



INSTITUTE OF ENGINEERING AND TECHNOLOGY

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Hyderabad | PIN: 500068

Department of Civil Engineering

Summary Report

on

One-week online Faculty Development Programme on “Sustainable Materials and Pavement Performance (SMPP): Design, Construction, and Maintenance”

26th April to 01st May 2021

Hosted by: Department of Civil Engineering, Sreyas Institute of Engineering and Technology, Hyderabad

Total Number of Participants: 180

Participants are the faculty members, research scholars and practicing engineers from India, USA, Nigeria, and Oman.

Meeting Platform: Google Meet

Day 1 Session 1

Keynote Speaker: Prof.K.Sudhakar Reddy, IIT Kharagpur

Topic: Sustainability of Materials in Pavements: Critical issues.

Time: 10:00 AM to 12:00 PM, April 26, 2021

Duration: 02 hours

Prof. Sudhakar Reddy, IIT Kharagpur highlighted the critical issues in the sustainability of the pavements. Prof.Reddy has also discussed innovative pavement technologies such as cell-filled concrete pavements, concrete block pavements, and short paneled concrete pavements. We need to adopt these technologies locally and have a feedback mechanism to implement at a large scale.



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Few glimpses of the session 1 of Day 1 in the FDP.

Sustainability of Pavements

- Loads – Spectrum of axle loads; repetitions; speeds/loading times/dynamic effects; rest periods
- Varying temperatures – peak summer, peak winter, continuously varying; temperature gradients (curling); increase or decrease in temperature (expansion/contraction), freezing and thawing
- Varying moisture conditions in different layers
- Effect of chemicals
- Subjected to the effects of aging

Meeting details: Raise hand, Turn on captions, Sudhakar Reddy Kusam is presenting

Meeting details: People (50), Chat

IN CALL:

- civil hod (You)
- AASHISH MISHRA
- akshi gupta
- AKSHATHA BA
- Arroju Srikeerthana
- Bandana Jethy
- Bornail Debnath
- BHARAT BHUSAN RAMP...
- Chandanshree N S

Meeting details: Raise hand, Turn on captions, Present now



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Day 1 Session 2

Name: Prof. Ramya Sri Mullapudi, IIT Hyderabad

Topic: Aspects of Recycled Asphalt Pavement material usage as Sustainable Flexible Pavement Material.

Time: 02:00 PM to 03:45 PM, April 26, 2021

Duration: 01 hr 45 minutes

Prof. Ramya discussed about the sources of reclaimed asphalt pavement material (RAP) and their nature while producing at high volume quantity. The percentage of RAP that can go into the various base, subbase layers of flexible and rigid pavements were discussed. The presentation also includes the healing characteristics of asphalt mixture with various dosages of RAP.

Few glimpses of the session 2 of Day 1 in the FDP.

The screenshot shows a Google Meet interface. The main window displays a presentation slide titled "Aspects of RAP Usage as Sustainable Flexible Pavement Material" by Dr. Ramya Sri. The slide content includes:

- Research Work - Doctoral level @IIT Kharagpur**
- Utilization of reclaimed asphalt pavement (RAP) in asphalt mixes**
- Reclaimed Asphalt Pavement (RAP)**
- Use of higher % of RAP-** Subbase, lower base (lower layers) with natural aggregates/ other industrial by-products
- Use of lower % of RAP-** binder and surface courses (Top layers- Asphalt Mixes)

The slide also features two images: "RAP Material - NH2" and "Typical Cross section of Bituminous Pavement".

On the right side of the screen, a "Meeting details" panel is visible, showing a list of participants in the call:

- civil hod (You)
- A. Vijaynath 17_102
- Aarjya G
- AASHISH MISHRA
- akhil gupta
- Arjun P.V
- Bandana Jethy
- Barnali Debnath

The bottom of the screen shows the Windows taskbar with the search bar and system tray.



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The screenshot displays a Google Meet window with a presentation slide. The slide title is "Research Work for Ph.D. Thesis (Contd) Healing of asphalt mixtures Difference Between Lab and Field Loading Pattern". It features a graph of sinusoidal loading with parameters σ_0 , σ_1 , and σ_2 , and a period T . Below the graph, it states "Sinusoidal loading or Haversine loading with standard rest period". To the right is a photo of traffic on a road with the caption "Traffic on road (www: <http://static01.nytimes.com>)". The slide contains two bullet points: "Asphalt mix is a viscoelastic material, which has the ability to recover during the rest periods" and "The process of reversal of damage process is called 'Healing'". The slide number is 15. The meeting interface shows a "Meeting details" sidebar with 63 participants, including Rajkumar varma, Ramya Mullapudi, ramyateja y, ranjithmar t, ravali kurikala, Rohit Kumar Gupta, S Puwar, Samuel Simron, and Shashipriya Gampa. The bottom of the screen shows a Windows taskbar with the time 2:27 PM on 4/26/2021.

Day 2 Session 1

Name: Prof. Kranthi Kumar Kuna, IIT Kharagpur

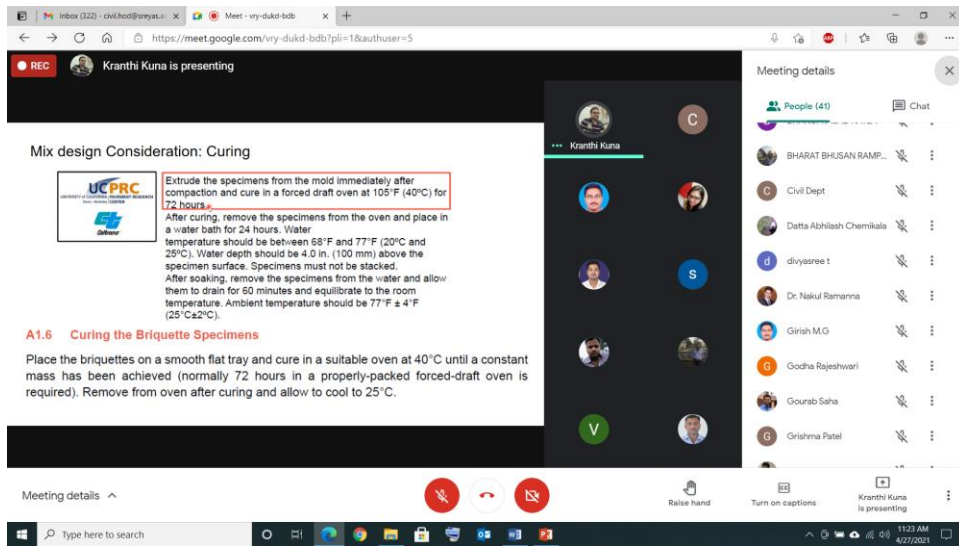
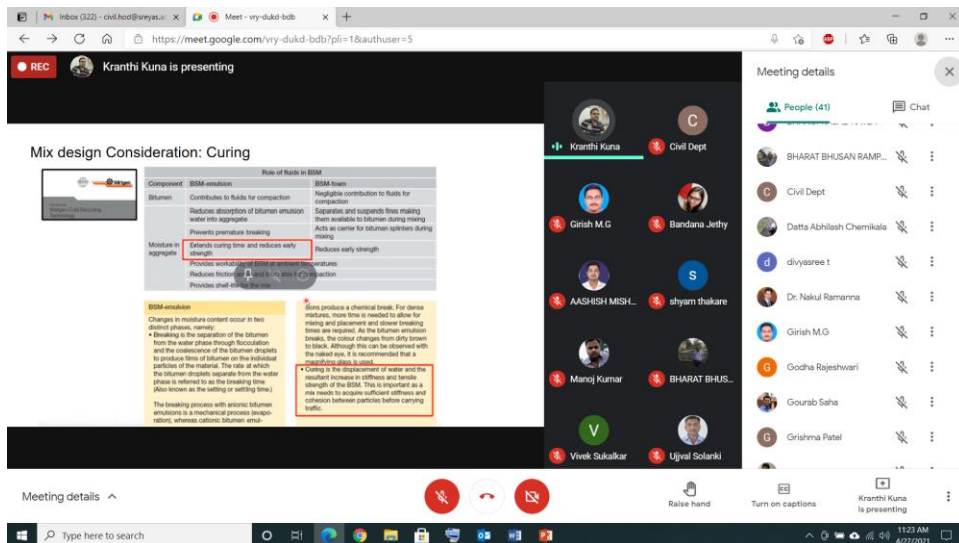
Topic: Methods of recycling: Design implications.

Time: 10:00 AM to 11:30 AM, April 27, 2021

Duration: 01 hr 30 minutes

Prof.Kuna has discussed about the cold mix technologies across the world and few case studies of Indian highways. The presentation includes the mix design considerations and the issues which frequently occurs in the experimentation on such mixtures undertake.

Few glimpses of the session 1 of Day 2 in the FDP.





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Day 2 Session 2

Name: Prof. Gourab Saha, NIT Rourkela

Topic: Overview of Sustainability – Connecting the Dots.

Time: 02:00 PM to 03:30 PM, April 27, 2021

Duration: 01 hr 30 minutes

Prof.Saha discussed about the various definitions of sustainability. How does this sustainability being linked to the various day to day activities. His presentation focused on to integrate the sustainability and engineering of pavement industry.

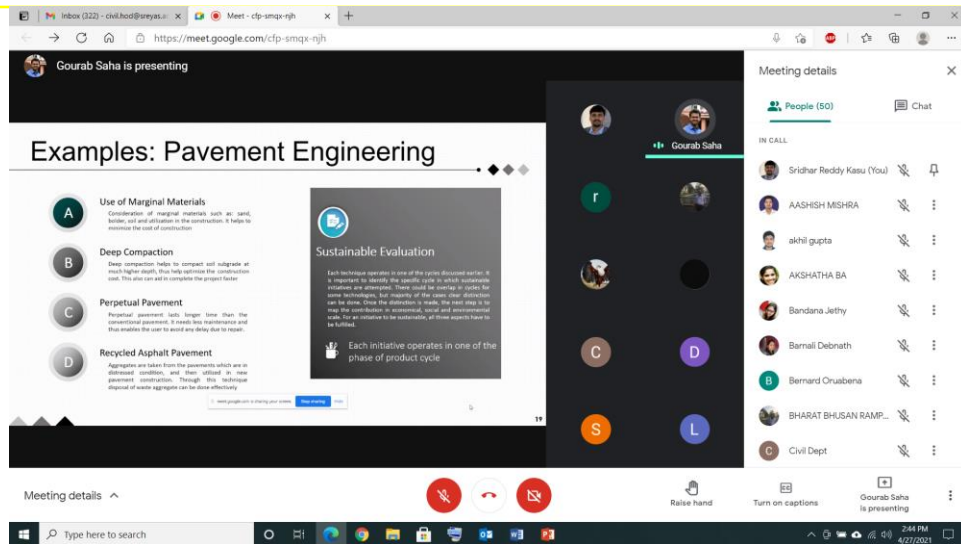
Few glimpses of the session 2 of Day 2 in the FDP.

The screenshot shows a Google Meet window with a presentation slide. The slide title is "Sustainability – Engineering – Where to look?". The slide content features a diagram with four main stages: Materials, Assembly, Usage, and Disposal. Arrows indicate the following connections: "Cradle-to-Processing" (Materials to Assembly), "Cradle-to-Assembly" (Materials to Usage), "Cradle-to-Usage" (Materials to Disposal), and "Cradle-to-Grave" (Materials to Disposal). The meeting interface includes a "Meeting details" panel on the right showing a list of participants: Sricher Reddy Kasu (You), AASHISH MISHRA, akhii gupta, AKSHATHA BA, Bondana Jethy, Barnali Debnath, Bernard Chrusbena, BHARAT BHUSAN RAMP..., and Civil Dept. The bottom of the screen shows the Windows taskbar with the time 2:41 PM on 4/27/2021.



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Day 3 Session 1

Name: Prof.Anush KC, IIT Bhubaneswar

Topic: Pervious Concrete Pavements: Solution towards Low Impact Development

Time: 10:00 AM to 11:30 AM, April 28, 2021

Duration: 01 hr 30 minutes

Prof.Anush has discussed about the pervious concrete pavements and their state of art review. He has highlighted the need of pervious concrete pavements to reduce the urban heat island effect (UHI). His presentation is also focused on the field performance of pervious concrete pavements which are constructed in various parts of the country.



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Few glimpses of the session 1 of Day 3 in the FDP.

MIX DESIGN

- The voids in coarse aggregate = Paste volume + air voids

Porosity, %	Paste Volume, % by volume	
	Well Compacted	Lightly Compacted
15	18	25
20	15	22
25	10	17
30	5	14

- Paste volume = cement volume + water volume + Admixture volume
- Cement content can be determined assuming w/c
- Water content = cement content * (w/c)

Formula: $V_{\text{voids of coarse aggregate}} = 1 - V_{\text{paste}} - \text{Air Voids}$

WAY FORWARD

Aesthetic Pervious concrete Paver Blocks - Developed by IIT BHU and IIT Bhubaneswar

- Easy to implement
- Less laborious and less construction equipment
- More aesthetic
- Ideal for cycle track, walkways in parks
- High skid resistance
- Easy maintenance



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Day 3 Session 2

Name: Prof. Umesh Chandra Sahoo, IIT Bhubaneswar

Topic: Design of Perpetual Pavements

Time: 02:00 PM to 03:30 PM, April 28, 2021

Duration: 01 hr 30 minutes

Prof. Sahoo was introduced by the convener of FDP. Prof. Sahoo has focused on the key design philosophies in the field of pavement engineering. More importantly, the philosophy focused on the perpetual pavement design, from the experiences of Austroads, India, and Belgium.

Few glimpses of the session 2 of Day 3 in the FDP.

The screenshot shows a Google Meet interface. The main content is a presentation slide titled "Philosophy of Pavement Design" by Dr. Umesh Chandra Sahoo. The slide contains three bullet points:

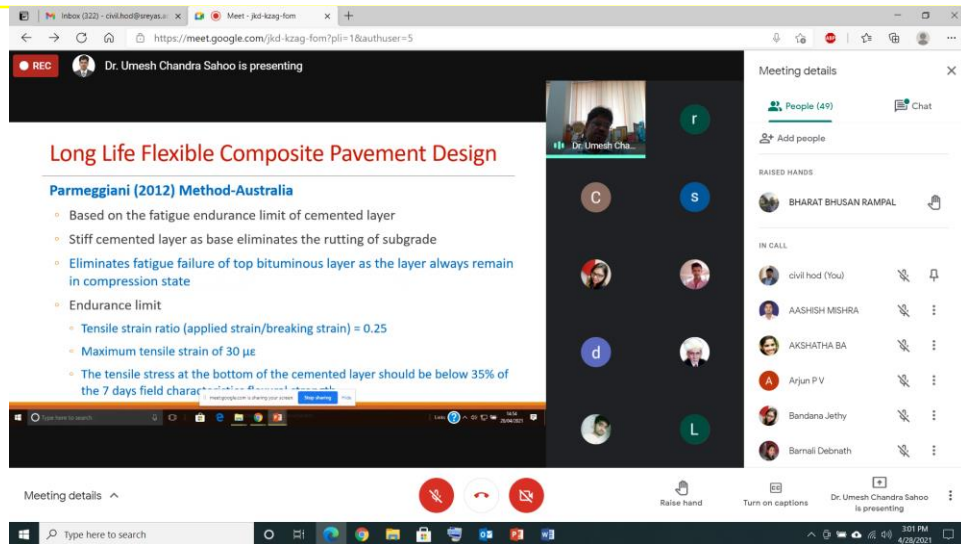
- Pavement design involves in selection of the materials to be used in different layers of a pavement and determining the thickness of each of the layers over a given subgrade and the expected traffic load.
- A pavement designer should address the structural failures. (i.e. failures associated with application of loads) as well as the functional failures.
- If the structural adequacy of the pavement can be maintained at a satisfactory level during the service life, while simultaneously putting in place a mechanism to ensure proper material selection, construction and maintenance, satisfactory functional performance can be achieved.

The interface also shows a list of participants in the call, including civil hod (You), AASHISH MISHRA, AKSHATHA BA, Arjun P V, Bandana Jethy, Barnali Debnath, and BHANUPRASAD KATLA. The meeting details panel on the right indicates 49 people are present.



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Day 4 Session 1

Name: Prof. Vishnu, NIT Warangal

Topic: Design of Emulsified Base Layers.

Time: 10:00 AM to 11:30 AM, April 29, 2021

Duration: 01 hr 30 minutes

Prof. Vishnu discussed about the design of emulsified base layers as per the asphalt institute manual series recommendations. The backdrop of such recommendations while calculating the optimal water content and optimal fluid content. The Indian roads congress design that accounting for emulsified base layers are also discussed.



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Few glimpses of the session 1 of Day 4 in the FDP.

The screenshot shows a Google Meet window with a presentation slide titled "Mix Design Guidelines" from the "Asphalt Institute-Manual Series-19". The slide content includes:

- Step-I: Determination of PMWC**
 - Determine the trial emulsion content for bases and given gradation
 - $$\% \text{ Emulsion} = \frac{[(0.06 \times B) + (0.01 \times C)] \times 100}{A}$$
 - B = percentage weight retained on 4.75mm sieve
 - C = 100-B
 - A = Residue by evaporation in BE
- Based on degree of coating after oven curing
- Step-II: Determination of Optimum Emulsified Asphalt Content**
- Now, determine the OeAC for evaluated PMWC based on $Stability_{max}$

The slide also features an image of asphalt aggregate. The meeting interface shows "vishnu R is presenting" and a list of 47 participants in the "IN CALL" section.

The screenshot shows a Google Meet window with a presentation slide titled "Material Inputs for Pavement Design" for "Pavement Design of High Volume Roads (using IRC 37-2018)". The slide lists:

- Resilient Modulus
- Poisson's Ratio

A table is provided with the following data:

Material Type	Basic Resilient Modulus (MR)	Poisson's Ratio
Subgrade soil with UCS > 0.5 or strength > 0.5 N/mm ²	2000 or lesser value (whichever is less)	0.35
Subgrade soil with UCS < 0.5 or strength < 0.5 N/mm ²	2000 or lesser value (whichever is less)	0.35
Current Indian Road	2000	0.35
Crack repaired layer	400	0.35
Crack repair overlay	400	0.35
Unbound granular base	1000 Eq. 3.1	0.35
Unbound granular base over CTB	1000 for unbound granular	0.35
Sub-base	1000 for unbound aggregates	0.35
Subgrade	1000 Eq. 3.1 or 2	0.35

The meeting interface shows "vishnu R is presenting" and a list of 47 participants. One participant, "ranjithkumar t", has their hand raised. The time shown is 10:50 AM on 4/29/2021.



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Day 4 Session 2

Name: Dr.Uma Maheshwar Arepalli, SRM University, AP.

Topic: Porous Asphalt Pavement Technology: Design, Construction, and Performance.

Time: 02:00 PM to 03:30 PM, April 29, 2021

Duration: 01 hr 30 minutes

Prof. Uma Arepalli, SRM AP has shared the current practices of porous asphalt pavement technology in the USA. He has also discussed about the test sections and their performance over the last one decade. Which we can make some trials locally and have some idea on way forward.

Few glimpses of the session 2 of Day 4 in the FDP.

The screenshot shows a Google Meet interface during a presentation. The main content is a slide titled "POROUS ASPHALT PAVEMENT TECHNOLOGY: DESIGN, CONSTRUCTION, AND PERFORMANCE". The slide lists the presenter as DR. UMA MAHESWAR A, PH.D. P.E. (USA), ASSISTANT PROFESSOR, CIVIL ENGINEERING DEPARTMENT, SRM UNIVERSITY, AP. It also includes contact information: UMAMAHESWAR.A@SRMAP.EDU.IN and mentions a faculty affiliate at the University of Maine, USA. A photograph on the slide shows a cross-section of a porous asphalt pavement structure with water being poured through it. The slide footer indicates the session is on 29th April (Thu), 2021, from 2:00 PM to 3:30 PM, part of a One-Week Online Faculty Development Programme at Sreyas Institute of Engineering and Technology, Hyderabad. The meeting interface shows a list of participants in the call, including civil hod (You), AASHISH MISHRA, AKSHATHA BA, Bandana Jethy, Bismil Debnath, BHARAT BHUSAN RAMP..., Civil Dept, and Dr. Nakul Ramanna. The presenter, Uma Maheswar Arepalli, is shown as the active speaker.



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Meeting details

- People (50)
- Chat
- Bernard Orubena
- BHANUPRASAD KATLA
- BHARAT BHUSAN RAMP...
- Civil Dept
- Dasari Jayaram Chowd...
- Dinesh More
- Dr. Nakul Ramanna
- Girish M.G
- Grishma Patel
- Gunda Sharanya

Uma Maheswar Arepalli is presenting

Meeting details

Uma Maheswar Arepalli is presenting

2:48 PM 4/30/2021

Day 5 Session 1

Name: Dr.Subhasis Pradhan, NTU Singapore

Topic: Present and Future Perspectives of Recycled Aggregate Concrete in Indian Infrastructure

Time: 10:00 AM to 11:30 AM, April 30, 2021

Duration: 01 hr 30 minutes

Dr.Subhasis discussed about the recycled aggregate concrete performance at multiscales such as meso-micro-macro levels. He has also discussed about the methods of mix designs incorporating the recycled aggregate concrete.



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Few glimpses of the session 1 of Day 5 in the FDP.

The slide displays the following content:

Improvement of Recycled Aggregate Concrete Performance

The mix design methods used for RAC or conventional concrete are,

- Direct Weight Replacement (DWR) Method
- Equivalent Mortar Volume (EMV) Method (Fathifazi et al., 2009)
- Direct Volume Replacement (DVR) Method
- Particle Packing Method (PPM) (Pradhan et al., 2017)**

Four images (a, b, c, d) show concrete cross-sections with varying recycled aggregate (RA) content. Below the images, the caption reads: (a) NA concrete mixture; (b) DWR mixture with R = 100%; (c) EMR mixture with R = 20%; (d) DVR mixture with R = 100% (Knaack and Karama, 2013).

The slide displays a flowchart illustrating the relationship between different levels of concrete analysis:

- Meso Level:** X-ray Microtomography
- Micro Level:** SEM Analysis, Nanoblasts
- Macro Level:** Aggregate Cracking Test, Concrete Mix
- Physio-Chemical:** Degree of hydration, TGA
- Macro-mechanical Performance:** Central node connecting all levels.

Arrows indicate the flow of information and relationships between these levels.



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Day 5 Session 2

Name: Dr.Anush KC, IIT Bhubaneswar

Topic: Construction of Concrete Pavements Using Slip Form Pavers

Time: 02:00 PM to 03:30 PM, April 30, 2021

Duration: 01 hr 30 minutes

Prof.Anush has mentioned various field-related issues which we can overcome with minimal care during execution of concrete pavement construction. His presentation includes the issues related to use of slip form paver construction and their repercussions in their design life.

Few glimpses of the session 2 of Day 5 in the FDP.

INTRODUCTION

Rigid Pavements

$$\frac{M}{I} = \frac{E}{R} = \frac{\sigma}{y}$$

Classic Bending Equation

Higher stiffness material depicts less deflection

Bituminous Layer
Granular base & sub-base
Subgrade

Meeting details

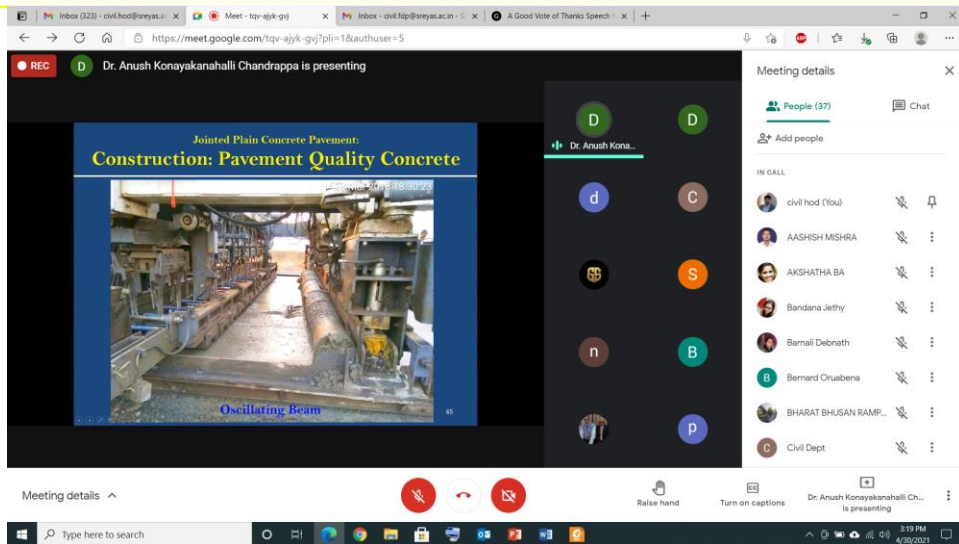
Dr. Anush Konayakanahalli Chandrappa is presenting

2:11 PM
4/30/2021



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Day 6 Session 1

Name: Prof.Veena Venudharan, IIT Palakkad

Topic: AR-GAP modified mixtures: From Development to Practice

Time: 10:00 AM to 11:30 AM, May 1, 2021

Duration: 01 hr 30 minutes

Prof.Veena has detailed about the asphalt rubber development and their use in the field. The temperature and the time required for the digestion of rubber particles in the bitumen binder is also discussed. Some of the rheological parameters were discussed and the results are compared with the conventional binders.



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Few glimpses of the session 1 of Day 6 in the FDP.

The screenshot shows a Google Meet interface with a presentation slide titled "AR Development". The slide content includes:

- AR characteristics depend on:
 - Base Asphalt
 - CR Type
 - CR Size
 - CR Dosage
 - Digestion Time
- Various country & state agencies specify these parameters based on their performance requirements & innate material properties
- India had adopted the AR specifications of Texas DOT which was not very successful in Indian pavement industry
- Develop AR to suit Indian conditions & performance requirements

The meeting details panel on the right shows 37 people in the call, including civil hod (You), AASHISH MISHRA, AKSHATHA BA, Akshita Reddy, Arroju Srikeerthana, Bandana Jethy, BHARAT BHUSAN RAMP..., and Civil Dept.

The screenshot shows a Google Meet interface with a presentation slide titled "Digestion Time Optimization". The slide content includes:

- Digestion time optimized for:
 - Base binder type - VG10, VG30 & VG40
 - CR dosage - 0, 10, 20 & 30 %
- Measurement of digestion:
 - Storage Stability
 - Dissipation Energy
 - Upper Temperature
- Optimized Digestion Time = 90 minutes @ 2000 rpm & 170-180 °C

The slide also features a photograph of a laboratory setup and a line graph showing data trends. The meeting details panel on the right shows 38 people in the call, including civil hod (You), AASHISH MISHRA, AKSHATHA BA, Arroju Srikeerthana, Bandana Jethy, BHARAT BHUSAN RAMP..., Bipin Karauliya, and Civil Dept.



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Day 6 Session 2

Name: Prof.K.Sridhar Reddy

Topic: Valedictory Session

Time: 02:00 PM to 03:30 PM, May 1, 2021

Duration: 01 hr 30 minutes

Programme Convener: Prof.K.Sridhar Reddy, Head of the Department, Civil Engineering,

He said that this kind of programmes will help the local faculty members to excel in the competitive world. We would like to continue conducting programmes such as workshops, and conferences to bridge the gap between industry and academia.

Principal: Prof.S.Sai Satyanarayana Reddy has said that this kind of programmes will help the faculty members to enhance their knowledge at the global level.

Vice-chairman: Ananthula Hriday Reddy, has said that we have been working to improve the current education system and “we are committed in pursuit of excellence”.

K Sridhar Reddy, Associate Professor and Head of the Department, on behalf of the Department of Civil Engineering, Sreyas Institute of Engineering and Technology Hyderabad, and the entire fraternity, extended sincere thanks to one and all.