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From the Secretary's Desk

Dear All,

Greeting's from Suhas

First of all , I congratulate each and every one for the successful CEEAMATECH2019 exhibition. Everybody who visited was delighted to see the venue as well as well planned activities. Our visitors are focused and hence every one exhibitor can communicate to them effectively.

This time CEEAMA has adopted the theme of B2B meeting with consultants. This has tremendous response and more than 1000 meetings were arranged and vendor and consultants come closer for better understanding. Every exhibitor has send the feedback to CEEAMA that B2B meetings shall be increased . CEEAMA is also positive about the same.

Few of the top officials from MSEDCL and PWD Electrical Dept. visited the exhibition and express their happiness to witness such exhibition. They congratulate CEEAMA for organizing such exhibition in Pune.

CEEAMA has feedback on the outcome of the exhibition. It is encouraging and CEEAMA will take a note of it and improve in future. For this CEEAMA needs young professional engineers to work as committee members and few senior professionals to work as Director on the GC . I appeal all of you to come forward and enroll your name for any of the positions available . Name can be send to me or to President of CEEAMA .

Wish you all a Happy Holi. !!!

With this I stop for this month.

Thanks With warm regards,

Suhas Keskar

Hon. Secretary

CEEAMA

What is New?

Light from an exotic crystal semiconductor could lead to better solar cells

Scientists have found a new way to control light emitted by exotic crystal semiconductors, which could lead to more efficient solar cells and other advances in electronics, according to a Rutgers-led study in the journal Materials Today.

Their discovery involves crystals called hybrid perovskites, which consist of interlocking organic and inorganic materials, and they have shown great promise for use in solar cells. The finding could also lead to novel electronic displays, sensors and other devices activated by light and bring increased efficiency at a lower cost to manufacturing of optoelectronics, which harness light.

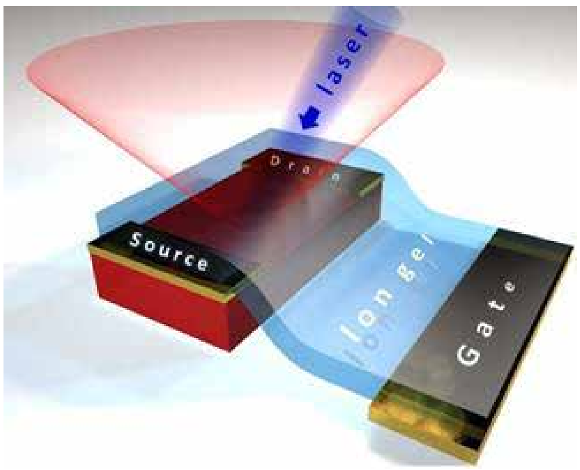
The Rutgers-led team found a new way to control light (known as photoluminescence) emitted when perovskites are excited by a laser. The intensity of light emitted by a hybrid perovskite crystal can be increased by up to 100 times simply by adjusting voltage applied to an electrode on the crystal surface.

Semiconductors like these perovskites have properties that lie between those of the metals that conduct electricity and non-conducting insulators. Their conductivity can be tuned in a very wide range, making them indispensable for all modern electronics.

Understanding photoluminescence is important for designing devices that control, generate or detect light, including solar cells, LED lights and light sensors. The scientists discovered that defects in crystals reduce the emission of light and applying voltage restores the intensity of photoluminescence.

Hybrid perovskites are more efficient and much easier and cheaper to make than standard commercial silicon-based solar cells, and the study could help lead to their widespread use, Podzorov (Scientist involved in research) said.

This is a conceptual view of a transistor device that controls photoluminescence (the light red cone) emitted by a hybrid perovskite crystal (the red box) that is excited by a blue laser beam after voltage is applied to an electrode (the gate).



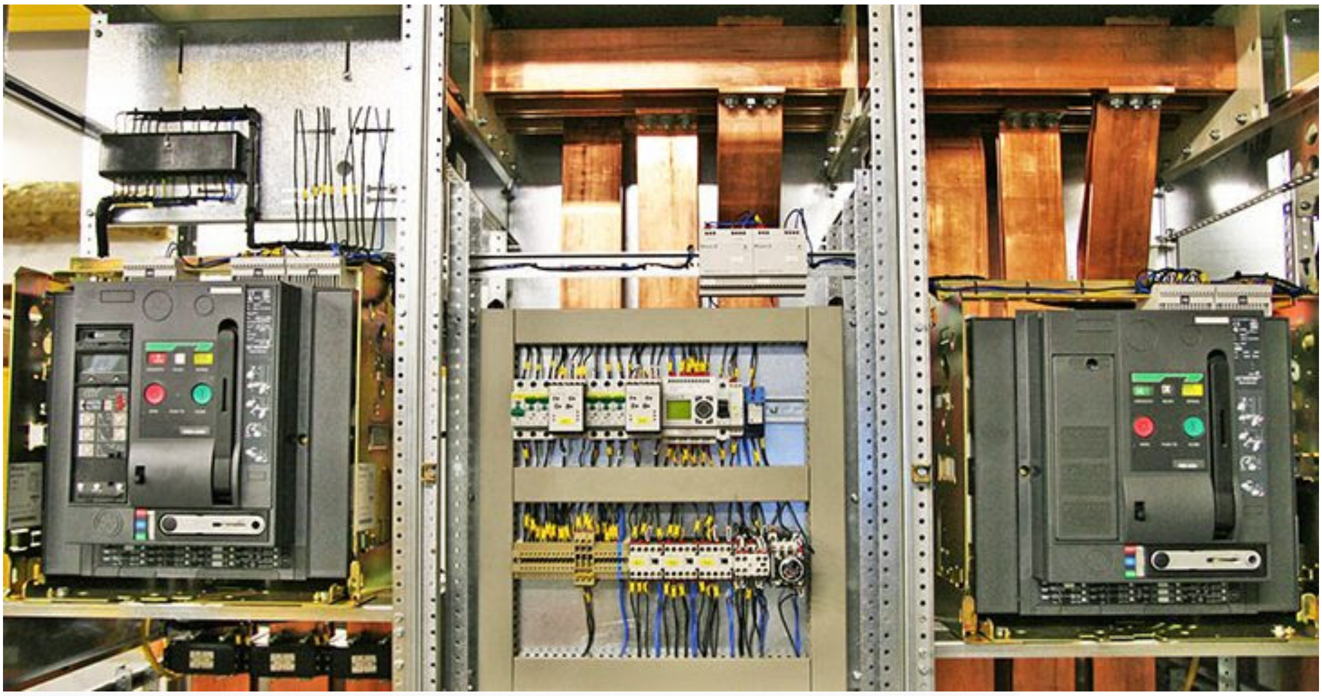
Source:https://www.sciencedaily.com/releases/2019/03/190306081719.htm

Contributed By Mangesh Shirgaonkar

Current heat losses produced by electrical operational equipment in LV switchgear

Heat losses in switchgear

It is widely accepted by all manufacturers that accumulation of heat (leading to overheating of devices) in switchgear is one of the greatest risks that could shorten the life expectancy of a switchgear, thus potentially damaging electrical and electronic devices or even lead to catastrophic failure.



Current heat losses produced by electrical operational equipment in LV switchgear

Electrical operational equipment in switchgear and distribution systems give off current heat losses to the surroundings. In order to ensure the proper functioning of the built-in equipment, it is necessary to determine the upper temperature limits.

For any temperature rise calculation, **the heat generated within the switchgear must be known**.

Let's follow the topics one by one from contents:

1. Upper temperature limit

The calculation procedure for the evaluation of the upper temperature limit is very difficult and complicated. Proof of compliance can be shown with the use of special software and tables. Computer-based evaluation (without ventilation) is used to determine the characteristics of the air over-temperature in the housing/enclosure.

This is comprised of the ambient temperature of the switchgear combination (outside the housing) and the air over-temperature inside the housing.

Note: As a result of the calculation, it can be seen whether the operational equipment in the partially type-tested switchgear combination is able to function without problems for the rated currents used as the basis for the power loss and for the calculated over-temperature of the air within the housing.

This determination concerns both the built-in switchgear and also the electrical connections, such as rails and isolated lines.

As long as no other conditions are specified, ***the ambient temperature (average over 24 hours) is taken as 35 °C and the inner temperature of the cabinet 55 °C****.*

In addition, the following conditions must also be fulfilled:

1. The power losses must be approximately uniformly distributed within the housing.
2. The air circulation must not be impeded.
3. In a partially type-tested switchgear combination or in a field subdivided by partitions, there must be no more than three horizontal partitions.
4. For air ducts, the cross-section of the exhaust air ducts must be at least 10 % greater than the cross-section of the air intake ducts.
5. The built-in operational equipment is designed for DC and AC voltages up to 60 Hz and for a maximum power supply feeder current intensity of 3150 A.

The following points must be known in order to calculate the over-temperature:

1. Smart I/O card protection type and protection class
2. Type of installation of housing/enclosure
3. Dimensions of housing/enclosure Type of construction (wall-mounted or floor-mounted distribution board)
4. Equipment installed, heat losses, determination of space
5. Location of installation (height, width and depth)
6. Structure of lines
7. Number of inner partitions
8. Type selection
9. Parts list, drawings
10. Reserve space.

1.1. Differentiation of Power Losses

The power losses of the different operational equipment are taken from the manufacturers' information and added. If the equipment is operated with a **load current which deviates from the rated current**, the power losses can then be described as in the following four groups:

1. Power losses proportional to the square of the current, e.g. main circuits of equipment, busbars and lines:

$P_v = P_{Vr} (I_B/I_r)^2$

2. Power losses which are nearly proportional to the current, e.g. rectifiers and thyristors:

$P_v = P_{Vr} . I_B/I_r$

3. Power losses which show a non-uniform behavior:

$P_v = P_{Fe} + P_{Cu} . (I_B/I_r)^2$

4. Power losses which remain constant, e.g. magnetic coils for contactors and light bulbs:

$P_v = P_{vr}$

Here, the meanings of the symbols are:

- **P_V** – Power loss
- **P_{Vr}** – Power loss of equipment
- **I_B** – Load current
- **I_r** – Rated current
- **P_{Fe}** – Iron losses
- **P_{Cu}** – Copper losses

The planning of low-voltage switchgear, distribution and control systems must meet certain criteria. The purpose of the system must first be known, e.g.:

- Transformer stations up to 24 kV and 1250 kVA
- Low-voltage main distribution boards
- Main distribution boards
- Sub-distributions
- Motor distribution systems
- Lighting circuit distribution systems
- Power distribution systems
- Busbar distribution systems
- Distribution cabinets for reactive power compensation
- Weak current distribution systems.

2. Distribution switchgear example

The following example shown in Figure 1 illustrates the procedure for proving **compliance with the upper temperature limits**.

A system with the block wiring diagram shown in Figure 1 is located in a distribution switchgear with the dimensions **H x W x T (2200 x 1000 x 600)**. The housing is a stand-alone construction and **IP 5X on all sides**, with no air ducts and without horizontal partitions inside.

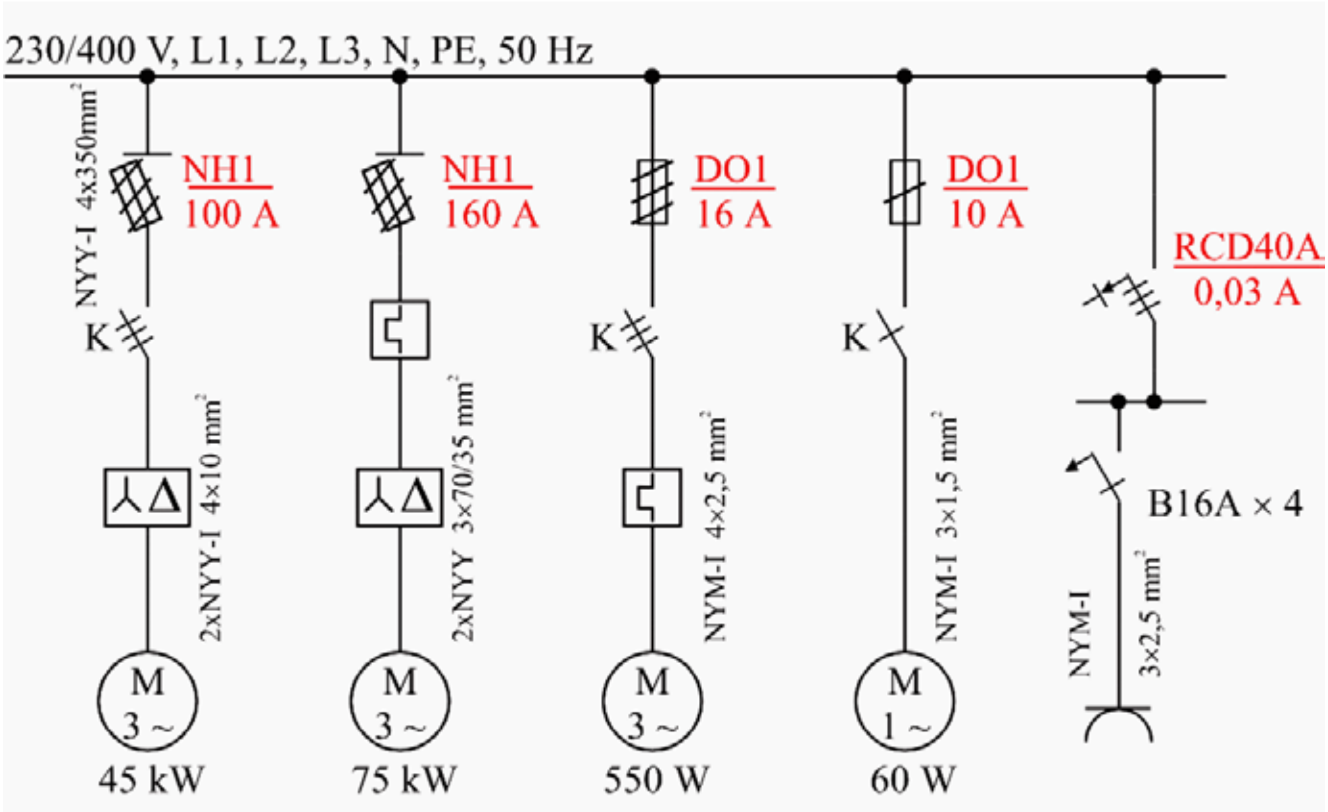


Figure 1 – Block wiring diagram

The objective is to prove compliance with the upper temperature limits by determination of:

1. Power loss from built-in equipment
2. Effective cooling surface A_e
3. Air over-temperature in the housing at half the height
4. Air over-temperature in the housing on the top surface

2.1 Determination of power loss from built-in equipment

- 1 busbar system Cu 20 × 5 with P_{Vr} = 63 W
- 1 power circuit breaker with I_n = 100 A, I_B = 70 A
- 1 NH1 fuse switch disconnector with I_n = 100 A, I_B = 80 A, P_{Vr} = 15.60 W.

$$\mathbf{P_v = P_{Vr}\ (I_B/I_r)^2}$$

- $\mathbf{P_v}$ = 15.60 W (70 A / 100A) = **7.644 W**
- 1 NH1 fuse switch disconnector with I_n = 160 A, I_B = 144 A, P_{Vr} = 20 W.
  $\mathbf{P_v}$ **=** 20 W (144 A / 160 A)² = **16.2 W**
- 1 D01 with I_n= 16 A, I_B = 1.55 A, P_{Vr} = 2.61 W
  $\mathbf{P_v}$ **=** 2.61 W (1.55 A / 16 A)² = **0.024 W**

- 1 D01 with I_n = 10 A, I_B = 1.5 A, Pv, = 2.61 W. P_{Vr} = 2.61 W
  P_v = 2.61 W (1.5 A / 10 A) = **0.058 W**
- 1 RCD with I_n = 40 A, I_B = 35 A, P_{Vr}= 13.81 W
  P_V = 13.81 W (35 A / 40 A)^2 = **10.57 W**
- 1 circuit breaker B16 A with I_n = 16 A, I_B = 8 A, P_{Vr} = 4.73 W
  P_V = 4.73 W (8 A / 16 A)^2 = 1.18 W × 4 = **4.73 W**
- 1 contactor with P_{Vr} = 15.7 W
- 3 relays with P_{Vr} = 3.10 W
- 3 star-delta switches with P_{Vr} = 28.6 W
- 1 external conductor with 2 x 4 x 10 mm², at 35 °C, P_{Vr} = 4.82 W
- 1 external conductor with 2 x 3 x 70/35 mm², at 35 °C, P_{Vr} = 8.40 W
- 1 external conductor with 4 x 2.5 mm², at 35 °C, P_{Vr} = 3.50 W
- 1 external conductor with 3 x 1.5 mm², at 35 °C, P_{Vr} = 2.09 W
- 1 external conductor with 3 x 2.5 mm², at 35 °C, P_{Vr} = 3.50 W
- 1 external conductor with 4 x 25 mm², at 35 °C, P_{Vr} = 6.25 W

*"The total of all power losses for the built-in equipment and lines is then **108.936 W**".*

2.2 Determination of the effective cooling surface A_e

Table 1 **– Determination of the effective cooling surface**

	A_0 [m×m]	**A_0** [m²]	Surface factor **b**	**A_e** [column 3×4]
1	**2**	**3**	**4**	**5**
Top surface	1 x 0.6	0.6	1.4	0.840
Front side	1 x 2.2	2.2	0.9	1.980
Back side	1 x 2.2	2.2	0.9	1.980
Left side surface	0.6 x 2.2	1.320	0.5	0.660
Right side surface	0.6 x 2.2	1.320	0.5	0.660
$A_e \sum (a_0\ b)$ = total 6.12				

The individual surfaces are calculated from the dimensions of the housing. The appropriate **surface factors b** can be taken from Table 1 above.

2.3 Air over-temperature in the housing half height

The determination of the air over-temperature in the housing **at half the height $\Delta t_{0.5}$** follows from the relationship:

$\Delta\ t_{0.5} = k\ d\ P^x{}_V$

Where:

- **Factor k** – It follows from Figure 2 for housings closed on all sides with A_e > 1.25 m² that **A_e = 6.12 m² and k = 0.140**.
- **Factor d** – It follows from Table 3 for housings closed on all sides with A_e > 1.25 m² and 0 horizontal partitions that **d = 1.0**.

Table 2 – Factor d for an effective cooling surface A_e 1.25 m²

Number of horizontal partitions	Blower without air duct	Blower with air duct
0	1.00	1.00
1	1.05	1.05
2	1.15	1.10
3	1.30	1.15

Table 3 – Exponent x for housing closed on all sides with an effective cooling surface A_e

Housing	x	
	A_e > 1.25 m²	**A_e < 1.25 m²**
Without air ducts	0.804	0.804
With air ducts	0.715	

- **Exponent x** – It follows from Table 3 for housings closed on all sides with $A_e > 1.25$ m² that x = 0.804.

Substituting these values in the relationship above: **$\Delta t_{0.5}$ =** $k\ d\ P^x{}_v = 0.140 \times 1.0 \times 219.912^{0.804}$ = **10.69 K**

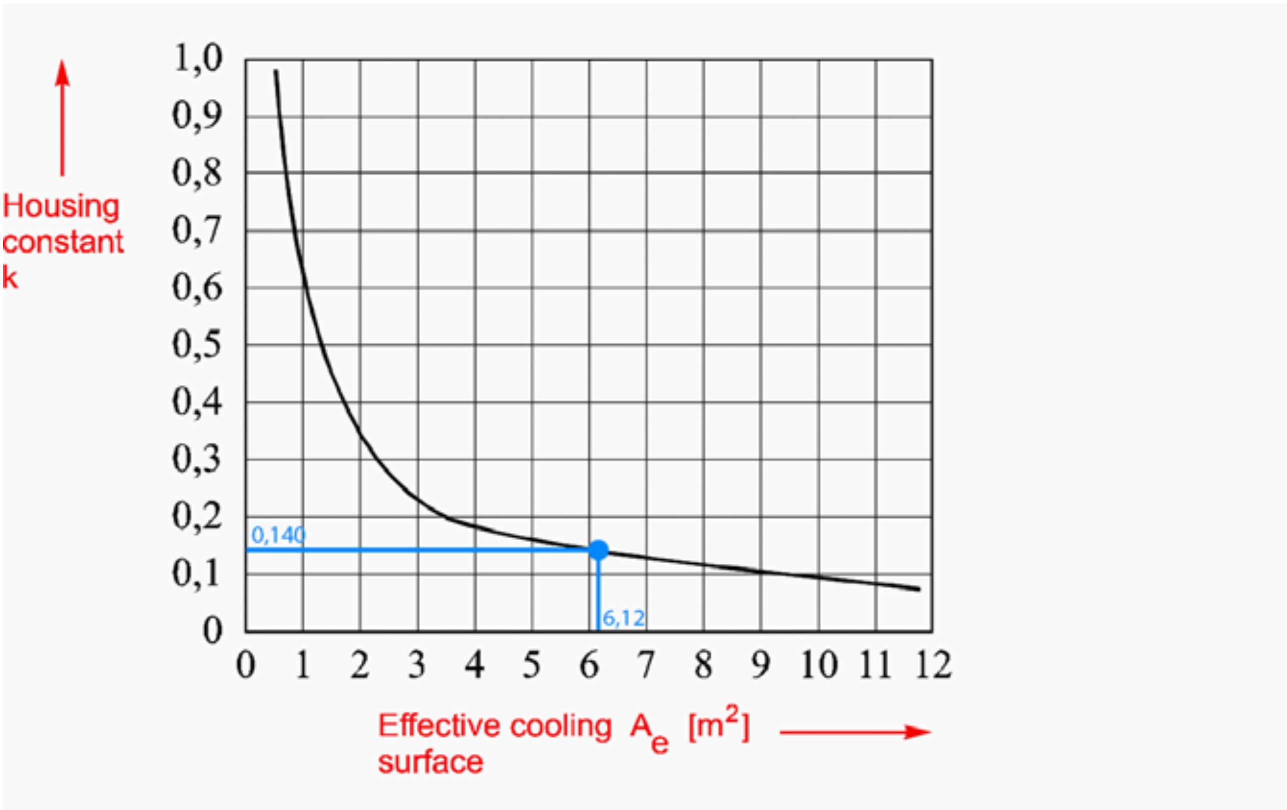


Figure 2 – Housing constant k for housings without air ducts

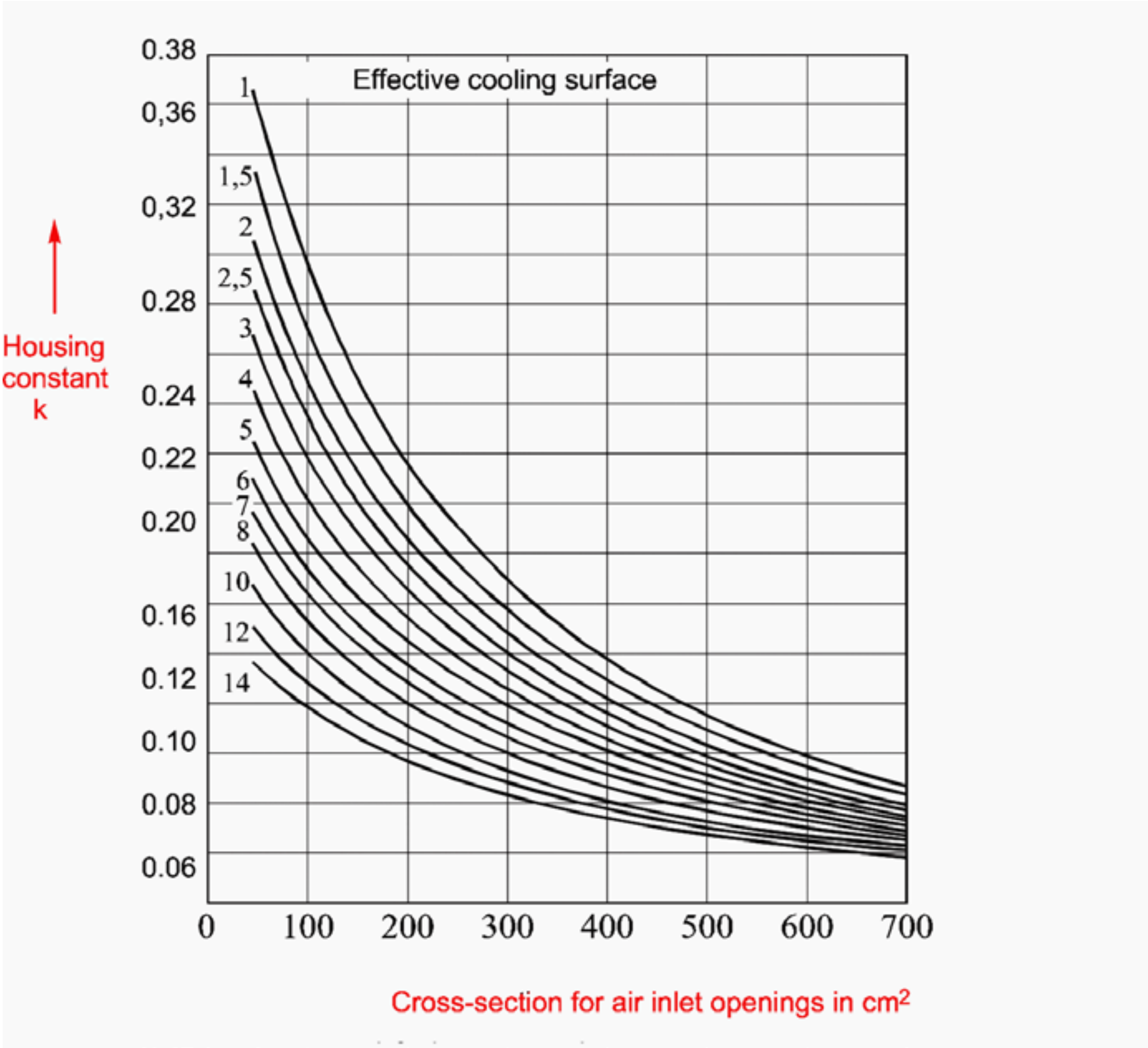


Figure 3 – Housing constant k for housings with air ducts

4. Air over-temperature in the housing top

The determination of the air over-temperature in the housing on the top surface **$\Delta t_{1.0}$** follows from the relationship:

$\Delta t_{1.0} = c \Delta t_{0.5}$

The factor c is taken from Figure 4 for housings closed on all sides with $A_e > 1.25$ m^2. This requires a knowledge of the variable:

- $f = (H \text{ in m})^{1.35} / A_G$ in m^2
- $f = 2.2^{1.35} / 1.0 \times 0.6$
- **$f = 4.832$**

With this, from curve 3 (stand-alone medium housing) c = 1.37.

Substituting this value in the relationship above, we obtain:

$\Delta t_{1.0}$= c $\Delta t_{0.5}$= 1.37 × 10.69 K = **14.65 K.**

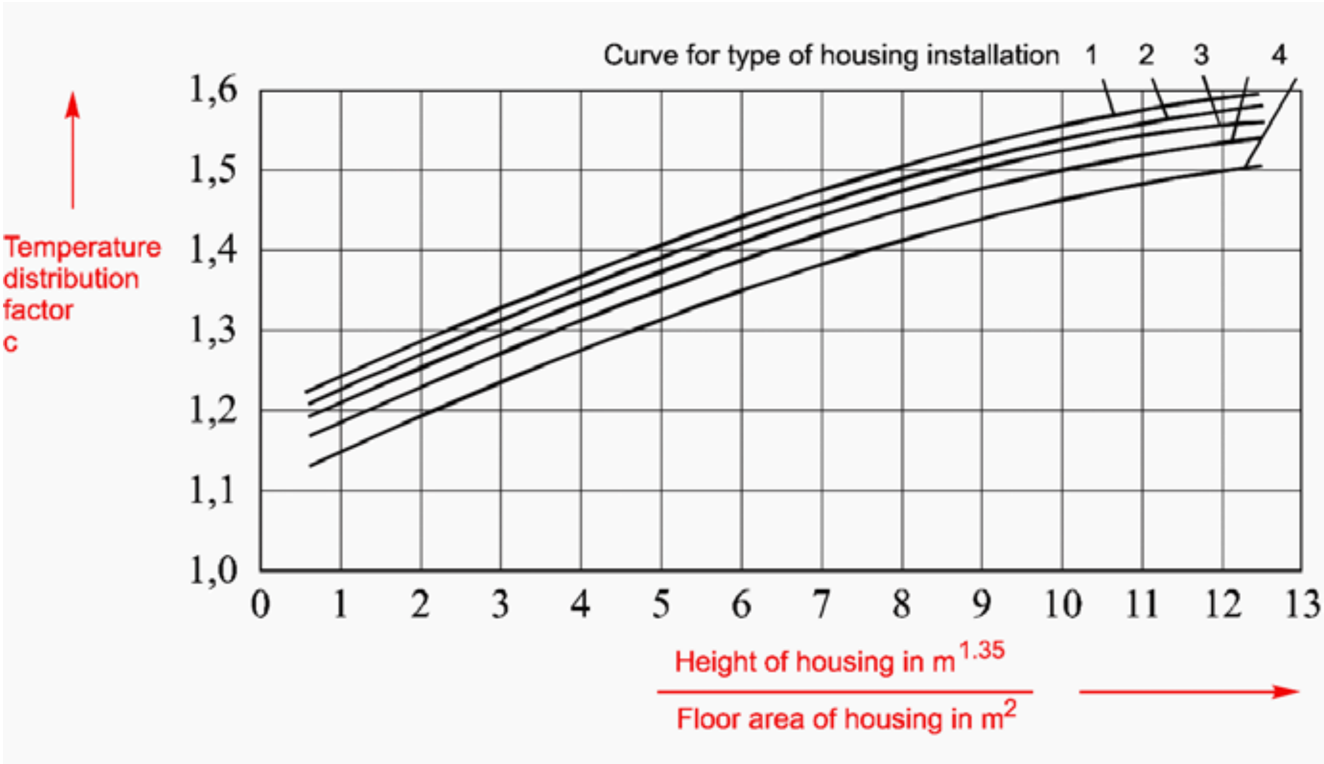


Figure 4 – Temperature distribution factor c with air ducts for **A_e > 1.25²**

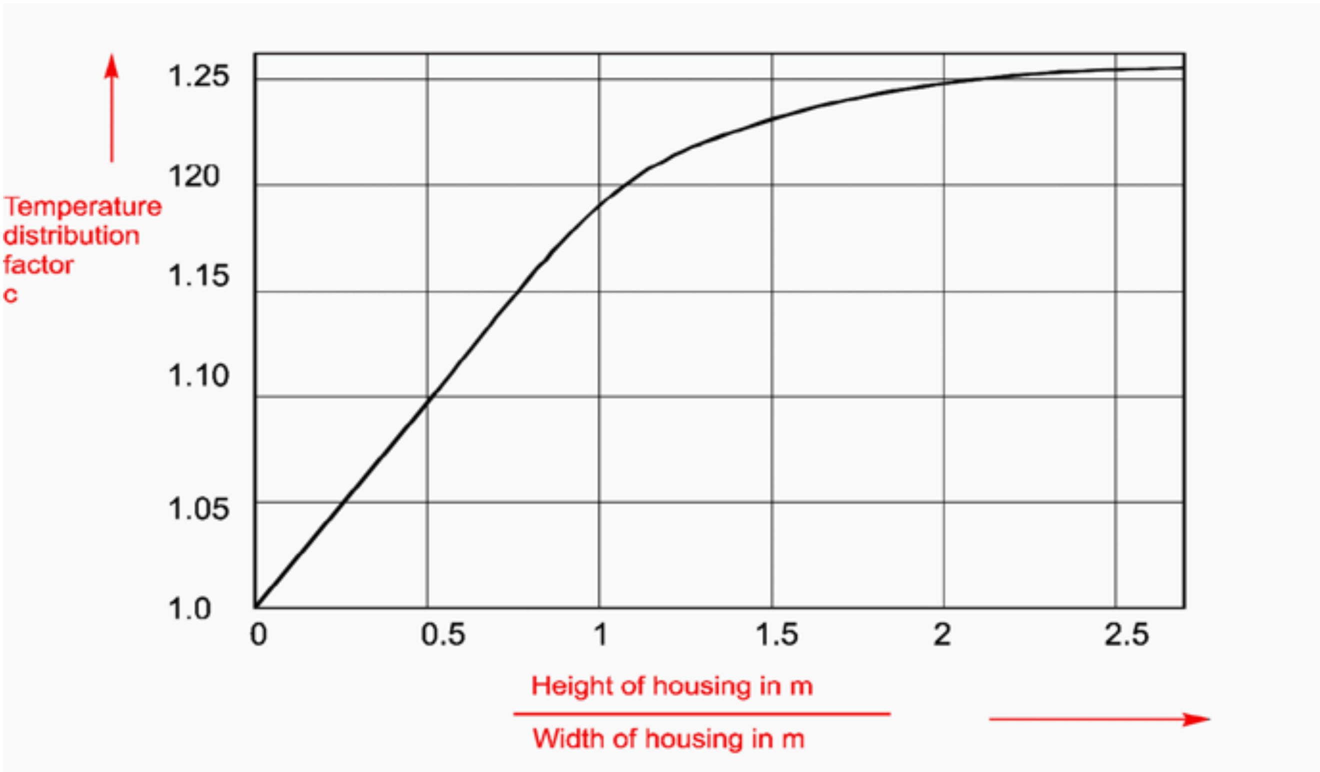


Figure 5 – Temperature distribution factor c without air ducts for **A_e < 1.25²**

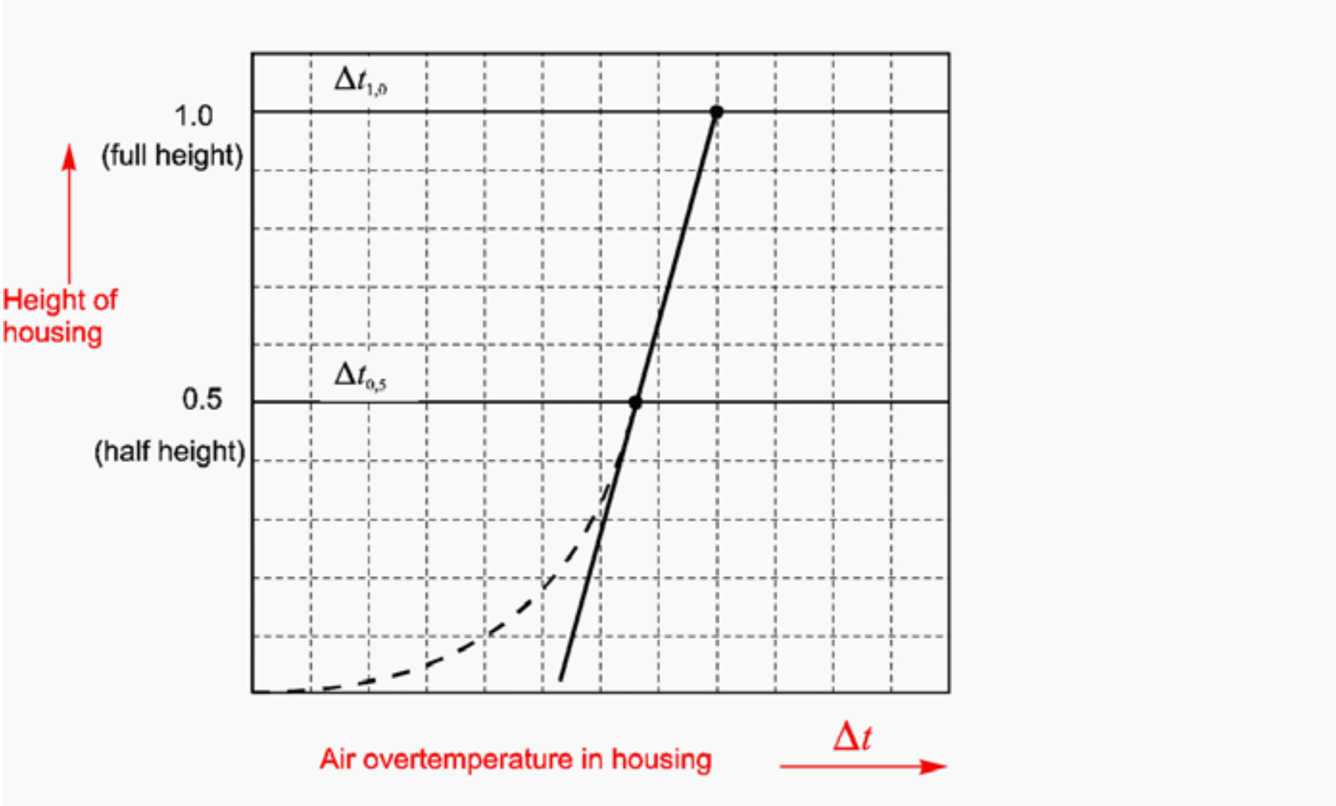


Figure 6 – Temperature rise characteristic for housings with Ae > 1.25²

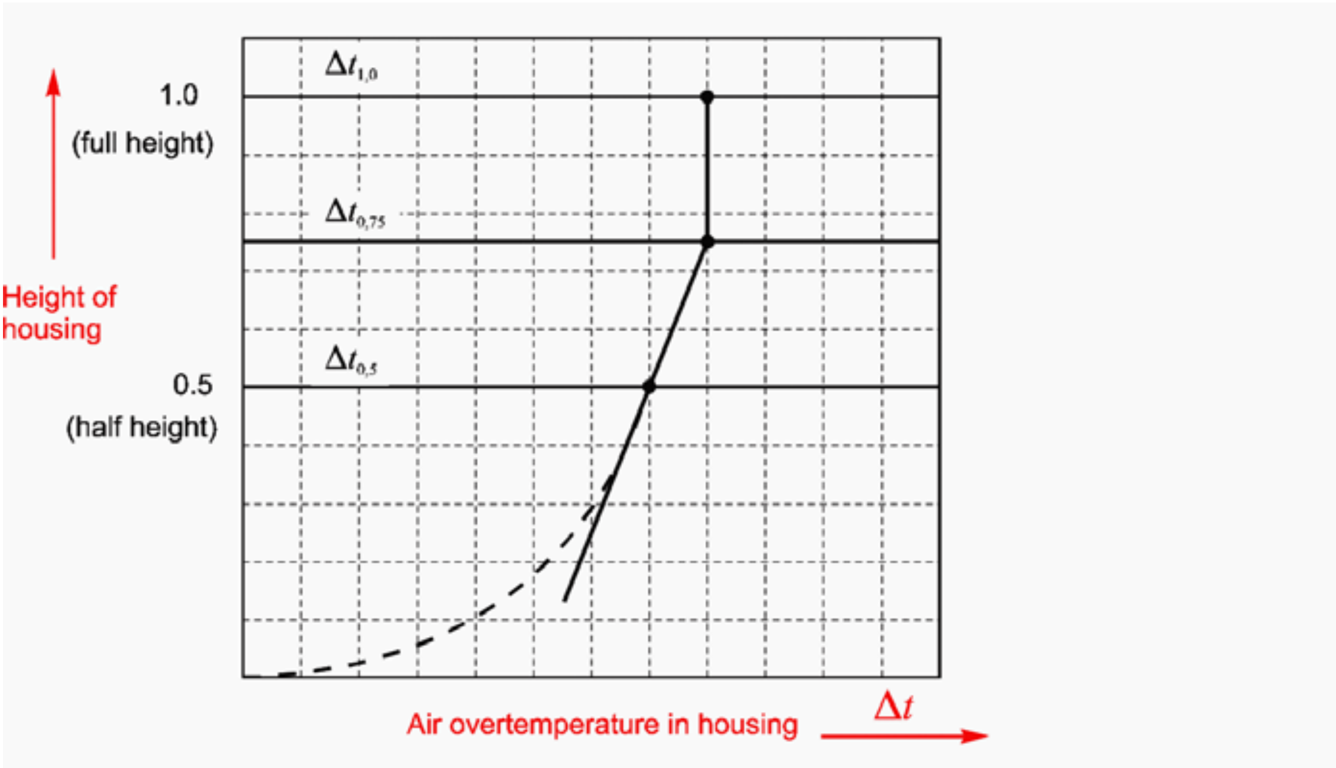


Figure 7 – Temperature rise characteristic for housings with Ae < 1.25²

*Note: For the calculated temperature of **14.65 K**, at an ambient temperature of 35 °C a **cabinet temperature of 49.65 °C will set in**. Since (according to information of the manufacturer) a temperature of 55 °C is permissible, **this constitutes proof that the upper temperature limits are satisfied**.*

Here the symbols have the meanings:

- **A_e** – Effective cooling surface of the housing
- **A_0** – Individual areas of the outer housing parts
- **H** – Height of housing
- **A_G** – Floor area of housing
- **b** – Area factor
- **c** – Temperature distribution factor
- **d** – Factor for temperature rise with horizontal partitions inside housing
- **k** – Housing constant
- **n** – Number of horizontal partitions inside housing (maximum 3)
- **P** – Effective power loss of operational equipment built into housing
- **x** – Exponent
- **Δt** – Overall air overtemperature in housing
- **$\Delta t_{0.5}$** – Air overtemperature at half height within housing
- **$\Delta t_{0.75}$** – Air overtemperature at 3/4 height within housing
- **$\Delta t_{1.0}$** – Air overtemperature within housing at upper edge of housing.

ULHAS VAJRE
C. ENG. (I), DEE, AMIE, BE, MIE, FIV, FISLE, MIIE, CEA, CEM, FISLE, FIAEMP

महाराष्ट्र शासन
मुख्य विद्युत निरीक्षक, मुंबई यांचे कार्यालय,
उद्योग, ऊर्जा व कामगार विभाग,
तिसरा मजला, प्रशासकीय इमारत, रामकृष्ण चेंबुरकर मार्ग,
चेंबुर (पुर्व) मुंबई ४०० ०७१

E-Mail : ceimumbai.nrg-mh@gov.in	दुरध्वनी क्र. ०२२-२५२७४६१३
जा.क्र.मुविनि/तांत्रिक/ 9808 /२०१८	दिनांक 29 AUG 2018

प्रति,

प्रधान सचिव (ऊर्जा)
उद्योग, उर्जा व कामगार विभाग,
मंत्रालय, मुंबई.

विषय :- केंद्रीय विद्युत प्राधिकरण (विद्युत पुरवठा व सुरक्षा संबंधी उपाययोजना), विनियम २०१० मधील विनियम ४४(२)(vii)(e)मधील विचलन(Deviation)

निवासी व व्यावसायिक ईमारतीत आयएसआय मान्यता प्राप्त अवरोधक द्रव असलेले रोहित्र वापरणेबाबत.

संदर्भः- १) शासन आदेश क्र. संकीर्ण-२०१६/प्र.क्र.३२३/ऊर्जा-५, दिनांक १३/०८/२०१८

उपरोक्त विषयास अनुसरुन संदर्भांकीत शासन आदेशान्वये व केंद्रीय विद्युत प्राधिकरण (विद्युत पुरवठा व सुरक्षा संबंधी उपाययोजना) विनियम, २०१० च्या विनियम ११६(२) मधील तरतुदीनुसार विषयांकित बाबतीत सदर आदेश निर्गमित करण्यात येत आहे.

हे आपल्या माहितीकरीता सविनय सादर

सोबत :- आदेश

(सु.रा. बागडे)
मुख्य विद्युत निरीक्षक
मुंबई

प्रत :- १) उप सचिव (उर्जा-५), उद्योग, ऊर्जा व कामगार विभाग, यांना माहितीकरीता सादर.
२) अधीक्षक अभियंता, प्रादेशिक विद्युत निरीक्षण मंडळ, मुंबई/पुणे/औरंगाबाद/नागपुर यांना माहितीकरीता व उचित कार्यवाहिकरीता रवाना.
३) सर्व विद्युत निरीक्षक यांना माहितीकरीता व उचित कार्यवाहिकरीता रवाना.
४) विद्युत निरीक्षक (सचिव, अनुज्ञापक मंडळ व उद्वाहन निरीक्षक) यांना माहितीकरीता व सर्व ठेकेदारांच्या निदर्शनास आणण्यास रवाना.
५) इलेक्ट्रीकल कॉन्ट्रक्टर असोशिएशन ऑफ महाराष्ट्र व इलेक्ट्रीकल विदर्भ कॉन्ट्रक्टर असोशिएशन. यांना माहितीकरीता व उचित कार्यवाहिकरीता रवाना.
६) महाराष्ट्र राज्य वीज वितरण / पारेषण / निर्मिती कंपनी मर्या. यांना माहितीकरीता व उचित कार्यवाहिकरीता रवाना.
७) मे. टाटा कं. लि. / मे. रिलायन्स इन्फ्रा प्रा. लि. / मे. एस. एन. डी. एल. नागपुर/ मे. बी.ई.एस.टी. /मे. टोरंट पावर भिवंडी यांना माहितीकरीता व उचित कार्यवाहिकरीता रवाना.

Government of Maharashtra Office of the Chief Electrical Inspector Industries, Energy & Labour Department 3rd Floor, Administrative Building, Ramakrishna Chemburkar Marg, Chembur (East), Mumbai-400071	
e-mail : ceimumbai.nrg-mh@gov.in	Phone- 022-25274613
No.CEI/TECH/ 347 /2018	Date- 29 AUG 2018

Order

In Exercise of the powers conferred vide Regulation 116(2) of Central Electricity Authority (Measures Relating to Safety and Electric Supply) 2010, the deviation in respect of matter referred in 44(2) (vii) (e) is being allowed as given below:-

"Only Dry type transformers or transformers filled with insulating liquid qualifying under IS 16081:2013, IS 16099:2013, IS 13503:2013 or sealed type transformers filled with insulating liquid qualifying under IS 16659:2017, shall be used for installations inside the residential and commercial buildings"

This deviation has been allowed by the Government of Maharashtra vide order no. Misc- 2016/ CR 323/ Energy-5 dated 13/08/2018 In exercise of the powers conferred by provisions of the regulation (116) (1) of Central Electricity Authority (Measures Relating to Safety and Electric Supply) 2010.

Chief Electrical Inspector
Mumbai


CEEAMATECH-2019
Consultant's Choice
8th 9th 10th February 2019
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