AFCEN RCC-F Errata 003 – EN

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AFCEN

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AFCEN RCC-F Errata 003

NOTE TO USERS

This document provides the corrections described in the table below, affecting the code editions, versions and paragraphs mentioned.

Code edition(s)	Version(s)	Errata description	Paragraph(s)
2017 *2020* *2024*	*French/English*	*Errors in units and formulas*	*Appendix D* *Appendix E*

Modified pages are presented in chronological order for the 2017 (Appendix D, Appendix E), 2020 (Appendix D, Appendix E), and 2024 (Appendix E) editions.

Modified parts of text appear in:

- ~~red strikethrough~~ for deleted text
- Green for the additional text

1) Measurement and I/C cables may be run in closed wraps.

2) The discontinuous-operation power cables supplying valves may be run in closed wraps.

3) For MV power cables: no protection may be used.

4) For LV power cables, it is necessary to:

   1/ check that for each cable installed on the raceway to be protected, the actual current I is less than the permissible current I_{50} for an ambient temperature of 50°C, taking into account a proximity coefficient of 0.72 for cables with a cross-section of 95 mm^{-2} or more and 0.8 for cables with a lower cross-section,

   2/ check that the total linear power dissipated by the cables does not exceed the limit value given by the formula

$$P = \frac{\Delta T \cdot p}{0{,}133 + \frac{e}{\lambda} \cdot \left(1{,}06 + 1{,}275 \frac{e}{l + h} \right)}$$

   - P: linear power (W/m)

   - ΔT: difference between the ambient temperature of the room and the temperature inside the sheath (generally 30 and 50°C, respectively).

   - λ: ~~c~~ thermal conductivity of the protection in its uninterrupted section, including conduction and surface convective exchanges. ~~(W.m^{-2}.K^{-1})~~ (W.m^{-1}.K^{-1})

   - l: internal width of the wrap (m)

   - h: internal height of the wrap (m)

   - e: thickness of the wrap wall (m)

   - p: external perimeter of the wrap(m).

5) when the average daily temperature of the room is liable to exceed 30 °C, it shall be checked that the current through the cable is less than the permissible current at the case inner temperature (calculated with the above formula) in administrative order not to cause heat-up of the cable core beyond the temperature guaranteeing the absence of cable degradation (generally 70 °C on the core for PVC).

6) The installation of low voltage power cables other than those supplying the valves, inside a closed case is not authorized in the Reactor Building.

7) The choice of the type of wrap is guided by the duration of the reference fire in the fire cell or compartment, outside the wrap.

8) Protection systems using qualified dams may also be used, provided that a rigid spacer block above the raceway guarantees a continuous air path with a minimum thickness of 5 cm. In this case, the limit power value shall be justified by means of a test or calculation.

1) All the types of electromechanical equipment can be installed in a case. Nevertheless, for power cables and equipment liable to dissipate power, it is necessary to (for more details cf. ENGSIN070251 ind A):

1/ check that for each cable installed on the raceway to be protected, the actual current I is less than the permissible current I_{50} for an ambient temperature of 50°C, taking into account a proximity coefficient of 0.72 for cables with a cross-section of 95 mm^{-2} or more and 0.8 for cables with a smaller cross-section,

2/ check that the total power P_{th} (W) dissipated by the cables does not exceed the limit value given by the formula :

$$P_{th} = \sum_{p=1}^{6} K_p \; S_{int\ p} \; \Delta T$$

The heat transfer coefficients h_p (internal or external) to be considered for each wall is given by the following table:

Type of wall (*p*)	**State**	~~h_p ($W.m^{-1}.K^{-1}$)~~ **h_p** ($W.m^{-2}.K^{-1}$)
Vertical	Lv_{int}<1.42 m (laminar)	**$2.24\ Lv_{int}^{-1/4}$**
	Lv_{int} >1.42 m (turbulent)	**2.57**
Ceiling	Turbulent	**2.77**
Floor	Turbulent	**$1.03\ Lc_{int}^{-1/4}$**

where

~~$K_p = \dfrac{1}{\frac{2}{h_p} + \frac{1}{h_p + 6{,}26} + \frac{e_p}{\lambda_p}}$ ($W.m^{-2}.K^{-1}$)~~ $K_p = \dfrac{1}{\frac{1}{h_p} + \frac{1}{h_p + 6{,}26} + \frac{e_p}{\lambda_p}}$ ($W.m^{-2}.K^{-1}$)

Lv = case height (m)

Lh = case width (m)

L = case length (m)

$Lv_{int} = Lv - 2e_p$ (m)

$Lh_{int} = Lh - 2e_p$ (m)

$L_{int} = L - 2e_p$ (m)

$P_{int} = 2(Lh_{int}+L_{int})$ internal perimeter (m)

$Lc_{int} = S_{int}/P_{int}$ (internal characteristic length) (m)

$\Delta T = T_{int} - T_{ext}$ ~~(°C)~~ (K)

T_{ext} = temperature outside the case ~~(°C)~~ (K)

T_{int} = temperature inside the case ~~(°C)~~ (K)

e_p = wall p thickness (m)

λ_p = thermal conductivity of the wall p material ~~($W.M^{-2}.°C^{-2}$)~~ ($W.m^{-1}.K^{-1}$)

$S_{int} = Lh_{int} \times L_{int}$ = case floor internal surface (m^2)

2) when the average daily temperature of the room is liable to exceed 30 °C, it shall be checked that the current through the cable is less than the permissible current at the case inner temperature (calculated with the above formula) in administrative order not to cause heat-up of the cable core beyond the temperature guaranteeing the absence of cable degradation (generally 70 °C on the core for PVC),

1) Measurement and I/C cables may be run in closed wraps.

2) The discontinuous-operation power cables supplying valves may be run in closed wraps.

3) For MV power cables: no protection may be used.

4) For LV power cables, it is necessary to:

   1/ check that for each cable installed on the raceway to be protected, the actual current I is less than the permissible current I_{50} for an ambient temperature of 50°C, taking into account a proximity coefficient of 0.72 for cables with a cross-section of 95 mm^{-2} or more and 0.8 for cables with a lower cross-section,

   2/ check that the total linear power dissipated by the cables does not exceed the limit value given by the formula

$$P = \frac{\Delta T \cdot p}{0{,}133 + \frac{e}{\lambda} \cdot \left(1{,}06 + 1{,}275 \frac{e}{l + h} \right)}$$

   With :

   P: linear power (W/m)

   ΔT: difference between the ambient temperature of the room and the temperature inside the sheath (generally 30 and 50°C, respectively).

   λ: ~~c~~ thermal conductivity of the protection in its uninterrupted section, including conduction and surface convective exchanges.~~(W.m^{-2}.K^{-1})~~ (W.m^{-1}.K^{-1})

   l: internal width of the wrap (m)

   h: internal height of the wrap (m)

   e: thickness of the wrap wall (m)

   p: external perimeter of the wrap(m).

5) when the average daily temperature of the room is liable to exceed 30 °C, it shall be checked that the current through the cable is less than the permissible current at the case inner temperature (calculated with the above formula) in administrative order not to cause heat-up of the cable core beyond the temperature guaranteeing the absence of cable degradation (generally 70 °C on the core for PVC).

6) The installation of low voltage power cables other than those supplying the valves, inside a closed case is not authorized in the Reactor Building.

7) The choice of the type of wrap is guided by the duration of the reference fire in the fire cell or compartment, outside the wrap.

8) Protection systems using qualified dams may also be used, provided that a rigid spacer block above the raceway guarantees a continuous air path with a minimum thickness of 5 cm. In this case, the limit power value shall be justified by means of a test or calculation.

1) All the types of electromechanical equipment can be installed in a case. Nevertheless, for power cables and equipment liable to dissipate power, it is necessary to :

1/ check that for each cable installed on the raceway to be protected, the actual current I is less than the permissible current I_{50} for an ambient temperature of 50°C, taking into account a proximity coefficient of 0.72 for cables with a cross-section of 95 mm^{-2} or more and 0.8 for cables with a smaller cross-section,

2/ check that the total power P_{th} (W) dissipated by the cables does not exceed the limit value given by the formula:

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The heat transfer coefficients h_p (internal or external) to be considered for each wall *p* is given by the following table:

Type of wall (*p*)	**State**	~~h_p ($W.m^{-1}.K^{-1}$)~~ h_p ($W.m^{-2}.K^{-1}$)
Vertical	Lv_{int} < 1.42 m (laminar)	**2.24 $Lv_{int}^{-1/4}$**
	Lv_{int} > 1.42 m (turbulent)	**2.57**
Ceiling	Turbulent	**2.77**
Floor	Turbulent	**1.03 $Lc_{int}^{-1/4}$**

Where:

~~$K_p = \dfrac{1}{\frac{2}{h_p} + \frac{1}{h_p + 6{,}26} + \frac{e_p}{\lambda_p}}$ ($W.m^{-2}.K^{-1}$)~~ $K_p = \dfrac{1}{\frac{1}{h_p} + \frac{1}{h_p + 6{,}26} + \frac{e_p}{\lambda_p}}$ ($W.m^{-2}.K^{-1}$)

Lv = case height (m)

Lh = case width (m)

L = case length (m)

$Lv_{int} = Lv - 2e_p$ (m)

$Lh_{int} = Lh - 2e_p$ (m)

$L_{int} = L - 2\ e_p$ (m)

$P_{int} = 2(Lh_{int}+L_{int})$ internal perimeter (m)

$Lc_{int} = S_{int}/P_{int}$ (internal characteristic length) (m)

$\Delta T = T_{int} - T_{ext}$ (K)

T_{ext} = temperature outside the case (K)

T_{int} = temperature inside the case (K)

e_p = wall p thickness (m)

λ_p = thermal conductivity of the wall p material ~~($W.M^{-2}.°K^{-2}$)~~ ($W.m^{-1}.K^{-1}$)

$S_{int} = Lh_{int} \times L_{int}$ = case floor internal surface (m^2)

REQ - 814 [AP.E]

Fire-resistant cases shall be designed in a way that it doesn't lead to damaging conditions for the electromechanical equipment they house neither lead to excessive ageing.

1) All the types of electromechanical equipment can be installed in a case.

REQ - 815 [AP.E]

Nevertheless, for power cables and equipment liable to dissipate power, it shall be:

1/ checked that for each cable installed on the raceway to be protected, the actual current I is less than the permissible current I_{50} for an ambient temperature of 50°C, taking into account a proximity coefficient of 0.72 for cables with a cross-section of 95mm^{-2} or more and 0.8 for cables with a smaller cross-section,

2/ checked that the total power P_{th} (W) dissipated by the cables does not exceed the limit value given by the formula:

$$P_{th=} \sum_{p=1}^{6} K_p \; S_{int} \; p \; \Delta T$$

The heat transfer coefficients h_p (internal or external) to be considered for each wall p is given by the following table:

Type of wall (*p*)	**State**	**h_p (W.m^{-2}.K^{-1})**
Vertical	Lv_{int} < 1.42 m (laminar)	**$2.24\ Lv_{int}^{-1/4}$**
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Floor	Turbulent	**$1.03\ Lc_{int}^{-1/4}$**

Where:

$$K_p = \frac{1}{\frac{1}{h_p} + \frac{1}{h_p + 6{,}26} + \frac{e_p}{\lambda_p}} (W.m^{-2}.K^{-1})$$

Lv = case height (m)

Lh = case width (m)

L = case length (m)

Lv_{int} = Lv -2e_p (m)

Lh_{int} = Lh -2e_p (m)

L_{int} = L – 2 e_p (m)

P_{int} = 2(Lh_{int}+L_{int}) internal perimeter (m)

Lc_{int} = S_{int}/P_{int} (internal characteristic length) (m)

ΔT = T_{int} – T_{ext} (K)

T_{ext} = temperature outside the case (K)

T_{int} = temperature inside the case (K)

e_p = wall p thickness (m)

~~*H*~~ h_p = wall convective exchange coefficient $(W.m^{-2}.K^{-1})$

λ_p = thermal conductivity of the wall p material $(W.m^{-1}.K^{-1})$

S_{int}= Lh_{int}×L_{int} = case floor internal surface (m²)

2) **REQ – 816 [AP.E]**

When the average daily temperature of the room is liable to exceed 30°C, it shall be checked that the current through the cable is less than the permissible current at the case inner temperature (calculated with the above formula) in order to not cause heat-up of the cable core beyond the temperature guaranteeing the absence of cable degradation (generally 70 °C on the core for PVC).

3) **REQ – 817 [AP.E]**

The installation of LV power cables other than those supplying the valves, inside a closed case is not authorised in the Reactor Building.

The choice of the type of case depends on the duration of the reference fire in the fire compartment or fire cell outside the case.