Deepak K. KAMDE

Postdoctoral researcher
Building Technology & Construction Management (BTCM) Division
Department of Civil Engineering
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EARNED DEGREES

- **Doctor of Philosophy (Civil Engineering)** 2016 - 20
  Indian Institute of Technology Madras (IIT Madras)
  Chennai, Tamil Nadu, India
  Thesis: *Electrochemical characteristics, bond behaviour, and service life of reinforced concrete systems with coated steel reinforcement and exposed to chlorides.*

- **Master of Technology (Structural Engineering)** 2012 - 14
  Sardar Vallabhbhai National Institute of Technology (SVNIT)
  Surat, Gujarat, India
  Project: *Service life prediction model for reinforced concrete systems under chloride attack.*

- **Bachelor of Engineering (Civil Engineering)** 2008 - 12
  Shri Ramdeobaba College of Engineering and Management (SRCOEM)
  Nagpur, Maharashtra, India.

AWARDS AND RECOGNITIONS

- **Institute Predoctoral Research Fellowship** at IIT Madras from June 2020 to December 2020
- **Guest Editor** of a Special Edition on '*Corrosion Control in Concrete Structures'* of Indian Concrete Journal in November 2020
- **NACE Foundation India Scholarship** for the year 2019 (one among five winners in India)
- **NACE Graduate Student Book Store Award** for the year 2019 (one among seven winners worldwide)
- **President** of **NACE Gateway India Section (NIGIS) – South Zone Student Section** from July 2018 – June 2020
- **Best Paper Award,** for 'Effect of exposure to UV rays on the performance of fusion-bonded-epoxy (FBE) coated steel rebars,' *CORCON, an International Conference & Expo*, NIGIS, Mumbai, September 2019
- **Best Oral Presentation Award**, for 'Electrochemical response and Service life estimation of RC structure with FBE coated steel rebars,' *CORSYM, an International Corrosion Prevention Symposium for Research Scholars*, organized by NIGIS- SZ-SS, Chennai, March 2018
- **Convener of CORSYM 2018**, an *International Corrosion Prevention Symposium for Research Scholars* organized by NIGIS and attended by 100+ scholars
- Active reviewer for national and international journals
- **Nominated** for 2021 **NACE International Outstanding Student Award** (result awaiting)

PATENT FILED

- Title: Assessment of Galvanic Anode Performance (GAP) for cathodic protection of reinforced concrete structures**,** *Inventors*: Radhakrishna G. Pillai and **Deepak K. Kamde,**
  Filing date: September 19, 2019, Application number: 2019 4103 7729.

INVOLVEMENTS IN STANDARD MODIFICATIONS

* Submitted recommendations to BIS to modify the "*Indian Standard 13620 - Fusion-bonded-epoxy-coated reinforcing bars - Specifications*"
* Assisting in the revision of the chapters on *Materials* and *Durability* in the "*Indian Standard 456 - Plain and reinforced concrete – Code of Practice*"
* Submitted recommendations to modify the "*ASTM Standard A775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars*"
* Preparing the new Indian Standard for *"Test methods to estimate the chloride thresholds of various steels embedded in concrete systems*
* Preparing the new Indian Standard for "*Test methods to estimate the long-term performance of sacrificial anodes in reinforced concrete systems*"

PUBLICATIONS

Scopus ID: 57204669135; IF: Impact Factor; CC: Citation Count

Refereed Journal Papers (Published)

RJ7 **Deepak K. Kamde** and Radhakrishna G. Pillai (2021) "Corrosion initiation mechanisms and prediction of the service life of concrete systems with fusion-bonded-epoxy (FBE) coated steel rebars and exposed to chlorides", *Construction and Building Materials*, Elsevier, 122314, https://doi.org/10.1016/j.conbuildmat.2021.122314 [IF: 4.419; CC: 1]

RJ6 Manu Harilal, **Deepak K. Kamde**, Sudha Uthaman, Rani P. George, Radhakrishna G. Pillai, John Philip, and Albert, S.K. (2021), "Use of nanoparticles, fly ash and corrosion inhibitors to enhance the corrosion resistance of concrete structures", *Construction and Building Materials*, Elsevier, 122097, https://doi.org/10.1016/J.CONBUILDMAT.2020.122097 [IF: 4.419; CC: 0]

RJ5 **Deepak K. Kamde**, Marc Zintel, Sylvia Kessler, and Radhakrishna G. Pillai (2021) "Performance indicators and specifications for fusion-bonded-epoxy (FBE) coated steel rebars in concrete", *Journal on Sustainable and Resilient Infrastructure*, Taylor and Francis. 10.1080/23789689.2020.1871539 [IF: 1.458; CC: 1].

RJ4 Arya E. Kandiyil, Varghese A. Ittyyeipe, **Deepak K. Kamde**, and Dhanya Vinod (2020) "Service life of RC systems with cement polymer composite coated steel reinforcement", Special issue on *Corrosion Control in Concrete Systems (C3S), Indian Concrete Journal*, Vol. 94 (11) [IF: 0.27; CC: 0]

RJ3 **Deepak K. Kamde** and Radhakrishna G. Pillai (2020) "Effect of ultraviolet exposure on corrosion performance and service life of Fusion-Bonded-Epoxy (FBE) coated steel rebars", *Corrosion***,** Science Section, 76(9), NACE International, https://doi.org/10.5006/3588 [IF: 1.927; CC: 6]

RJ2 **Deepak K. Kamde** and Radhakrishna G. Pillai (2020) "Effect of surface preparation on corrosion of steel rebars coated with cement-polymer-composites (CPC) and embedded in concrete", *Construction and Building Materials*, Elsevier, 237, pp 1-11, https://doi.org/10.1016/j.conbuildmat.2019.117616. [IF: 4.419; CC: 8]

RJ1 **Deepak K. Kamde**, Kondraivendhan Balakrishnan, and Satish Desai. (2015) "Service life prediction model for reinforced concrete structures under chloride ingress", *Journal of Advances in Structural Engineering*, Springer, pp 145-155, https://doi.org/10.1007/978-81-322-2187-6 [IF: -; CC: 1]

Refereed Journal Papers (In review)

RJ* **Deepak K. Kamde** and Radhakrishna G. Pillai "Service life of concrete systems with Cement-Polymer-Composite (CPC) coated steel rebars", *ACI Materials* Journal.

RJ* **Deepak K. Kamde**, Sylvia Kessler, and Radhakrishna G. Pillai "Condition assessment of reinforced concrete systems with fusion-bonded epoxy-coated rebars", *Corrosion Journal*, NACE International.

In Preparation (planned to be submitted by March 30, 2021)

* Naveen Krishnan, **Deepak K. Kamde**, Zameel D. Veedu, Radhakrishna G. Pillai, Dhruvesh Shah, and Rajendran Velayudham, "Life cycle cost benefits of galvanic anode cathodic protection in concrete structures", *Journal of Performance of Constructed Facilities*, ASCE

* **Deepak K. Kamde**, Karthikeyan Manickam, Radhakrishna G. Pillai, and George Sergi, "Long-term performance of galvanic anodes in reinforced concrete systems", to be submitted to *Corrosion Journal*, NACE.

* **Deepak K. Kamde** and Radhakrishna G. Pillai, "Short-term test method for assessing the long-term performance of sacrificial anodes in concrete systems", *Corrosion*, NACE.

* **Deepak K. Kamde**, Dyana Joseline, Sripriya Rengaraju, Jayachandran Karuppanasamy, Anand Godara, and Radhakrishna G. Pillai, "Factors affecting the performance of corrosion inhibitors as admixtures to enhance the service life of concrete structures", *Cement and Concrete Research*, Elsevier.

* Karthikeyan Manickam, **Deepak K. Kamde**, Naveen Krishnan, Radhakrishna G. Pillai, "Performance assessment of galvanic anodes in reinforced concrete systems using a short-term test method", *Construction and Building Materials*, Elsevier.

* Radhakrishna G. Pillai, Sripriya Rengaraju, **Deepak K. Kamde**, and Dyana Joseline "Accelerated Corrosion Test (ACT) to determine chloride threshold of various steel rebars in concrete systems", *Corrosion*, NACE.

Book Chapter published

* **Deepak K. Kamde**, Dyana Joseline, Sripriya Rengaraju, Jayachandran Karuppanasamy, and Radhakrishna G. Pillai, "Corrosion and service life assessment of concrete structures", *A Treatise in Corrosion Science, Engineering, Technology and Management: Perspectives & Strategies*, Springer Nature.

Refereed Conference Papers (RC)

RC9 **Deepak K. Kamde**, Naveen Krishnan, Radhakrishna G. Pillai, George Sergi, Dhruvesh Shah, and Rajendran Velayudham, "8-year performance of cathodic protection systems in reinforced concrete slabs and life-cycle cost benefits", *Proceedings of the RILEM Spring Convention*, Rovinj, Croatia, April 2019.

RC8 **Deepak K. Kamde**, Dubey A., Lavangia R., Ram K., and Radhakrishna G. Pillai "Effect of replacement level of GGBFS and microslag on diffusion coefficients of concrete", *Proceedings of the 3rd R. N. Raikar Memorial International Conference & Gettu-Kodur International Symposium on Advances in Science and Technology of Concrete*, American Concrete Institute - India Chapter, Mumbai, India, December 2018.

RC7 Dhanya B. S., Varghese A. I., Rudhan A., Ajayan A., Malavika S., and **Deepak K. Kamde** "Effect of surface preparation on the corrosion resistance of cement polymer composite coated steel reinforcement", *Proceedings of the 3rd R. N. Raikar Memorial International Conference & Gettu-Kodur International Symposium on Advances in Science and Technology of Concrete*, American Concrete Institute - India Chapter, Mumbai, India, December 2018.

RC6 **Deepak K. Kamde** and Radhakrishna G. Pillai "Effect of Corrosion Level on Bond Performance of Cement Polymer Composite (CPC) Coated Rebar", *Proceedings of the ICCRRR*

(International Conference on Concrete Repair, Rehabilitation, and Retrofitting), Cape Town, South Africa, November 2018.

RC5 **Deepak K. Kamde** and Radhakrishna G. Pillai "Performance assessment of sacrificial anodes for cathodic protection of reinforced concrete structures", *Proceedings of the ICCRRR*, Cape Town, South Africa, Nov. 2018.

RC4 Dyana Joseline, **Deepak K. Kamde**, Sripriya Rengaraju, and Radhakrishna G. Pillai, "Residual Service Life Estimation and its Importance for Pretensioned Concrete (PTC) Bridges in Coastal Cities", *Proceedings of the Sixth International Conference on the Durability of Concrete Structures (ICDCS)*, University of Leeds, Leeds, United Kingdom, July 3-5, 2018.

RC3 **Deepak K. Kamde** and Radhakrishna G. Pillai "Corrosion performance of fusion-bonded-epoxy coated steel rebars.", *Proceedings of the ICACMS 2017*, RILEM, Chennai, Sept. 2017.

RC2 **Deepak K. Kamde** and Radhakrishna G. Pillai "Effect of surface preparation on the performance of Cement Polymer Composite (CPC) coatings for steel in concrete structures", *CORROSION 2017*, NACE, New Orleans, USA, March 2017.

RC1 **Deepak K. Kamde**, Kondraivendhan B, and Satish N. D. "Service life Prediction model for reinforced concrete structures under chloride ingress", *Proceedings of the 13th Biannual Structural Engineering Convention 2014*, Indian Institute of Technology Delhi, Dec. 2014.

Other Conference Papers and Presentations

RC10 **Deepak K. Kamde** and Radhakrishna G. Pillai "Service life of concrete systems with coated steel rebars", *Poster presentation at ACI convention*, Chicago, USA, October 2020.

OC9 **Deepak K. Kamde** and Radhakrishna G. Pillai "Effect of exposure to UV on the performance of fusion-bonded-epoxy (FBE) coated steel rebars", *Proceedings of the CORCON 2019*, NACE, Mumbai, Sept 23. – Sept. 26, 2019 **(Best Paper Award).**

OC8 Krishan N., **Deepak K. Kamde**, and Radhakrishna G. Pillai "Cost-benefit analysis of reinforced concrete repair with and without sacrificial anodes", *Proceedings of the 3rd R. N. Raikar Memorial International Conference*, Mumbai, India, Dec. 2018 (only presentation).

OC7 **Deepak K. Kamde** and Radhakrishna G. Pillai "Development of the short-term test method to assess the performance of sacrificial anode for cathodic protection of concrete structures", *Proceedings of the CORCON 2018*, NACE, Jaipur, Sept. 30 – Oct. 3, 2018

OC6 Zameel D. V., Naveen K., **Deepak K. Kamde**, and Radhakrishna G. Pillai "Effect of concrete resistivity on the performance of SACP anodes", *Proceedings of the CORCON 2018*, NACE, Jaipur, Sept. 30 – Oct. 3, 2018. (only presentation).

OC5 **Deepak K. Kamde** and Radhakrishna G. Pillai "Electrochemical response and service life estimation of Reinforced Concrete Structures with FBEC rebars", *Proceedings of the CORSYM 2018*, IIT Madras, NACE, Chennai, March 2018. **(Best Presentation Award).**

OC4 **Deepak K. Kamde** and Radhakrishna G. Pillai "Short-term test methods to evaluated chloride threshold of CPC coated rebars", *Proceedings of the CORCON 2017*, NACE, Mumbai, Sept. 2017.

OC3 **Deepak K. Kamde** and Radhakrishna G. Pillai "Effect of surface treatment on the performance of cement-polymer-composite (CPC) coatings for steel in concrete structures", *Proceedings of the CORCON 2016*, NACE, Delhi, Sept. 2016.

OC2 **Deepak K. Kamde** and Anand Hulagabali, "Comparative study for the design of single-span bridge using AASTHO-LRFD and Indian standard method" *Proceedings of the International Conference on Advances in Engineering and Technology*, Nagpur, Maharashtra, India, 2014.

OC1 **Deepak K. Kamde,** Anand Hulagabali, and Sharan Basava, "Three-dimensional steady-state finite-difference flow model – a case study", *International Conference on Emerging Trends in Civil and Mechanical Engineering*, Siliguri, West Bengal, India, 2013. Also, published in IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, ISSN: 2320-334 pp 40-44.

PROFESSIONAL MEMBERSHIPS

1. NACE International (Student member since November 2015 – Reg. No. 930208)
    - Committee member of TEG 043X (Reinforced Concrete: Cathodic Protection) and TEG 053X (Reinforced Concrete: Design, Evaluation, and Remediation).
    - Organized a National level story writing competition, **'**Corrosion in Public (CiP)' during January 2020.
    - Key organizer for a national level one-day symposium on 'Interpretation of Electrochemical Response from New-age-steel-cementitious Systems (ERNS)' during January 2020.
    - Served as President of NIGIS-SZ SS from July 2018 to June 2020.
    - Organized a national level seminar C3S during June 2019.
    - Served as Convener for an international symposium on corrosion prevention and control - CORSYM 2018.
    - Technical Editor for proceedings of CORSYM 2018.
    - Key volunteer in organizing various international and national NACE events like CORCON 2015, 2016, 2017, and 2018 (with more than 200 presentations and 600 participants); C3S 2016, 2017, and 2019 (with more than 100 participants); and CORROSION 2017.
    - Reviewed the conference papers of CORCON 2016 & 2017.
    - Volunteered for running the technical session and a mini-camp for 55 high school students during CORROSION 2017, New Orleans, USA.
2. ICI (Indian Concrete Institute) (Lifetime membership No. 11316)
    - Key organizer for one-day seminar on corrosion performance of PT structures held at IIT Madras during May 2019.
    - Key organizer of a workshop on 'Cathodic protection – past, present, and future' during October. 2018.
    - Key organizer of an international workshop on 'Corrosion Control in Concrete Structures (C3S)' in 2016, 2017, and 2019.
3. RILEM (Executive member since 2017; Reg. No. 34304)
    - Member of TC ECS: Assessment of electrochemical methods to study corrosion of steel in concrete
    - Key member in organizing the International Conference in Advances in Construction Materials, and Systems (ICACMS) 2017.
    - Key organizer of 2nd international workshop on C3S 2017.
4. ASTM International (Participating member since 2020; Reg. No. 2272834)
    - Member of Committee A 01 on Steel, Stainless Steel and Related Alloys.
    - Submitted recommendations to modify ASTM A775 on modification of standard specifications for fusion bonded epoxy coated rebars.

OTHER PROJECTS INVOLVED

Present work

- '*Corrosion assessment, health monitoring, and service life extension using cathodic protection of Chajja made of reinforced lime mortar*', at Rashtrapati Bhavan (official residence of President of India), Delhi.
- '*Assessment, prevention, and protection of RC structure with coated rebars*', sponsored by the Department of Science and Technology.
- '*Evaluation of Sacrificial Anode Cathodic Protection (SACP) systems for reinforced concrete applications*.', sponsored by Vector Corrosion Technologies, Canada and India.
- '*Service life prediction and suggestion of the type of steel and concrete to achieve 200 + years*' service life of tunnel with rock bolt for the structure with national importance.
- '*Performance evaluation of commercially available inhibitors on corrosion resistance of steel-concrete systems*.', sponsored by various Chemical Industries – 4 projects.
- '*Long-term assessment of the performance of reinforced concrete slab exposed to natural chloride environment (Mumbai)*', a joint research project with Vector Corrosion Technologies Canada and IIT Madras.

- '*Service life extension of RC residential apartment with 675 flats using sacrificial anodes*', Kolkata, India.

Past work

- *Condition assessment of the Industrial Development Bank of India (IDBI), Chennai*, was done. Actively involved in condition assessment of the building and prepared recommendations for corrosion protection and strengthening of the building.
- '*Condition assessment of various buildings in IIT Madras*': repair using cathodic protection systems was recommended, and the projects are being monitored for their performance.
- '*Corrosion performance of CPC coated steel rebars*': interlaboratory research project with Rajiv Gandhi Institute of Technology Kottayam.

WORK EXPERIENCE

Teaching

Half-Time Teaching Assistantship (August 2013 – September 2014)

- *Assisted in conduction laboratory sessions for Concrete Technology*

Assistant Professor at RK University, Rajkot, Gujarat, (June 2014 to September 2015)

- *Undertaken UG and PG courses: Structural Analysis I, II, and III (UG), Concrete Technology (UG), Advanced Structural Analysis (PG).*
- *Modified syllabus for Structural analysis II, III, and Advanced structural Analysis.*
- *In-charge of various administrative posts and responsibilities.*
- *Guided two under-graduate project groups and one M. Tech. Student for their academic projects.*

Graduate Teaching Assistant (January 2016 to June 2020)

- *Assisted Dr. Pillai in NPTEL course material, assignment questions, short quizzes for MRCF (Maintenance and Rehabilitation of Constructed Facilities') during June 2018 to June 2019 and HTRA assistance during Jun.-Dec. 2018.*
- *'Material testing lab' for the graduate course during Jan.-Jul. 2017 and Jan.-Jul. 2018.*
- *Quality Enhancement in Engineering Education (QEEE) for the course on Durability of Concrete.*
- *Material testing lab for the undergraduate course during Jul.-Nov. 2016 and Jul.-Nov. 2017.*

Research

Project Associate at IIT Madras, Chennai (September 2015 to December 2015).

- *'Estimation of the residual service life of a reinforced concrete bridge with Cement Polymer Composite coated steel rebars'.* This work quantified the effect of inadequate surface preparation on chloride threshold and corrosion-free service life of RC structure.
- *Estimation of chloride threshold for a steel-concrete interface for the concrete mixed with various inhibitors using accelerated corrosion test.*
- *Chloride threshold estimation for pre-stressing steel, QST, and CTD bars embedded in OPC, PPC, and LC3 using ASTM G 109 and impressed current corrosion technique.*

Mentoring *(January 2018 to present)*

I have involved myself in mentoring a few graduate students on the following:

- Assessment of concrete systems with prestressing strand (*part of Ph.D. thesis*).
- Long-term performance of sacrificial anodes in protecting reinforced concrete systems (*part of a M.S. and Ph.D. thesis*).
- Electrochemical characteristics of metallic coated reinforcements for concrete systems (*part of Ph.D. thesis*).
- Improvement on their presentation, communication, and technical writing skills.

LECTURES GIVEN / OUTREACH

No.	Topic	Where?	When?
15	Concerns associated with steels in construction	Mizoram University	November 2020
14	Performance of coated steel rebars	Coal India Limited	November 2020
13	Corrosion in reinforced concrete systems	Online AICTE STTP @ Bannari Amman Institute of Technology	October 2020
12	Corrosion in reinforced concrete systems	Guest talk at RK University, Rajkot	September 2020
11	Corrosion mechanisms of coated steel rebars in concrete	Online course for Coal India Limited, Ranchi	August 2020
10	Corrosion in concrete systems	Webinar, Tech launchpad	August 2020
9	Corrosion and its control	G. H. Raisoni College of Engineering, Nagpur, India	July 2020
8	Corrosion performance of reinforcing steel rebars used in reinforcing steel rebars in concrete construction in India	Faculty Development Program (FDP), R. R. Reddy College, Bangalore, India	June 2020
7	Concerns about some of the reinforcing steel rebars used in reinforcing steel rebars in concrete construction in India	Workshop on corrosion of reinforced concrete, CSIR, SERC, Chennai, India	November 2019
6	Corrosion assessment of CPC and FBE coated steel embedded in concrete structures	21-day long workshop on NDT techniques for concrete structures, CSIR, SERC, Chennai	July 2019
5	Corrosion performance of CPC coated steel embedded in concrete structures – a case study	1-day workshop, C3S 2019, IIT Madras, Chennai, India	June 2019
4	Demonstration of the working principle of cathodic protection in concrete structures	A one-day workshop on corrosion control in concrete structures 2018, IIT Bombay	October 2018
3	Corrosion mechanism and service life estimation of RC structures with coated rebars	Quality Concrete Construction, METCON TMT Bars, Kochi	May 2018
2	Hands-on training for corrosion assessment techniques	ECT 2018, BSAR Crescent University, Chennai, India	March 2018
1	Chloride induced corrosion and service life estimation of RC structures with coated rebars	CEA Fest - National level annual technical program, IIT M, India	January 2018

CERTIFICATION PROGRAMMES

1. Participated in CPD course on Repair and Rehabilitation of Concrete Structures, held at University of Cape Town, South Africa, during Nov. 2018.
2. Attended 1st global meet on Cathodic Protection, organized by NIGIS, held at Delhi, India, during Jan. 2018.
3. Organized and participated in the 1st, 2nd, and 3rd 'Corrosion Control in Concrete Structures (C3S)' IIT Madras.
4. Participated in GIAN course on 'Advanced Design of Bridge and Construction,' during June 2016 held at IIT Madras, Chennai, India.

5. Participated in a short-term course on 'Advanced Concrete Technology (ACT),' organized by IIT Madras and secured 'A' grade, held at Chennai during Dec. 2015.
6. Attended a workshop on 'Recent Advances in Civil Engineering Material,' organized by SVNIT Surat, Sept.-Oct. 2014.
7. Participated in the International Workshop on 'Emerging Trends in Earthquake Engineering and Structural Dynamics,' organized by IIT Delhi, December 2014.
8. Participated in a short-term training program on 'Structural Diagnosis, Repair and Retrofitting of RCC Structures' (Under TEQIP-II), June 2013, held in SVNIT, Surat, India.

INTERNSHIPS

1. 45 days (December 2017 to January 2018): fully funded winter internship by JASSO at the Nagaoka University of Technology at Nagaoka, Niigata, JAPAN.
2. 45 days (May - June 2011): fully funded summer internship with Gujarat Maritime Board, for the construction of On and offshore construction of RORO terminal, Gujarat, INDIA
3. 45 days (June – July 2011): summer training at Madhusudan Agrawal Constructions for the construction work of G + 2 commercial building, at Bilaspur, Chhattisgarh, INDIA.

EXTRACURRICULAR ACTIVITIES

- Volunteer for teaching students at government schools in rural areas of Tamil Nadu under *One Lab – One School* program.
- Key organizer/volunteer for various technical and cultural programs at SRKNEC, Nagpur.
- Lead member of organizing team for Structural Engineering Convention 2012 at SVNIT Surat.
- Runner up in National level Jawaharlal Nehru National Science Exhibition held at KV Jabalpur in June 2005.
- Participated in High-Altitude Trekking Programme held in Himachal Pradesh in May 2004.
- 1st runner up as Best Student of Chhindwara district for the year 2002, organized by Rotary Club and ACC Cements.

REFERENCES

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