CEEAMA E-NEWS Published by Consulting Electrical Engineers Association of Maharashtra

Volume No. 4 Issue #25

Electrical Consultants Newsletter

January 2023

From the Editor's Desk,

A big Hiiii and hug to all engineers and Technocrats patronising CEEAMA on this fresh new year 2023.

Amidst the Lockdowns & battered economy in the past 2 years, it feels encouraging, rejuvenated, inspiring and of course lucky that we can see this year. We lost many of our near & dear ones initially due to fear and later due to the side-effects of the treatment which grossly went wrong as can be seen with the 10 fold increased cases of cardiac arrests and sudden deaths. Nobody will take responsibility but the recent tussle of Pharma industries fighting out indemnification for their own products and government denying with Supreme Court to compensate people on AEFI help to join the dots. So finally we need to handle our life. Well many conspiracies...so leave it to the experts.

Happy New Hear

The Global recession is believed to be exacerbated by the Ukraine war. But I personally feel it's a very small country to cause such damage unless there is vertical split in the countries the way it happened during world-war.



Editorial

At home front our country, has rarely been number one in the world in anything – save failures. But how things have changed! In 2022, India has become global champion in an area that none could have predicted-stock market performance. After a long time Indian markets are in good cheer! As compared to 2013, today India's forex reserves are twice as high. Inflation is below RBI benchmark of 6% and lower than Europe & US.

On the other hand China's economy is shrinking due its comparatively lousy handling of the lockdowns. Morgan Stanley predicts China's GDP growth in the next decade at just 3.6%, while India's will average 6.5%. It also thinks India will account for no less than 25% of world GDP growth.

Opening up of offices brought back jobs and thus the boom in real estate as well which was also otherwise sluggish. <u>More markedly the Electrical Engineers are</u> now in high demand and so is the entire electrical fraternity.

Various accidents, and fires have brought the electrical safety to the fore. The high rates of fires in EVs and susceptibility in its real effect on global warming has put a big question mark making Switzerland the first country to ban EVs. We need to thereby take cautious approach on its implementation in view of long term repercussions.

CEEAMA have been regularly debating on the topic with active participation of faculties and various stakeholders. CEEMA received massive response in the form of high footfall and active membership drive at the recently concluded ECAM EXPO in Pune. Special mention and thanks to Prof. Sachin Shelar and his students of AISSMS IOIT who have been regularly groomed by our director Mr. Narendra Duvedi. He and our secretary Mr. Veejaye Limaye presented papers at the Technical session and made CEEAMA proud.



Editorial

Our president has also initiated communication with "Influential Policy Makers" at central government with PMO in connection with statutory recognition for electrical design consultants. It was also discussed at IEEMA sponsored consultants get together at Goa recently. The copy of grievance registered with PMO is attached. Actually this is not a grievance but option under "Suggestions and feedback" on PMO portal. Let us see if this goes further

CEEAMA is also glad to announce the appointment of M/s. Prabha Enterprises as its "Official secretariat office".

ENEWS committee working on Themes for ENEWS will finalize one per quarter; topic related to electrical design. We appeal senior members to forward their thoughts in the form of articles which can be included. Associate members can include product innovations, case studies, etc.

Last but not the least, we at CEEAMA, expect to raise some revenue through ENEWS for sustainable existence. We request Associate members to come forward and contribute in the form of Advertisements. Also appeal all our members and readers to remain united and patronise with the association irrespective of your field of expertise and work.

Once again, wish you all a very Happy, healthy and prosperous new year 2023!!

Regards,

Subhash L. Bahulekar Chief Editor – CEEAMA



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CEEAMA GRIEVANCE TO PMO

12/30/22, 1:38 PM

Grievance Status

Details for registration number : PMOPG/E/2022/0345558

Name Of Complainant	Narendra Duvedi	
Date of Receipt	30/12/2022	
Received By Ministry/Department	Prime Ministers Office	

Grievance Description

Dear Sirs,

I am an electrical engineer with 40 years field experience, executive director of a private limited company involved in electrical safety audits and President of Consulting Electrical Engineers Association of Maharashtra (CEEAMA) which is a ROC registered No Profit Company.

Implementation of Rules and regulations related to electrical safety in our country is very poor and as per government records about 15 persons loose their life every day in India due to electrical accidents. At present electrical design engineers do not have any statutory recognition in our country parallel to doctors, chartered accountants etc and they do not sign electrical designs with statutory authority. At project implementation level these designs are expected to be checked by Electrical Inspectors who work under Energy Ministry of various states. This does not happen seriously a they are very less in number and many of them do not have exposure to latest technologies and basic subject knowledge. Healthy and safe electrical infrastructure is backbone of modern society. The safe designs get twisted by project owners in view of cost reduction, many times even unsafe designs are created as designer is not answerable to any body.

Government will have to invest in publicity of Electricity act provisions, rules and regulations etc so that common man would know about them.

We few such techno social organizations are ready to volunteer to suggest proven methods followed world wide to avoid confusions and help create healthy and safe electrical infrastructure. In this regard we have formed a delegation and would like to interact with influential policy makers from central government. In this connection we seek guidance from PMO for proceeding further.

Current Status	Grievance Received
Date of Action	30/12/2022
	Officer Concerns To
Forwarded to	Prime Ministers Office
Officer Name	Mukul Dixit ,Under Secretary (Public)
Organisation name	Prime Ministers Office
Contact Address	Public Wing 5th Floor, Rail Bhawan New Delhi
Email Address	us-public.sb@gov.in
Contact Number	011-23386447
	Print Close



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ECAM EXPO 2022







Some snippets from The ECAM Pune Expo at Pune 4th-6th November, 2022.

Mr. Duvedi addressed the participating companies and audience during the expo.





EARTHING DESIGN & CALCULATIONS Part - 1

We wish to bring to you the first part in the series of articles on earthing design and calculations. In this part we would be covering the small/medium size MV distribution substation. We will be covering salient points without going in too many details that would help the consultant in the design of an earthing system. **Preamble:**

The soil resistivity testing shall be carried out by the geological survey and testing agency. The method of resistivity testing can be found in IS: 3043.

The touch and step voltages are not required to be calculated for MV distribution substation. These shall be covered in the subsequent articles for HV substations.

Design Parameters & Formulas:

For the purpose of calculations the soil resistivity shall be assumed to be 10 Ω -m. (Please see notes at the end of the article)

Current density permissible at the earth electrode surface is given by,

 $Id = 7.57*10^3 / \sqrt{(\rho^*t)} \text{ Amps/m}^2$ (As per 10.3 of IS: 3043)

Where,

 ρ – resistivity

t – fault clearance time

Resistance in ohms of the plate type electrode is given by,

R = $\rho/4 * \sqrt{(\pi/A)}$ Ω. (As per 9.2.1 of IS: 3043, amendment, 2006)

Resistance in ohms of the pipe type electrode is given by,

R = 100 ρ /2 π L * loge(2L/D) Ω. (As per 9.2.2 of IS: 3043, amendment, 2006)

Where, D is the diameter and L is the length of electrode in cm.

While designing the earth grid, it is recommended that the duration of the earth fault current to be taken as 1 second for 66 kV and above. For systems below 66 kV the duration shall be taken as 3 seconds.

Earthing Calculations For Substation Area -

The fault level of the 11/22/33 kV substation is assumed to be as 26.3 kA for 3 sec.

The fault level could be higher or lower depending upon the rating of the transformers in the supply company's substations or within the premises of the consumer.

A. Earthing Conductor Size: The minimum cross sectional area of the conductor is given by the formula, $I/S = k \times 1/\sqrt{t}$ (As per 12.2.2.1 of IS: 3043)

Where

I is the fault current in Amperes

S is the cross sectional area

k is the constant depending on the material of conductor (80 for steel with initial temp of 40°C and final temp of 500°C). As per table 6A of IS: 3043

0%

t is the fault clearing time in seconds (3.0 seconds)

Minimum size of conductor required at 11 kV = $26.3 \times 1000 \times \sqrt{3} = 569 \text{ mm}^2$

80

The corrosion allowance for conductors laid underground are as given below,

For soil having a resistivity above 100 Ω -m –

For soil having a resistivity between 25 100 Ω -m –	15%
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EARTHING DESIGN & CALCULATIONS - PART 1

For soil having a resistivity below 25 Ω -m –

30%

Therefore, considering a corrosion allowance of 30%, the minimum conductor cross section area is $569*1.3 = 739.7 \approx 750 \text{ mm}^2$

Nearest standard size = 75 x 10 mm G.I. strip (750 Sq.mm)

The earthing grid therefore shall consist of G.I. strip of 75 x 10 mm connecting all the earthing pits.

B. Earthing Pits:

With a fault level of 26.3 kA for 3 seconds; ρ, resistivity is 10, (the assumed value of soil resistivity), the calculations are given below.

Permissible current density at the earthing electrode as per equation given in design parameters, $7570/\sqrt{10*3}$ = 1382 A/m²

Total Area of earth electrodes required to dissipate the fault current is $26300/1382 = 19.03 \text{ m}^2$.

Considering plate electrodes of 600x600x6mm, the area available on both sides for fault dissipation is $0.6 \times 0.6 \times 2 = 0.72 \text{ m}^2$

Therefore the number of earthing pits required are $19.03/0.72 = 26.42 \approx 27$.

Alternatively, if we consider G.I. pipe electrode of 65 NB then the area available is π *D*L = 3.14*0.065*3 = 0.612 m2.

Therefore number of earth pits (Pipe type) required to dissipate the earth fault shall be $19.03/0.612 = 31.09 \approx 32$ Nos.

C. Transformer Area-

After having calculated the earthing conductor size and number of earth pits for a fault current duration of 3 seconds for the substation, we can now calculate the conductor sizes for equipment with fault clearance time of the protective switchgears (As per 7.0.1-2 of IS: 3043)

Assuming the transformer rating of 1600 kVA, the calculations are given below,

The fault level of 1600 kVA transformer at 6% impedance is 38.5 kA on LV side.

The fault clearance time t is taken as 0.25 seconds.

Using the formula for conductor size for body earthing,

 $I/S = k \times 1/\sqrt{t}$

= 38500 x 0.5

= 313 mm2 (Considering the corrosion factor of 30%)

Nearest standard size = 60 x 6 mm G.I. strip (360 Sq.mm)

However we shall provide 2 runs of 60X6 mm G.I. strips to each transformer to take into account the contingency. Using the formula for conductor size for neutral earthing,

 $I/S = k \times 1/\sqrt{t}$

= 38500 x 0.5

205

Value of k for bare copper conductor is 205 as per table 6A of IS: 3043.

 $= 93.9 \text{ mm}^2$

= 122 mm2 (Considering the corrosion factor of 30%)

Nearest standard size = 25 x 6 mm Copper strip (150 Sq.mm)

We shall provide 2 runs of 25X6 mm G.I. strips to each transformer to take into account the contingency.



EARTHING DESIGN & CALCULATIONS - PART 1

However as per statutory requirements, the transformer neutral shall be connected to earth with 2X50X6 mm Copper strips (or 2X75X8 G.I. strips).

Earthing Pits For Transformer-

Using the same formulae given earlier,

Permissible current density at the earthing electrode as per above equation, $7570/\sqrt{\rho^*t} = 7570/\sqrt{(10^*0.25)} = 7570/1.58 = 4787 \text{ A/m}^2$.

Area required to dissipate the fault is $38500/4787 = 8.04 \text{ m}^2$.

As previously done, the number of plate type earthing pits required are,

 $= 8.04/0.72 = 11.16 \approx 12$ Nos.

However, if the transformer is located in the same area as the substation then we may provide the higher number of earth pits calculated above for the substation, that is 27 numbers.

Similarly the calculations can be repeated for D.G. Set, PCC and other equipment. General -

1. Distance between two earth electrodes shall not be less than 3 metres (or driven depth).

2. For backfilling of earth pits, earth enhancing compounds or bentonite clay or fly ash shall be used along with salt and charcoal.

3. All the earth pits shall be interconnected in the form of a grid. Wherever rectangular grid is formed, the strips shall be laid at about 0.6 metre depth to form a mesh of size about 3 mtrs X 3 mtrs.

4. The ground grid shall encompass all of the area within the substation fence and extend about 1.0 metre outside the substation area if possible.

Notes:

1. If the geological survey report with the details of soil resistivity is not available then the Table-3 of IS: 3043 may be referred for assuming the value of soil resistivity.

2. If there are too many earthing pits required with the conventional type of pipe or plate electrode and there are space restrictions then we may consider a higher size of earthing plate, 1200X1200X12 mm as earthing electrode.

This will considerably bring down the number of earthing pits.

References: Code Of Practice For Earthing - IS: 3043

Disclaimer

"IS 3043: 2018 - Code of Practice for Earthing" have been referred to compile the information presented in this synopsis. Although every attempt has been made to ensure the accuracy of this material, neither CEEAMA nor any of its contributors to this publication assumes responsibility for any inaccuracies or omissions in the data presented. For use in practice, we strongly advise that, information utilized from this publication should be verified from the relevant sources and to use document of actual standard published by respective institution.

Contributed by LFM Mr. Krishna Chandavar K.S. Chandavar and Associates LFM-049

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CEEAMA E-QUIZ JANUARY 2023

1. Project kick-off meeting provides

- 1. New Project briefing
- 2. Installation procedure
- 3. Commissioning activities
- 4. Bulk MTO

2. Input for Electrical Load list

- 1. Transmission Line location
- 2. C&S material schedule
- 3. Mechanical Load list
- 4. All of the above

3. Key SLD provides Metering & Protection details

- 1. TRUE
- 2. FALSE
- 3. Both A & B
- 4. None of the above
- 4. A potentiometer is usually a
- 1. Digital Instrument
- 2. Deflection type instrument
- 3. Null type instrument
- 4. None of these
- 5. A negative sequence relay is usually used to protect
- 1. An Alternator
- 2. A transformer
- 3. A transistor
- 4. A Junction

6. The starting current of a three phase induction motor is 3 times the rated current, while the rated slip is 8 %. Find the ratio of starting toque to full load toque

- 1. 0.5
- 2. 0.75
- 3. 0.72
- 4. 0.8

7.1 volt can be expressed as

- 1. 1 joule/weber
- 2. 1 joule/ columb
- 3. 1 joule/ohm
- 4. 1 watt/ Joule





CEEAMA E-QUIZ 2023

8. In which of the given single-phase motor, the rotor has no teeth or winding?

- 1. Shaded pole motor
- 2. Capacitor start motor
- 3. A permanent capacitor run the motor
- 4. Hysteresis motor

9. In an induction motor, crawling is caused by

- 1. High Voltage
- 2. Heavy loads
- 3. Improper design of machine
- 4. Harmonic produced in the motor

10. A 3 phase Induction motor having 70 Hz frequency draws a power of 80 kW from mains. If the stator losses are 4kW and rotor emf oscillates at 120 oscillations per minute, find the rotor copper losses

- 1. 0.26 kW
- 2. 0.54 kW
- 3. 0.10 kW
- 4. 0.99 kW

Rules for the QUIZ:

- The Quiz will be open for 10 days from the date of EMAIL.
- Each correct answer received on DAY 1 will get 100 points
- Next days the points will reduce as 90 80 70 and on 10th day points will be ZERO even if the answer is correct.

• All participants will receive E certificate signed by CEEAMA President with the points earned mentioned on the same.

Please use following google form link to participate in the QUIZ. https://forms.gle/f7BpNdYVavD3pkxX6

"Thank you all for the overwhelming response to the E-NEWS in general and E-Quiz in particular. MCQ based quiz is always tricky and surprisingly can take us aback when we realise our conceptions (misconceptions) about the subject / system / product.

The aim of the feature was to create inquisitiveness in your mind and help you check your technical quotient quickly. The response will also help us to present articles and webinars on subjects which are important, but which lack enough awareness / knowledge in general.

It can open a pandora box for our discussions and arguments and probable solutions. Engineering evolves with conception. It gets fuelled with community discussions and capitalist actions. All stakeholders start realising the need to take a closer look and help improve standards as we have seen in the past century. Surely it makes the world a better place.

Wish you all a better luck this time. Do spread the word."





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A-103. Sanpada Railway Station Building, 1st floor Sanpada East, Navi Mumbai – 400705 Email: admin@ceeama.org