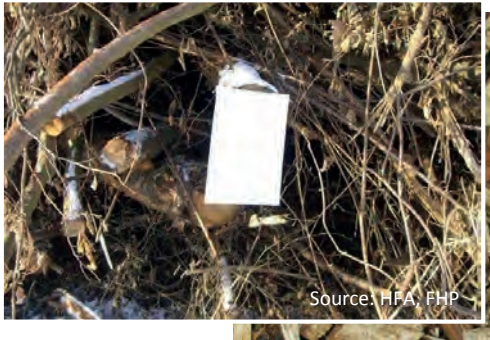


Source: Komptech GmbH

OENORM C 4005 wood chips C2 P45B M45

ISO/FDIS 17225-1 wood chips 1.1.4.5 P45 M40 A2.0 F10 N0.3 S0.04 Cl0.02
production drum chipper 50 mm 75% 1.1.4.1/1.1.4.3 25% 1.1.4.2

C2



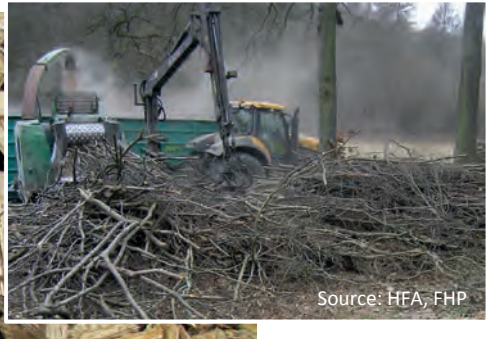
OENORM C 4005 wood chips C2 P45B M35

ISO/FDIS 17225-1 wood chips 1.1.4.3 P45 M30 A3.0 F10 BD250 N0.3 S0.04 Cl0.02 Q12.6

production drum chipper 70 mm

C2

Source: HFA, FHP [53]

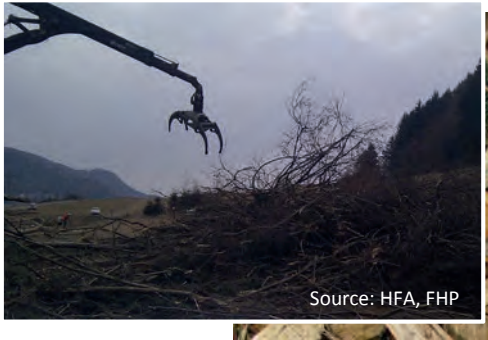


Source: HFA, FHP

OENORM C 4005 wood chips C2 P- M45

ISO/FDIS 17225-1	wood chips	1.1.8	P200	M40	A2.0	F10	BD250	N0.3	S0.04	Cl0.02
production	drum chipper	ns	20% 1.1.3.1	10% 1.1.3.2	55% 1.1.4.1/1.1.4.3			15% 1.1.4.2		

C2


Source: HFA, FHP

Source: HFA, FHP [81]

OENORM C 4005 wood chips C2 P45B M55

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M55 A3.0 F15 BD350 N0.3 S0.05 Cl0.02
production drum chipper 100 mm 40% 1.1.1.1 60% 1.1.4.1/1.1.4.3

C2

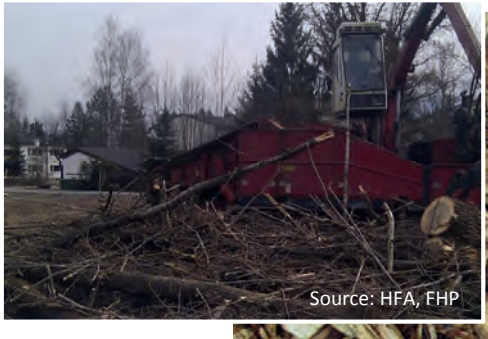
Source: HFA, FHP [84]

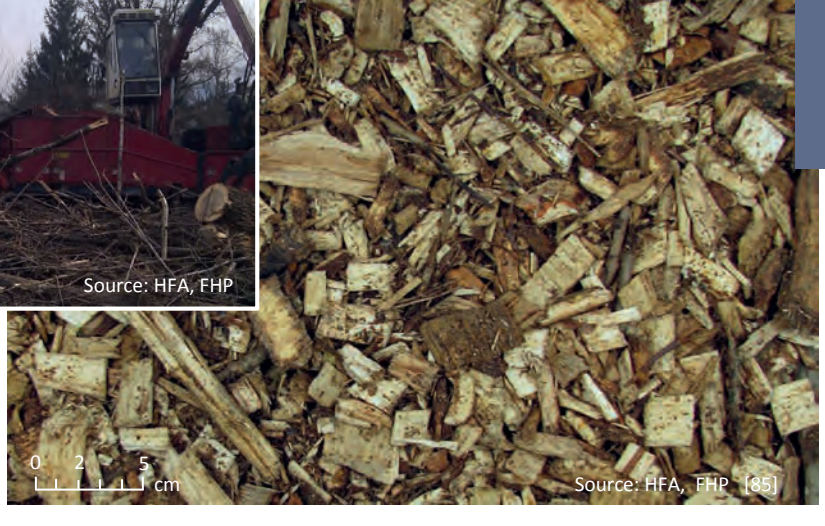
Source: HFA, FHP

OENORM C 4005 wood chips C2 P45B M55

ISO/FDIS 17225-1 wood chips 1.1.8 P31 M55 A3.0 F10 BD350 N0.5 S0.08 Cl0.02
production drum chipper 100 mm 30% 1.1.1.1 20% 1.1.3.1 50% 1.1.4.1/1.1.4.3

C2


Source: HFA, FHP



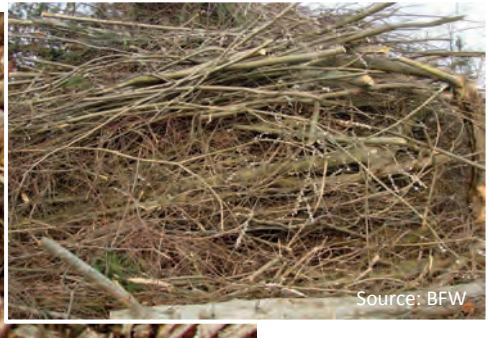
Source: HFA, FHP [85]

OENORM C 4005 **wood chips C2 P63 M55 A5.0**

ISO/FDIS 17225-1 **wood chips 1.1.8 P45 M50 A5.0 F15**
production **drum chipper 80 mm 50% 1.1.3.1 50% 1.1.4.1/1.1.4.3**

C2

Source: HFA, BFW [124]

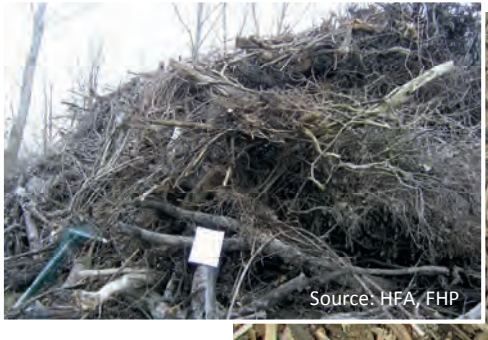


Source: BFW

OENORM C 4005 wood chips C2 P45B M35 A7.0 F25

ISO/FDIS 17225-1 wood chips 1.1.8 P16 M25 A7.0 F20 BD250 N0.5 S0.08 Cl0.02
production drum chipper ns 15% 1.1.3.1 85% 1.1.4.1/1.1.4.3

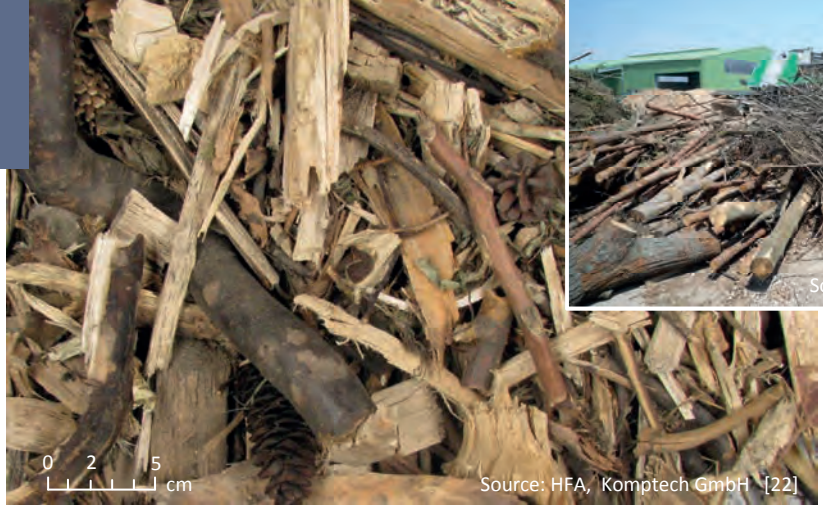
C2



OENORM C 4005 hogfuel C2 P- M35 A7.0+

ISO/FDIS 17225-1 hogfuel 1.1.4.3 P300 M25 A10.0+ F15 Q12.0
production shredder 100 mm

C2



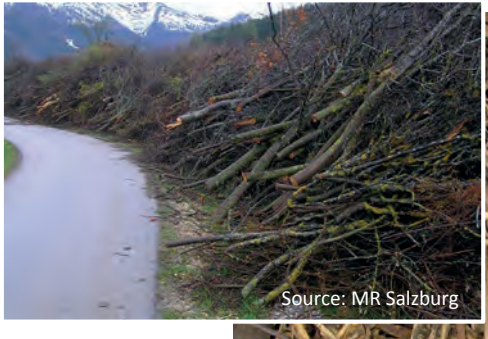
Source: HFA, Komptech GmbH [22]

Source: Komptech GmbH

OENORM C 4005 **wood chips C2 P- M45** **A7.0+ F-**

ISO/FDIS 17225-1 **wood chips 1.1.4.3 P45 M45 A10.0+ F30+**
production **drum chipper 90 mm**

C2



Raw material group C3

C3

Raw material – origin and source

1.1.1.3 Whole trees without roots, short rotation coppice
1.1.1.4 Whole trees without roots, bushes
1.1.1.5 Whole trees without roots, blends and mixtures
1.1.4.1 Logging residues, deciduous (fresh/green, includes leaves)
1.1.4.2 Logging residues, coniferous (fresh/green, includes needles)
1.1.4.4 Logging residues, coniferous, stored
1.1.4.5 Logging residues, blends and mixtures
1.1.7 Wood from gardens, parks, roadside maintenance, vineyards, fruit orchards

Typical values: A5.0 F25

The examples include mixtures with raw material from C1, C2 and C3.

OENORM C 4005 wood chips C3 P63 M45

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M45 F20
production drum chipper 80x100 mm 50% 1.1.3.2 50% 1.1.4.2

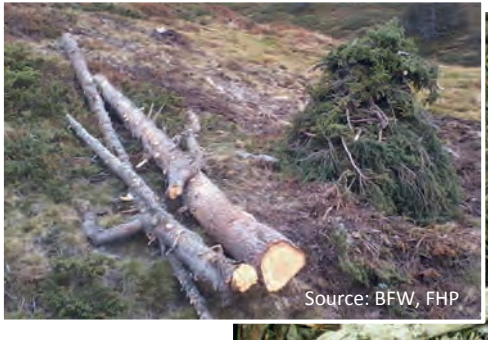
C3

Source: HFA, BFW, FHP [121]

Source: BFW, FHP

OENORM C 4005 wood chips C3 P100 M45

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M45 F25
production drum chipper 80x100 mm 25% 1.1.3.2 75% 1.1.4.2



C3

OENORM C 4005 wood chips C3 P45B M55

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M50 A3.0 F20
production drum chipper 81 mm 50% 1.1.3.2 50% 1.1.4.2

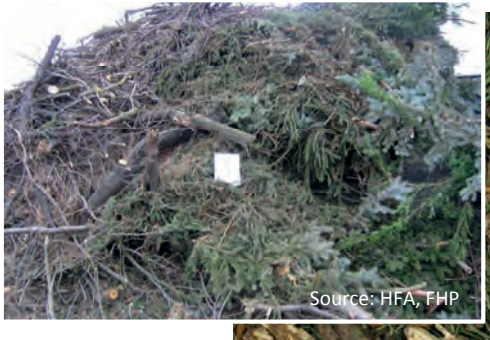
C3

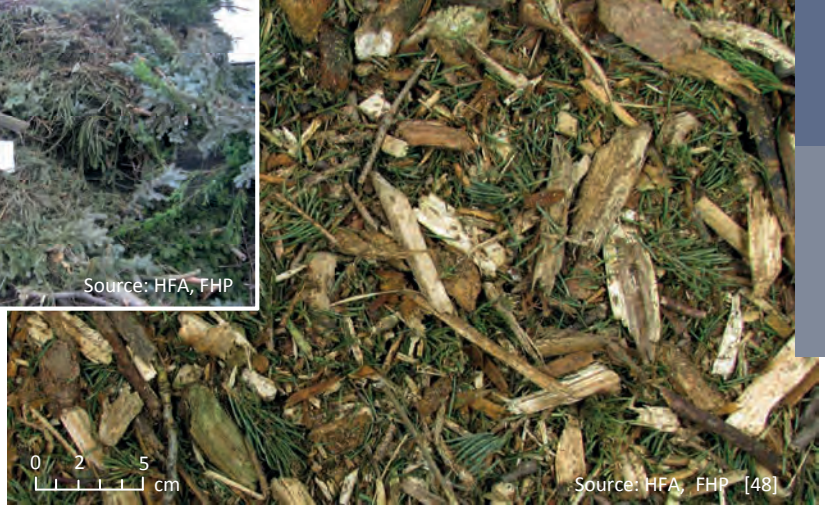
Source: HFA, BFW [125]

Source: BFW

OENORM C 4005 wood chips C3 P45B M45

ISO/FDIS 17225-1 wood chips 1.1.4.5 P45 M45 A5.0 F25 BD300 N1.0 S0.08 Cl0.05
production drum chipper 80 mm 50% 1.1.4.1/1.1.4.3 50% 1.1.4.2





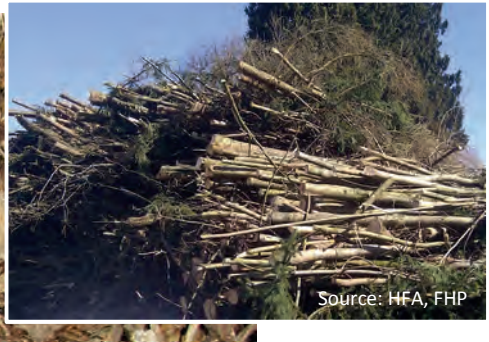
C3

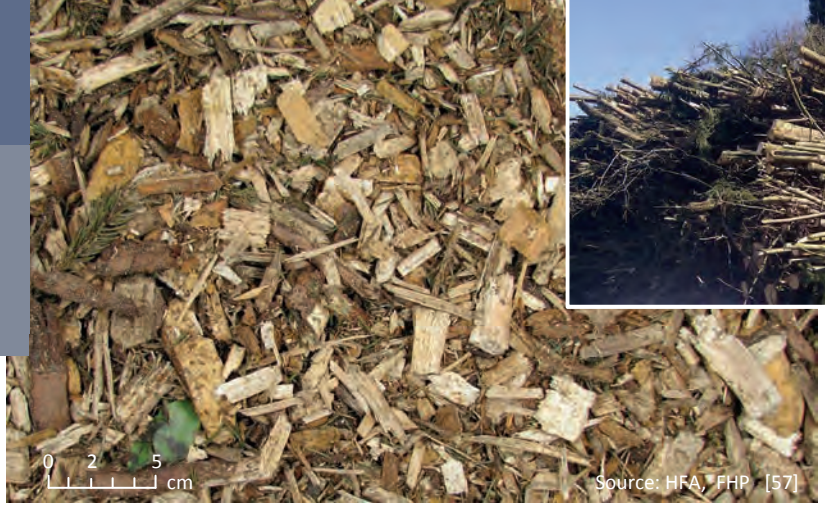
OENORM C 4005 wood chips C3 P63 M55

ISO/FDIS 17225-1 wood chips 1.1.8 P31 M50 A3.0 F15 BD300 N0.2 S0.03 Cl0.02

production drum chipper 100 mm 5% 1.1.3.1 5% 1.1.3.2 20% 1.1.4.1/1.1.4.3 60% 1.1.4.2 10% 1.1.7

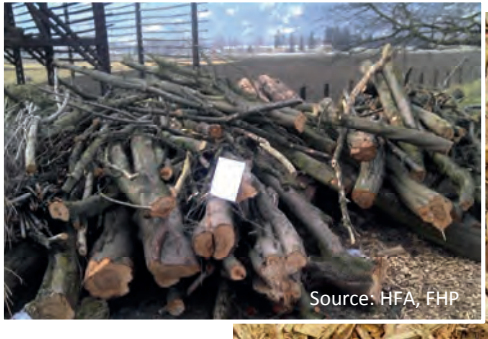
C3

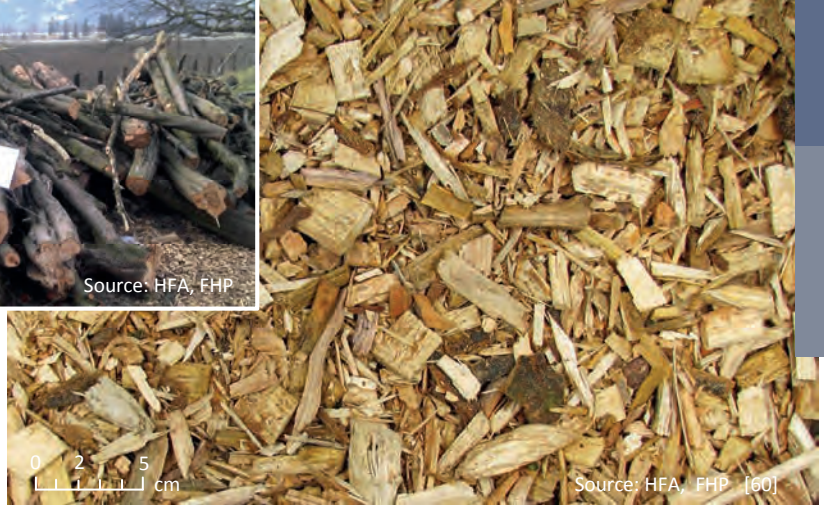




OENORM C 4005 wood chips C3 P45B M45

ISO/FDIS 17225-1 wood chips 1.1.8 P16 M45 A1.5 F15 BD250 N0.2 S0.03 Cl0.02
production drum chipper ns 50% 1.1.3.2 50% 1.1.7


Source: HFA, FHP



Source: HFA, FHP [60]

C3

OENORM C 4005 wood chips C3 P100 M35

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M25 A1.0 F05 BD200 N0.2 S0.02 Cl0.02
production drum chipper ns 75% 1.1.3.2 25% 1.1.7

C3

Source: HFA, FHP [61]

Source: HFA, FHP

OENORM C 4005 wood chips C3 P45B M55

ISO/FDIS 17225-1 wood chips 1.1.7 P31 M55 A1.5 F15 BD300 N0.2 S0.03 Cl0.02
production drum chipper ns

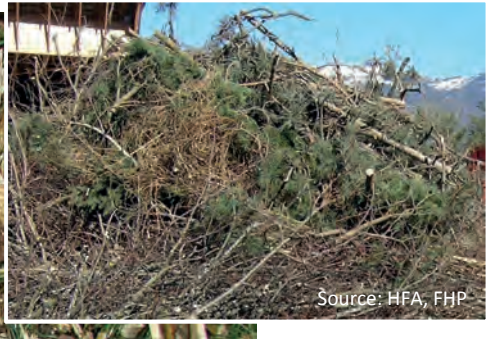
C3

OENORM C 4005 wood chips C3 P63 M45

ISO/FDIS 17225-1 wood chips 1.1.4.2 P31 M45 A3.0 F25 BD300 N0.5 S0.04 Cl0.02
production drum chipper 80 mm

C3

Source: HFA, FHP [71]

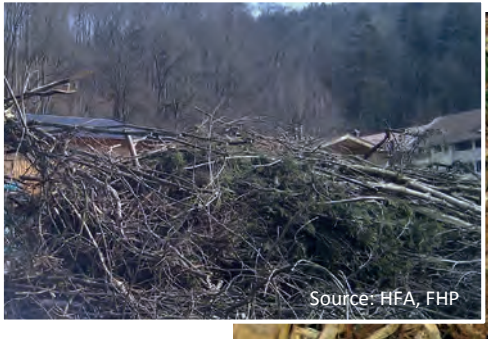


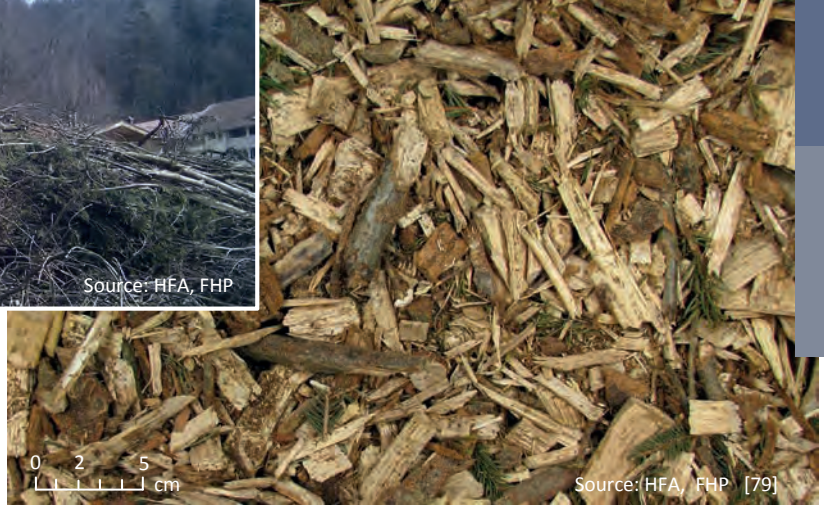
Source: HFA, FHP

OENORM C 4005 wood chips C3 P- M45

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M40 A2.0 F15 BD350 N0.5 S0.04 Cl0.02

production drum chipper 80 mm 10% 1.1.1.1 5% 1.1.1.2 15% 1.1.3.1 15% 1.1.3.2 20% 1.1.4.1/1.1.4.3 20% 1.1.4.2 15% 1.1.7



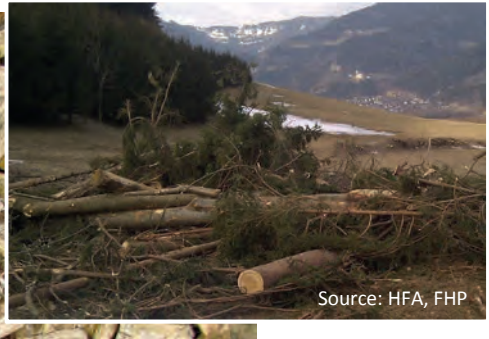


C3

OENORM C 4005 wood chips C3 P63 M45

ISO/FDIS 17225-1 wood chips 1.1.8 P45 M45 A3.0 F20 BD300 N0.2 S0.03 Cl0.02
production drum chipper ns 10% 1.1.1.1 20% 1.1.1.2 40% 1.1.4.1/1.1.4.3 30% 1.1.4.2

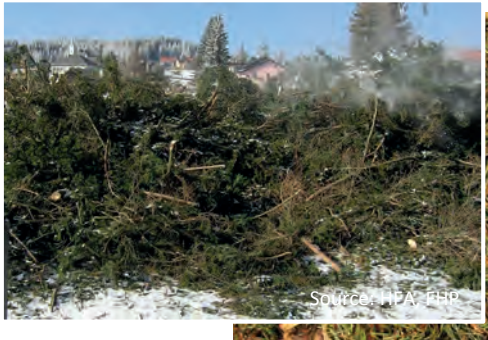
C3


Source: HFA, FHP

Source: HFA, FHP [82]

OENORM C 4005 wood chips C3 P- M55+ F-

ISO/FDIS 17225-1 wood chips 1.1.4.4 P- M55+ A5.0 F30+ BD350 N1.0 S0.08 Cl0.05 Q6.4
production drum chipper 100 mm



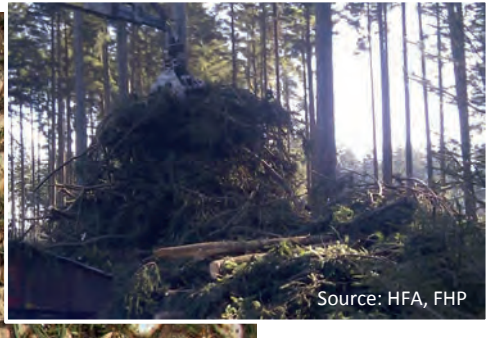
C3

OENORM C 4005 **wood chips C3 P- M55 F-**

ISO/FDIS 17225-1 **wood chips 1.1.4.5 P31 M50 A2.0 F30 BD350 N0.5 S0.05 Cl0.02**
production **drum chipper ns 10% 1.1.4.1/1.1.4.3 90% 1.1.4.2**

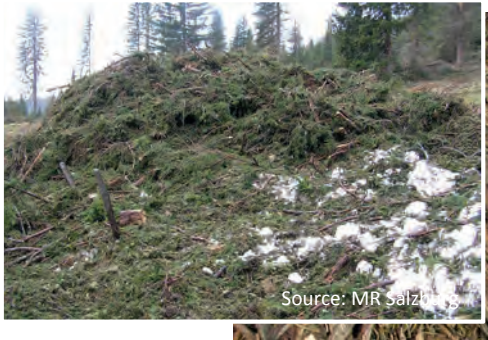
C3

Source: HFA, FHP [77]


Source: HFA, FHP

OENORM C 4005 wood chips C3 P- M55+ A7.0 F-

ISO/FDIS 17225-1 wood chips 1.1.4.2 P- M55+ A7.0 F30+
production drum chipper 90 mm



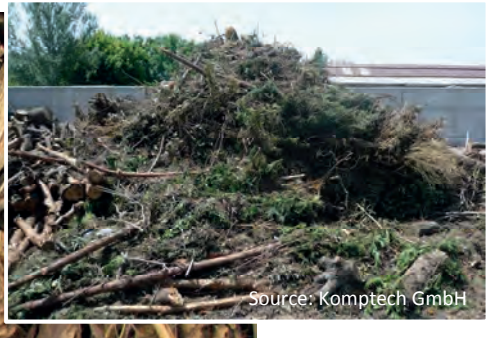
C3

OENORM C 4005 hogfuel C3 P100 M45 A7.0+

ISO/FDIS 17225-1 hogfuel 1.1.7 P45 M40 A10.0 F10 Q10.0
production shredder XL post-treatment

C3

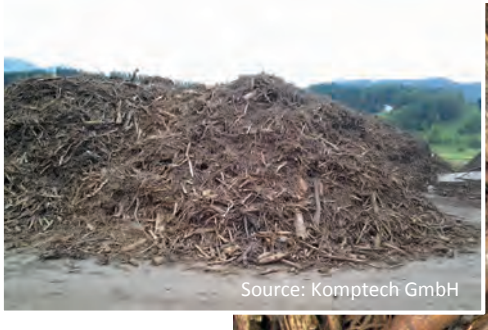
Source: HFA, Komptech GmbH [19]

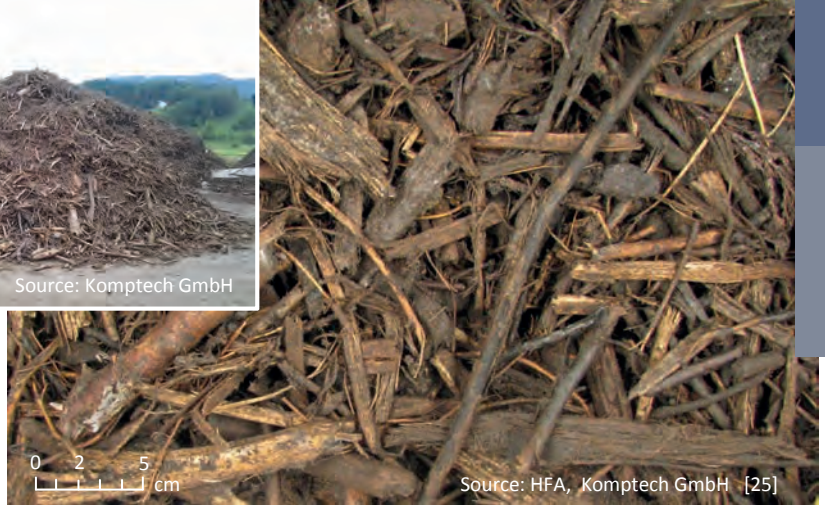


Source: Komptech GmbH

OENORM C 4005 hogfuel C3 P- M45 A7.0+

ISO/FDIS 17225-1 hogfuel 1.1.7 P200 M45 A10.0+ F10 N0.3 S0.05 Cl0.05 Q6.3
production shredder 250 mm post-treatment


Source: Komptech GmbH



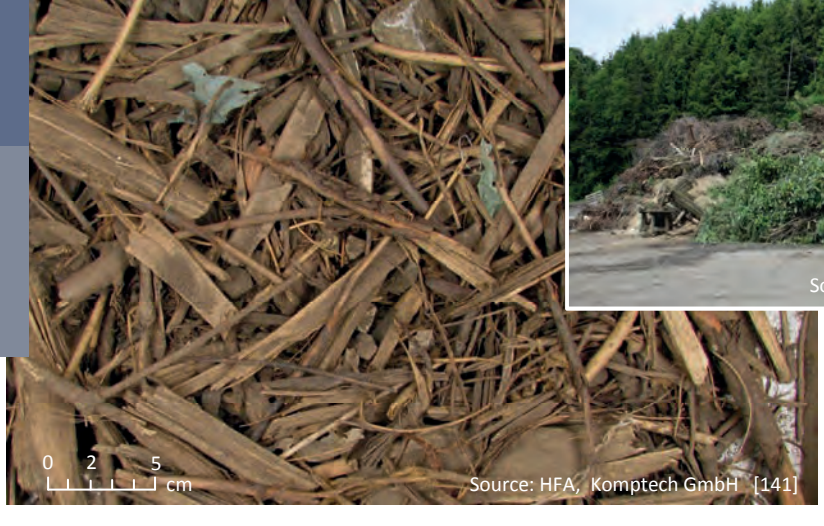
Source: HFA, Komptech GmbH [25]

C3

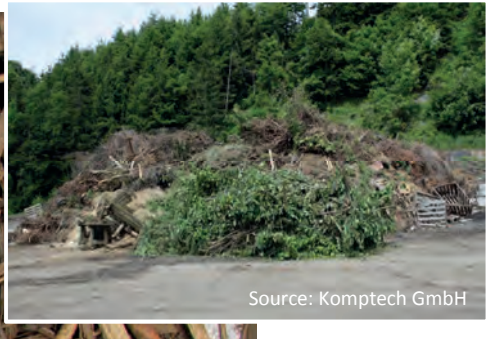
OENORM C 4005 hogfuel C3 P- M35 A7.0+

ISO/FDIS 17225-1 hogfuel 1.1.7 P300 M30 A10.0+ F15
production shredder 300 mm post-treatment

C3



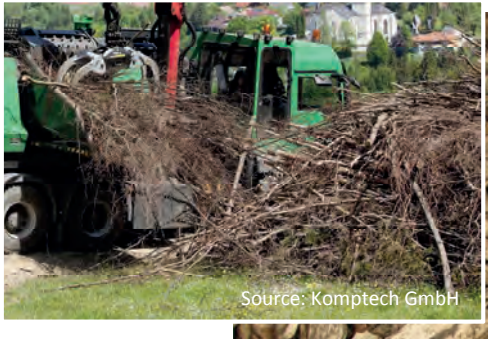
Source: HFA, Komptech GmbH [141]



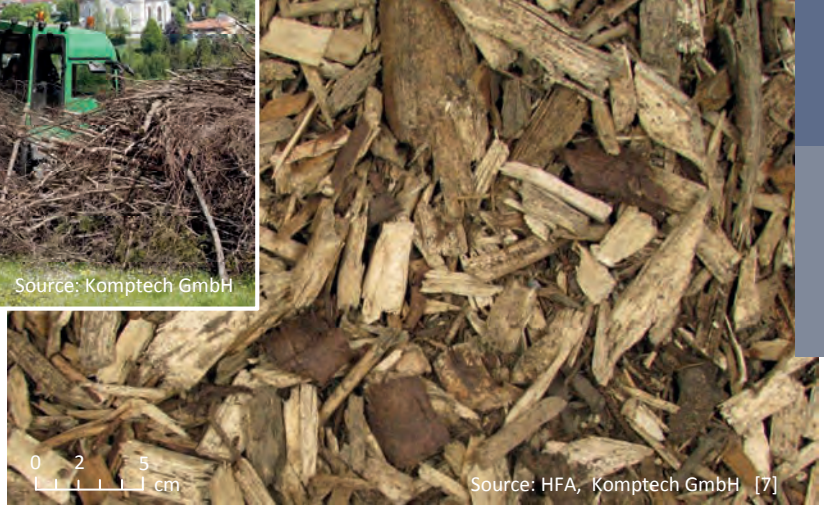
Source: Komptech GmbH

OENORM C 4005 **wood chips C3 P45B M55** **A7.0+**

ISO/FDIS 17225-1 **wood chips 1.1.4.2 P31 M55 A10.0 F25 Q7.6**
production **drum chipper 80 mm**



Source: Komptech GmbH



Source: HFA, Komptech GmbH [7]

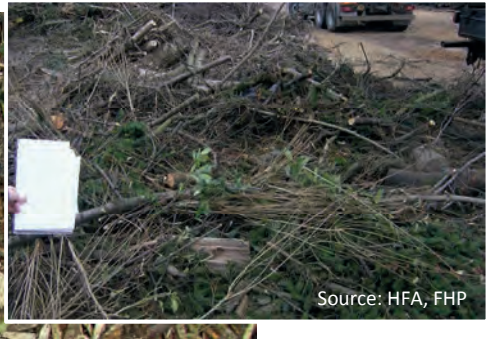
C3

OENORM C 4005 **wood chips** **C3** **P63** **M45** **A7.0+**

ISO/FDIS 17225-1 **wood chips** **1.1.4.5** **P31** **M45** **A10.0** **F25** **BD350** **N0.5** **S0.08** **Cl0.02**
production **drum chipper** **80 mm** **80%** **1.1.4.1/1.1.4.3** **20%** **1.1.4.2**

C3

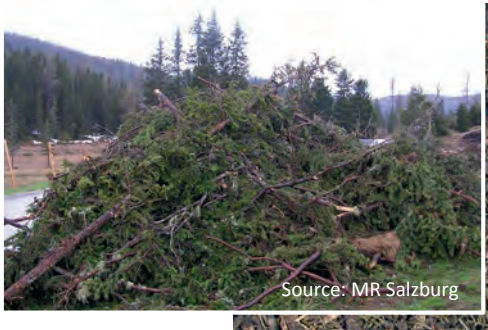
Source: HFA, FHP [49]



Source: HFA, FHP

OENORM C 4005 wood chips C3 P- M55+ A7.0+ F-

ISO/FDIS 17225-1 wood chips 1.1.4.2 P- M55+ A10.0 F30+
production drum chipper 90 mm


Source: MR Salzburg

Source: HFA, MR Salzburg [131]

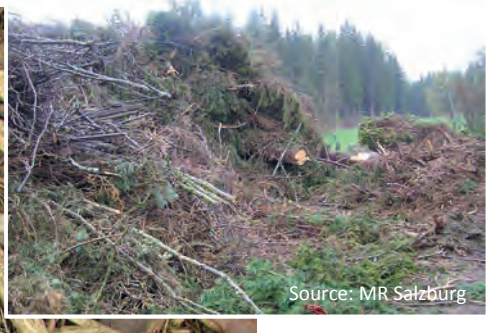
C3

OENORM C 4005 **wood chips C3 P- M55 A7.0+ F-**

ISO/FDIS 17225-1 **wood chips 1.1.4.2 P- M50 A10.0+ F30+**
production **drum chipper 90 mm**

C3

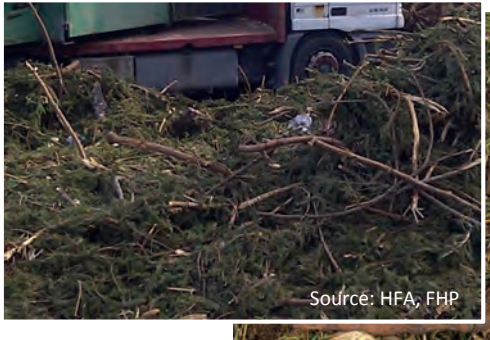
Source: HFA, MR Salzburg [133]

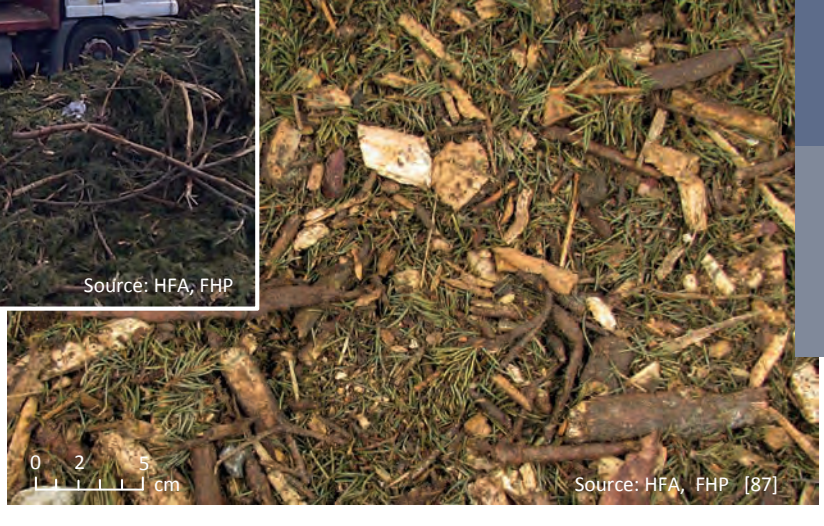

Source: MR Salzburg

OENORM C 4005 **wood chips C3 P- M55+ A7.0+ F-**

ISO/FDIS 17225-1 **wood chips 1.1.4.2 P45 M55+ A10.0 F30 BD350 N0.5 S0.08 Cl0.02**

production **drum chipper 80 mm**





C3

Raw material group C4

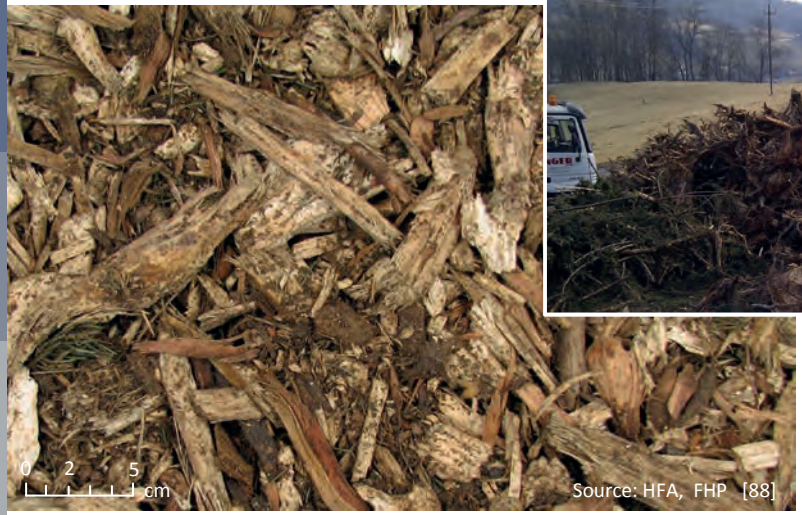
Raw material – origin and source

1.1.2 Whole trees with roots
1.1.5 Stumps/roots
1.1.6 Bark (from forestry operations)
1.1.8 Blends and mixtures

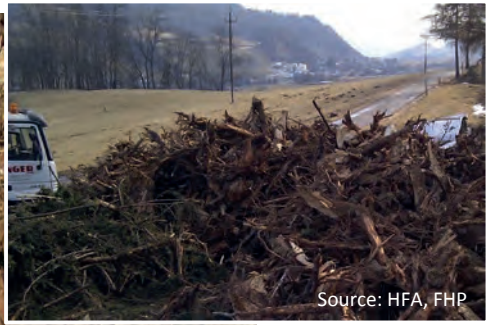
Typical values: A7.0 F25

OENORM C 4005 hogfuel C4 P100 M55

ISO/FDIS 17225-1 hogfuel 1.1.5 P45 M50 A5.0 F10 BD300 N0.2 S0.02 Cl0.02 Q8.9
production shredder ns



Source: HFA, FHP [88]

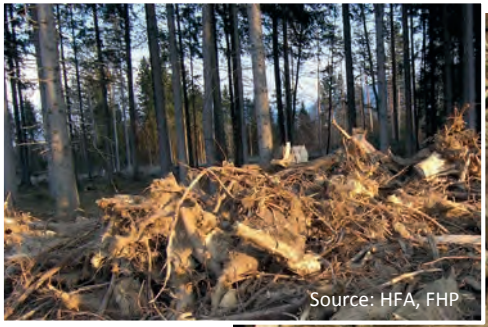


Source: HFA, FHP

C4

OENORM C 4005 hogfuel C4 P- M45 A7.0+ F-

ISO/FDIS 17225-1 hogfuel 1.1.5 P45 M40 A10.0+ F30+ BD350 N0.2 S0.02 Cl0.02
production shredder 120 mm


Source: HFA, FHP

Source: HFA, FHP [66]

C4

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