The proof is here!!
The proof is here!!
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The proof is here!!

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Bedding-, Insulation- and Jacket-Compounds

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"Fire protection from the inside"!

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds show remarkable effects on:

**BURNING PERFORMANCE** acc. to specifications. such as:
IEEE 1202, CSA FT4 and UL 1685
and are a **short route** to achieve:

**LOW SMOKE (LS) recognition**

The proof is here!!!

"Fire protection from the inside"!

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
"Fire protection from the inside!"
Our presentation was all about:

Hi-FR, non-halogen bedding compounds
The advantages of highly flame-retarded non-halogen bedding compounds...

"Fire protection from the inside"!
Highly flame-retarded non-halogen bedding compounds....: “Fire protection from the inside”!

* **Applications and functions**

* **Bedding compounds make a cable round**
  
  (More esthetic + easier pulling during installation)

* **Fill gaps between insulation and jacket**
  
  (... also helps to reduce chimney effects during burning)

* It can embed (enclose) metal braids, tapes and other ‘armour’ (... Thus reduces potential damage by the armour to jackets + keeping braids, tapes and armours in position)

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds.....: “Fire protection from the inside”!

* Applications and functions

- Improved protection against mechanical damage of the insulation.

- Reduced humidity penetration into the insulation (Due to implementation of a radial barrier)

- The contribution to ‘materials cost’ reduction (Due to minimizing wallthicknesses of (more) expensive sheathing/jacketing compounds)

Ron Goethals, Philadelphia; June 18, 2014

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....: "Fire protection from the inside!"

**For many XLPE-insulated cable constructions, the bedding compound shall not adhere to the insulation.**

**Reason:**
- To improve ‘easy peeling’, *(and thus reduce installation time)*
Highly flame-retarded non-halogen bedding compounds.....: “Fire protection from the inside”!

Main topics ....

* Some selection criteria ➔ Processing

- Important, as 2 extrusion processes can be applied:

  * The **2-Step process (= off-line)**, and

  * The **One step “Tandem” process (= in-line)**
Highly flame-retarded non-halogen bedding compounds....:

“Fire protection from the inside”!

2-Step process (off-line)

Cable drum containing insulated wire

Empty cable drum

>>> Bedding-, Insulation- and Jacket-Compounds <<<

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Highly flame-retarded non-halogen bedding compounds....:
"Fire protection from the inside"!

2-Step process (off-line)

Step 1: Bedding compound is extruded over the insulated wire(s) or core.

Bedding compound

Insulated wires or core

Cable drum containing insulated wire

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds:
“Fire protection from the inside”!

2-Step process (off-line)

Step 1: Bedding compound is extruded over the insulated wire(s) and DIRECTLY coiled on a cable drum.

Bedding-, Insulation- and Jacket-Compounds

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Highly flame-retarded non-halogen bedding compounds.....:
“Fire protection from the inside”!

2-Step process (off-line)

After the bedding compound has been applied, the full drum is moved to another (or the same) extrusion line for the 2nd step:

Extrusion of the jacket over the bedding compound.

Bedding-, Insulation- and Jacket-Compounds

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Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

2-Step process (off-line)

After the bedding compound has been applied, the full drum is moved to another (or the same) extrusion line for the 2nd step:

Extrusion of the jacket over the bedding compound.

Cable drum containing insulated wire, embedded in the bedding compound

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds:...
“Fire protection from the inside”!

2-Step process (off-line)

Step 2: Jacket compound is extruded over the bedding compound

>>> Bedding-, Insulation- and Jacket-Compounds <<<
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Highly flame-retarded non-halogen bedding compounds....:

“Fire protection from the inside”!

2-Step process (off-line)

**Step 2:** Jacket compound is extruded over the bedding compound *(and can be coiled again)*

>>> Bedding-, Insulation- and Jacket-Compounds <<<

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Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

Processing of bedding compounds

Tandem process (= in-line)

In this process the bedding compound AND the sheathing compound are extruded on 2 extruders, which stand ‘in-line’.

>>> Bedding-, Insulation- and Jacket-Compounds <<<

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>>> Bedding-, Insulation- and Jacket-Compounds <<<

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

Halogen-free, highly flame-retarded bedding compounds can help to significantly reduce hazards, like:

- Toxicity
- Corrosivity
- Smoke production

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds.....:
“Fire protection from the inside”!

Halogen-free, highly flame-retarded bedding compounds can help to significantly reduce hazards, like:

AND....:

Flame-spread

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds.....:
“Fire protection from the inside”!

Results which were shown at the IWCS 2014:

Test 1

>>> Bedding- , Insulation- and Jacket-Compounds <<<

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

These 2 (European) cables were tested acc. to EN 60332-3 Part 23 (Class B). Cables were mounted in a ‘touching configuration’ (1 layer).

Test 1

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....

“Fire protection from the inside”!

These 2 (European) cables were tested acc. to EN 60332-3 Part 23 (Class B).
Cables were mounted in a ‘touching configuration’ (1 layer)

<table>
<thead>
<tr>
<th>Test set-up</th>
<th>The cables are secured to a ladder, close together or spaced apart depending on the type of fire. The cables can be secured in several layers. Test apparatus acc. to IEC / EN 60332-3-10.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame temperature</td>
<td>Determined by the stipulated quantity of propane gas and air.</td>
</tr>
</tbody>
</table>
| Test duration | IEC Part 21/EN Part 21: Category A F/R for special applications only  
IEC Part 22/EN Part 22: Category A (7 l flammable material/m): 40 min  
IEC Part 23/EN Part 23: Category B (3.5 l flammable material/m): 40 min  
IEC Part 24/EN Part 24: Category C (1.5 l flammable material/m): 20 min  
IEC Part 25/EN Part 25: Category D (0.5 l flammable material/m): 20 min |
| Compliance criterion | The visible area of fire damage to the cables must not exceed 2.5 m in height from the bottom edge of the burner. |
Highly flame-retarded non-halogen bedding compounds...

“Fire protection from the inside”!

Results:

- Improved fire retardancy
- Considerable reduction of Total Heat Release (THR)

THR = Total Heat Release

- 2.5 m (8.2 ft) THR : 18 MJ
- 1.6 m (5.2 ft) THR : 5.5 MJ

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds: “Fire protection from the inside”!

Results:
- =2.5 m (8.2 ft)
- THR: 18 MJ

(THR = Total Heat Release)

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

<table>
<thead>
<tr>
<th>Results</th>
<th>LSZH jacket: LOI = 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>THR : 18 MJ</td>
<td>2.5 m (8.2 ft)</td>
</tr>
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Results:
- Improved fire-retardancy
- Considerable reduction of Total Heat Release

Bedding-, Insulation- and Jacket-Compounds
- Thermoplastic
- Moisture-crosslinkable
- CV-curable
- E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....

“Fire protection from the inside”!

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:

“Fire protection from the inside”!

Test 2

Cable construction:

• Non-FR XLPE Insulation (3 x 1,5 mm² (= 16 AWG))
• LSZH Bedding (compare: 3 different compounds)
• LSZH Jacket (compare: 2 different compounds)

19 of these cables were vertically mounted, acc to EN 50399.
Distance between cables: 1 cm (= 0,4”)

20 minutes: burner of 21 kW
Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

<table>
<thead>
<tr>
<th>Insulation</th>
<th>Bedding compound</th>
<th>LOI</th>
<th>Jacket</th>
<th>LOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 1,5 mm² XLPE (non FR)</td>
<td>FM 1249</td>
<td>Non FR</td>
<td>S 1003 F</td>
<td>40</td>
</tr>
</tbody>
</table>

Testing 2

21 kW Burner; 20 minutes

Damaged cable > 10 feet

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:

"Fire protection from the inside"!

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</tr>
<tr>
<td>2, 3</td>
<td>FM 1248</td>
<td>45</td>
<td>„</td>
<td>40</td>
</tr>
</tbody>
</table>

**Damaged cable**

- 21 kW Burner, 20 minutes
- > 10 feet
- = 7 feet

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:

“Fire protection from the inside”!

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<tr>
<td>2</td>
<td>FM 1248</td>
<td>45</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>FM 1239</td>
<td>55</td>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>

Damaged cable:
- > 10 feet
- = 7 feet
- = 5 feet

21 kW Burner, 20 minutes

Bedding-, Insulation- and Jacket-Compounds

* Thermoplastic
* Moisture-crosslinkable
* CV-curable
* E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

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<td>40</td>
</tr>
<tr>
<td></td>
<td>FM 1248</td>
<td>45</td>
<td>S 1027 F</td>
<td>45</td>
</tr>
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21 kW Burner, 20 minutes

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<th>Damaged cable</th>
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<tr>
<td>&gt; 10 feet</td>
</tr>
<tr>
<td>= 7 feet</td>
</tr>
<tr>
<td>= 5 feet</td>
</tr>
<tr>
<td>= 6,5 feet</td>
</tr>
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Bedding-, Insulation- and Jacket-Compounds

Thermoplastic  *  Moisture-crosslinkable  *  CV-curable  *  E-beam Irradiation Crosslinkable
Highly flame-retarded non-halogen bedding compounds....:
“Fire protection from the inside”!

<table>
<thead>
<tr>
<th>Insulation Compound</th>
<th>LOI</th>
<th>Bedding Compound</th>
<th>LOI</th>
<th>Jacket Compound</th>
<th>LOI</th>
</tr>
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Conclusion:
Applying a **highly flame-retarded bedding compound** had **more impact** on these fire-tests than applying a **more flame-retarded jacketing compound**!

---

**21 kW Burner, 20 minutes**

- 5 feet
- 6.5 feet

21 kW Burner, 20 minutes

**Conclusion:** Applying a **highly flame-retarded bedding compound** had **more impact** on these fire-tests than applying a **more flame-retarded jacketing compound**!
The proof is here!!

What we tried to accomplish in 2014 was:

- Attract USA cable manufacturers to use our bedding compounds
- Convince them to start a trial project
- Help them with selecting the right product for their construction
- Show them how simple these compounds can be processed
- Hope for positive results in 2015
The proof is here!!

After 1 year, we CAN confirm that our expectations ... did turn into reality!!

Our highly flame-retarded bedding compounds **DO SHOW REMARKABLE RESULTS**
in cable constructions, according to US specifications.
The proof is here!!

**Project 1: Multicore cable**
UL 1685 – smoke test; UL 1277 Vertical Tray Cable; CSA FT-4 Vertical Tray Cable

3 core cable, 14 AWG (2.0 mm2), Insulation: Halogenated XLPE VW-1 (LOI = 27) or Non VW-1 (LOI = 24)
Jacket: E-beam crosslinkable oil resistant non-halogen flame-retarded LSZH (LOI = 40)

Variables in the construction: 1) Filler material and 2) Fire-resistant aramid tape
The proof is here!!

**Project 1**: Multicore cable
UL 1685 – smoke test; UL 1277 Vertical Tray Cable; CSA FT-4 Vertical Tray Cable

Insulation: XLPE VW-1; Jacket: LSZH, LOI 40

Variables in the construction:
- 1) Filler material
- 2) Fire-resistant aramid tape

Large scale Flame Test: FT 4
- BTU's: 70,000 (21 kW)
- Time: 20 minutes

For your info: 1 BTU (British Thermal Unit) is the amount of heat, which is needed to raise 1 lbs of water by 1 degree Fahrenheit.

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
**The proof is here!!**

**Project 1: Multicore cable**
UL 1685 – smoke test; UL 1277 Vertical Tray Cable; CSA FT-4 Vertical Tray Cable

Insulation: XLPE VW-1; Jacket: LSZH, LOI 40

Variables in the construction: 1) **Filler material** and 2) **Fire-resistant aramid tape**

Large scale Flame Test: **FT 4**
- BTU’s: 70,000 (21 kW)
- Time: 20 minutes

Following properties were tested:
- Damaged cable length
- Peak smoke
- Total smoke

>>> Bedding-, Insulation- and Jacket-Compounds <<<

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The proof is here!!

Char length (= damage) in cm

Non VW-1 insulation

1: PP yarn filler
2: Aramid based tape

Char length (= damage) in cm

1: Bedding compound FM 0474/5
2: Non VW-1 insulation

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The proof is here!!

Char length (= damage) in cm

- UL 1685: max 244 cm
- FT 4: max 155 cm

Non VW-1 insulation

1: PP yarn filler
2: Aramid based tape

Bedding-, Insulation- and Jacket-Compounds

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The proof is here!!

Char length (= damage) in cm

PP yarn + aramide tape

UL 1685: max 244 cm

FT 4: max 155 cm

PP yarn filler

Aramid based tape

Non VW-1 insulation

>>> Bedding-, Insulation- and Jacket-Compounds <<<

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

**Char length (= damage) in cm**

- **UL 1685**: max 244 cm
- **FI 4**: max 155 cm
- **PP yarn + aramide tape**: (213 cm)
- **FM 0474/5**: (125 cm)
- **No tape**: 50, 100, 150, 200, 250

**Non VW-1 insulation**

1. **PP yarn filler**
2. **Aramid based tape**

1. **Bedding compound FM 0474/5**
2. **No tape**

---

**Thermoplastic** * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Peak smoke in m²/s

Non VW-1 insulation

1: PP yarn filler
2: Aramid basedtape

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Peak smoke in m²/s

- UL 1685: max 0.25
- FT 4: max 0.40

> >>>> Bedding-, Insulation- and Jacket-Compounds <<<<<

- Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Peak smoke in m²/s

- (0,75 m²/s)
- PP yarn + aramide tape

FT 4: max 0.40
UL 1685: max 0.25

1: PP yarn filler
2: Aramid based tape

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Peak smoke in m²/s

- PP yarn filler
- Aramide based tape
- No tape

Peak smoke in m²/s

- (0.75 m²/s)
- (0.05 m²/s)

UL 1685: max 0.25
FT 4: max 0.40
FM 0474/5: No tape

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Total smoke in $m^2$

VW-1 insulation

1: PP yarn filler
2: Aramid based tape

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Ron Goethals, Philadelphia; June 18, 2014
The proof is here!!

Total smoke in m²

Bedding-, Insulation- and Jacket-Compounds

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The proof is here!!

Total smoke in m²

VW-1 insulation

1: PP yarn filler
2: Aramide based tape

(305 m²)

UL 1685: max 95 m²
FT 4: max 150 m²

PP yarn + aramide tape

Total smoke in m²

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Total smoke in m²

- PP yarn + aramide tape
  - FT 4: max 150 m²
  - UL 1685: max 95 m²
  - FM 0474/5 NO tape
  - (20 m²)

- VW-1 insulation
  - 1: PP yarn filler
  - 2: Aramide based tape

- Bedding-, Insulation- and Jacket-Compounds

- Thermoplastic
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Bedding-, Insulation- and Jacket-Compounds

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The proof is here!!

Project 2:
Evaluation and preparation for CPR (European regulations)

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Project 2:
Evaluation and preparation for CPR

Cone calorimeter tests
according to ISO 5660 (Heat flux = 50 kW/m²)

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
### Burn test acc. EN 13501: Euroclasses

<table>
<thead>
<tr>
<th>classification</th>
<th>$A_{ca}$</th>
<th>$B_{1ca}$</th>
<th>$B_{2ca}$</th>
<th>$C_{ca}$</th>
<th>$D_{ca}$</th>
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<th>F</th>
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<td>FIPEC Scen1</td>
<td>FIPEC Scen1</td>
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<td>$\leq 15$</td>
<td>$\leq 30$</td>
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<td>HRR / kW</td>
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<td>$\leq 30$</td>
<td>$\leq 60$</td>
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<tr>
<td>EN 61034 smoke production</td>
<td>s1a, s1b, s2, s3</td>
<td>s1a, s1b, s2, s3</td>
<td>s1a, s1b, s2, s3</td>
<td>s1a, s1b, s2, s3</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>EN 50267 acidity</td>
<td>a1, a2, a3</td>
<td>a1, a2, a3</td>
<td>a1, a2, a3</td>
<td>a1, a2, a3</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>EN 50399 flaming droplets</td>
<td>d0, d1, d2</td>
<td>d0, d1, d2</td>
<td>d0, d1, d2</td>
<td>d0, d1, d2</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>

#### Project 2: CPR (European regulations)

- **The class which is a challenge already for the cable industry**
- **The 4 classes in which the cable industry is going to ‘move’**

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**Thermoplastic** * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable

>>> Bedding-, Insulation- and Jacket-Compounds <<<
The proof is here!!

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)

Total Heat Release (MJ)

CPR Class D: max 70 MJ
CPR Class C: max 30 MJ
CPR Class B2: max 15 MJ
CPR Class B1: max 10 MJ

Bedding-, Insulation- and Jacket-Compounds

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

**Total Heat Release (MJ)**

*Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)*

- Standard LSZH sheathing compound
- CPR Class D: max 70 MJ
- CPR Class C: max 30 MJ
- CPR Class B2: max 15 MJ
- CPR Class B1: max 10 MJ

Total Heat Release (in MJ):

- 100
- 80
- 60
- 40
- 20

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Total Heat Release (MJ)

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m2)

Standard LSZH sheathing compound

Highly flame-retarded LSZH sheathing compound

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable

Bedding-, Insulation- and Jacket-Compounds

CPR Class D : max 70 MJ

CPR Class C : max 30 MJ

CPR Class B2 : max 15 MJ

CPR Class B1 : max 10 MJ

(70 – 75)

(60 – 65)
The proof is here!!

The graph illustrates the total heat release (in MJ) of various compounds and sheathing materials. The compounds are categorized into two main types: Standard LSZH sheathing compound and Highly flame-retarded LSZH sheathing compound.

- **Standard LSZH sheathing compound**
  - Total Heat Release: (70 – 75) MJ
  - CPR Class D: max 70 MJ

- **Highly flame-retarded LSZH sheathing compound**
  - Total Heat Release: (60 – 65) MJ
  - CPR Class C: max 30 MJ

- **Highly flame-retarded LSZH bedding compound**
  - Total Heat Release: (45 – 50) MJ
  - CPR Class B1: max 10 MJ

The graph also highlights the cone calorimeter results according to ISO 5660, where the heat flux is set at 50 kW/m². The compounds are further characterized as:

- Thermoplastic
- Moisture-crosslinkable
- CV-curable
- E-beam Irradiation Crosslinkable

The graph visually compares the heat release of these compounds against the maximum allowable heat release for different CPR classes.
The proof is here!!

Total Heat Release (MJ)

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m2)

- Standard LSZH sheathing compound: (70 – 75) MJ
- Highly flame-retarded LSZH sheathing compound: (60 – 65) MJ
- Highly flame-retarded LSZH bedding compound: (45 – 50) MJ
- Remarkable bedding compound FM 0474/5: (5) MJ

CPR Class D: max 70 MJ
CPR Class C: max 30 MJ
CPR Class B2: max 15 MJ
CPR Class B1: max 10 MJ

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable

Ron Goethals, Philadelphia; June 18, 2014
The proof is here!!

Total Smoke Production (m²)

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)

>>> Bedding-, Insulation- and Jacket-Compounds <<<

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

**Total Smoke Production (m²)**

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)

- Standard LSZH sheathing compound
- Bedding-, Insulation- and Jacket-Compounds
- Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)

Total Smoke Production (m²)

- Standard LSZH sheathing compound: (700 – 1000)
- Highly flame-retarded LSZH sheathing compound: (350 - 500)

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)

Total Smoke Production (m²)

- Standard LSZH sheathing compound: (700 - 1000)
- Highly flame-retarded LSZH sheathing compound: (350 - 500)
- Highly flame-retarded LSZH bedding compound: (250 - 400)

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable

Ron Goethals, Philadelphia; June 18, 2014
The proof is here!!

Cone calorimeter results acc. to ISO 5660 (Heaflux = 50 kW/m²)

Total Smoke Production (m²)

- Standard LSZH sheathing compound
  - (700 – 1000)

- Highly flame-retarded LSZH sheathing compound
  - (350 - 500)

- Highly flame-retarded LSZH bedding compound
  - (250 - 400)

Remarkable bedding compound FM 0474/5

>>> Bedding-, Insulation- and Jacket-Compounds <<<

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable
The proof is here!!

Cone calorimeter results acc. to ISO 5660 (Heatflux = 50 kW/m²)

Total Smoke Production (m²)

- Standard LSZH sheathing compound: (700 – 1000)
- Highly flame-retarded LSZH sheathing compound: (350 - 500)
- Highly flame-retarded LSZH bedding compound: (250 - 400)
- Remarkable bedding compound: FM 0474/5 (60-70)

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable

Ron Goethals, Philadelphia; June 18, 2014
The proof is here!!
Highly flame-retarded non-halogen bedding compounds show remarkable effects on:

**BURNING PERFORMANCE** acc. to specifications. such as:

IEEE 1202, CSA FT4 and UL 1685

and are a **short route** to achieve:

**LOW SMOKE (LS)** recognition

"Fire protection from the inside"!

The proof is here!!
“Fire protection from the inside”!

Ron Goethals, Philadelphia; June 18, 2014

Thermoplastic * Moisture-crosslinkable * CV-curable * E-beam Irradiation Crosslinkable

>>> Bedding-, Insulation- and Jacket-Compounds <<<