# 2023 MTC&E ISIC Track Summary Report

International Society for Intelligent Construction

# INTRODUCTION

## 2023 MTC&E ISIC TRACK

The International Society for Intelligent Construction (ISIC, www.IS-IC.org) North America Chapter sponsored an ISIC track during the Minnesota Transportation Conference and Expo (MTC&E) from May 15th to May 16th, 2023, in Minneapolis, MN, USA. The ISIC Track's theme was "Digital Workflow from Design to Construction."

The International Society for Intelligent Construction (ISIC) is a source of knowledge and information on intelligent construction technologies for public agencies, contractors, consultants, academia, and other relevant industries.

ISIC provides a forum for disseminating knowledge concerning collecting, analyzing, and applying information relating to intelligent construction technologies (ICT) for infrastructure. ICT is a combination of modern science and innovative construction technologies. The mission of ISIC is to promote the applications of ICT to the life-cycle of infrastructure: from the survey, design, construction, operation, and maintenance/rehabilitation by adapting to changes in environments and minimizing risks. Its mission aims to improve the quality of construction, cost-saving, and safety.

The scope of ISIC covers all current and emerging intelligent construction technologies for the infrastructure life-cycle. The Scope includes intelligent sensing, data analysis, decision-making, and execution. The Scope covers civil engineering, construction machinery, electronic sensor technology, survey/testing technology, information technology/computing, and other related fields.

This document is a summary report for the 2023 MTC&E ISIC track. The event is a partnership among ISIC, MnDOT, and National Road Research Alliance (NRRA).

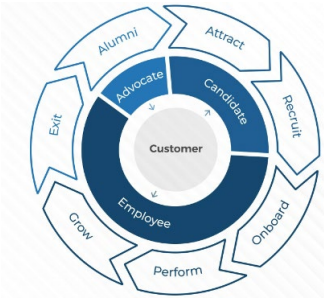
# A G E N D A

Rebecca Embacher of MnDOT, an ISIC Technical Committee member, designed the agenda. The ISIC NA Chapter organized the speakers and moderators. The consolidated 2023 MTC&E ISIC track is as follows.

| MTC&E 2023 - ISIC Track Theme: Digital Workflow from Design to Construction | | | |
|---|---|---|---|
| **Session Number** | **ISIC Prentation Title** | **Presenters** | **Moderator** |
| 1 | How Technology Attracts and Retains Employees | Britton Lawson, WEI USA<br>Joe Boelke, Rachel Contracting<br>Nate Alm, Frattalone companies inc. | Kevin Garcia, Trimble |
| 2 | Use of Ground Penetrating Radar and LiDAR Data during Development of 3D Milling/Paving Surface Models | Eyoab Zegeye, MnDOT<br>Jim Schneider, MnDOT<br>Kyle Klassen, WSB | Tim Kowalski, Wirtgen Group |
| 3 | Smoothness Modeling for AMG Milling and Paving Applications | Scott Saltzman, Civil Solutions<br>Ryan Zenahlik, TOPCON | George Chang, Transtec Group |
| 4 | Milling and Paving Equipment and the use of 3D Models. | Laikram Narsingh (Nars), Wirtgen<br>Kevin Garcia, Trimble<br>Jim Preston, TOPCON | Charles Hixon, Digital Construction Works |
| 5 | Integrating Multiple Software Applications for Optimal Highway Workflows | Charles Hixon, Digital Construction Works<br>Kerry Newbanks, Bentley | Jim Preston, TOPCON |
| 6 | Geometric and Material As-Built Data Collected by Road Construction Equipment | Laikram Narsingh (Nars), Wirtgen Group<br>Jim Preston, TOPCON | George Chang, Transtec Group |
| 7 | Living Models in Asset and Pavement Management Systems | Magdy Mikhail, Trimble<br>Chuck Hixon, DCW | Tim Kowalski, Wirtgen Group |
| 8 | Contractor's Perspective on 3D Construction | Chad Mathiowetz, Mathiowetz Construction<br>Britton Lawson, Veit USA<br>Brandon Tobias, Ames Contracting | Todd Mansell, Caterpillar |

# SESSION 1

How Technology Attracts and Retains Employees




## ABSTRACT

This was a panel discussion on "How Technology Attracts and Retains Employees."

## MODERATOR AND SPEAKERS

The moderator for this session was Kevin Garcia, Trimble. The speakers included Britton Lawson, Veit & Company; Joe Boelke, Rachel Contracting; and Nate Alm, Frattalone companies Inc.

# SESSION 2

Use of Ground Penetrating Radar and LiDAR Data During Development of 3D Milling/Paving Surface Models

## ABSTRACT

This session covered the topic of using Ground Penetrating Radar (GPR) and LiDAR data to develop 3D milling/paving surface models. Discussions will detail: (1) what is the GPR technology and how does it work; (2) how GPR measurements are used to determine layer thicknesses; (3) Why and how LiDAR data is captured for the existing surface; (4) how one can tie these data elements together to produce a variable-depth milling surface model to allow for varying mill depths, corrections of cross-slopes and profiles, and improve smoothness; (5) best practices in the creation of models that are field ready.

## MODERATOR AND SPEAKERS

The moderator for this session was Tim Kowalski, John Deere Wirtgen Group Group. The speakers included Eyoab Zegeye, MnDOT; Jim Schneider, MnDOT; and Kyle Klassen, WSB.

# PRESENTATIONS

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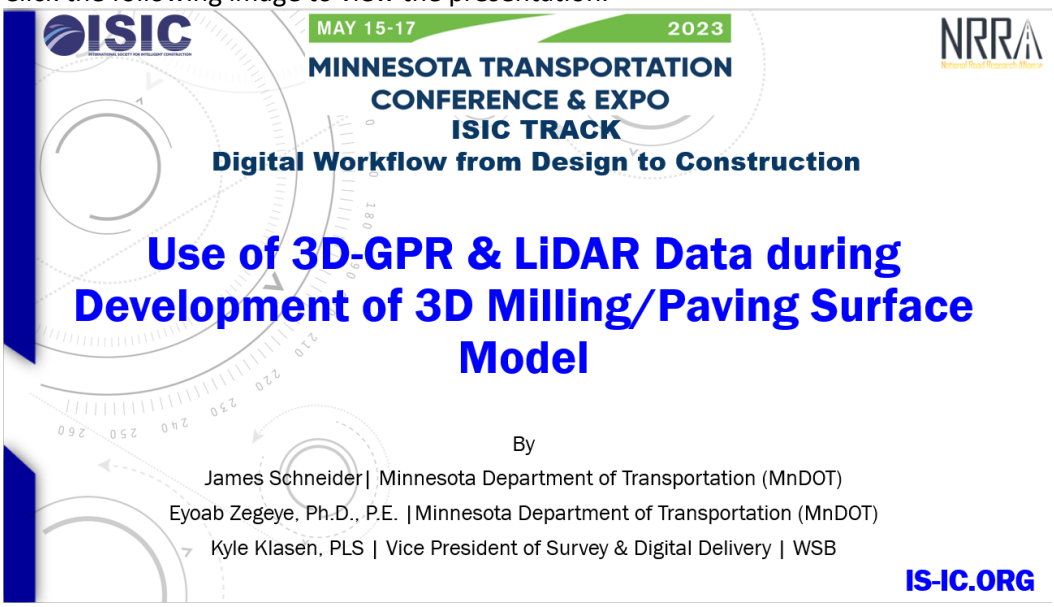
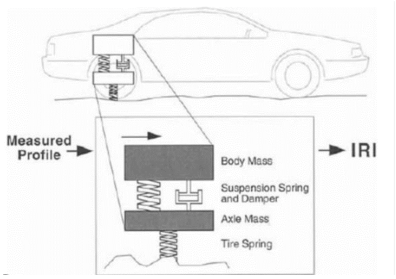





# SESSION 3

Smoothness Modeling for AMG Milling and Paving Applications

## ABSTRACT

Review of models for smoothness is an integral process of the certification process, as milling and paving machines follow the models exactly. This presentation focused on 1)The impacts of models containing roughness on construction operations and final as-builts; 2) Moving from string line to digital models in construction (QA & QC checks); 3) Design modeling for PDFs vs. Design modeling for paving files; 4) Means and methods in design to achieve a smoother ride; and 5)Model review.

## MODERATOR AND SPEAKERS

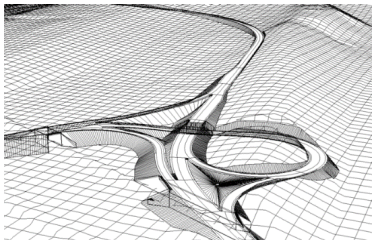
The moderator for this session was George Chang, Transtec Group. The speakers included Scott Saltzman, Civil Solutions; and Ryan Zenahlik, TOPCON.

# PRESENTATIONS

Click the following image to view the presentation.

# SESSION 4

Milling and Paving Equipment and the use of 3D Models



## ABSTRACT

This presentation focused on using 3D models for milling and paving. The three-part presentations include 1). Benchmarking Do's & Don't - understanding machine components and ideal locations for benchmarking and why; 2). Model Building - what goes into creating a "constructible model," and 3). Using 3D Models for Field Construction - what's needed to execute the model as intended.

## MODERATOR AND SPEAKERS

The moderator for this session was Charles Hixon, TOPCON. The speakers included Kevin Garcia, Trimble; Laikram Narsingh (Nars), John Deere Wirtgen Group; Jim Preston, TOPCON.

# PRESENTATIONS

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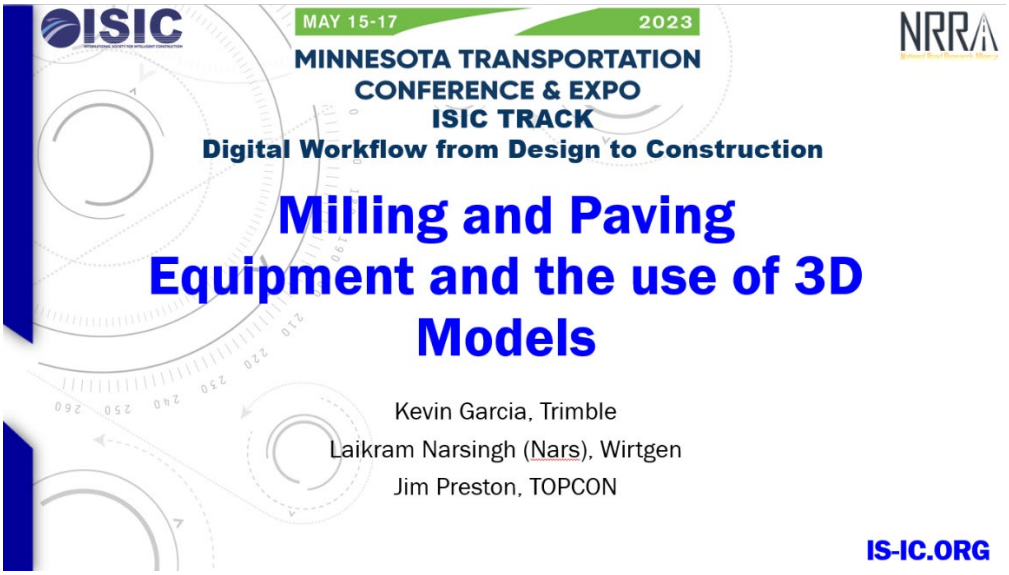

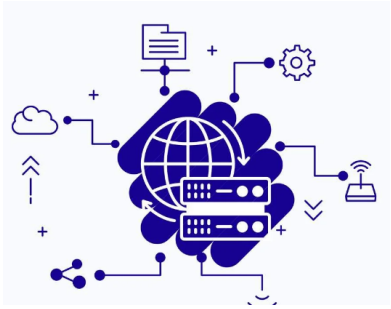

# SESSION 5

Integrating Multiple Software Applications for Optimal Highway Workflows

## ABSTRACT

Technologies such as 4D (scheduling)/5D (budgeting), and Digital Twin workflows enable project managers to coordinate and operate their projects effectively. This session focused on integrating these digital technologies to improve operations, add value, and use the digital construction ecosystem to reduce delays when changes are required.

## MODERATOR AND SPEAKERS

The moderator for this session was Jim Preston, TOPCON. The speakers included Kerry Newbanks, Bentley, and Charles Hixon, TOPCON.

# PRESENTATIONS

Click the following image to view the presentation.

# SESSION 6

Geometric and Material As-Built Data Collected by Road Construction Equipment

## ABSTRACT

This session covered automatic documentation of data relative to the pavement profile and paving parameters relating to Construction "As Built." It will also cover data format and storing that will promote data sharing between different equipment to provide additional information to operators for better management of the construction Process.

## MODERATOR AND SPEAKERS

The moderator for this session was George Chang, Transtec Group. The speakers included Laikram Narsingh (Nars), John Deere Wirtgen Group Group, and Jim Preston, TOPCON

# PRESENTATIONS

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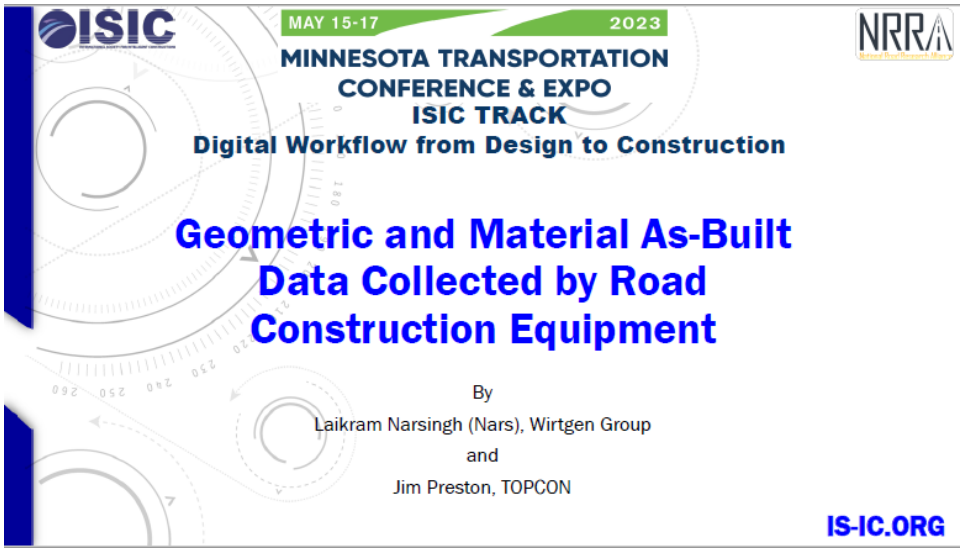

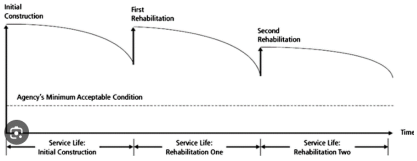


# SESSION 7

Living Models in Asset and Pavement Management Systems

## ABSTRACT

This session covered how today's construction field technologies, like machine control and survey, can enhance the data included in pavement and asset models owners use for analysis and planning. We will provide examples of data sets that could provide additional benefits to owners regarding managing the life-cycle of pavement assets.

## MODERATOR AND SPEAKERS

The moderator for this session was Tim Kowalski, John Deere Wirtgen Group Group. The speakers included Magdy Mikhail, Trimble, and Chuck Hixon, TOPCON.

# PRESENTATIONS

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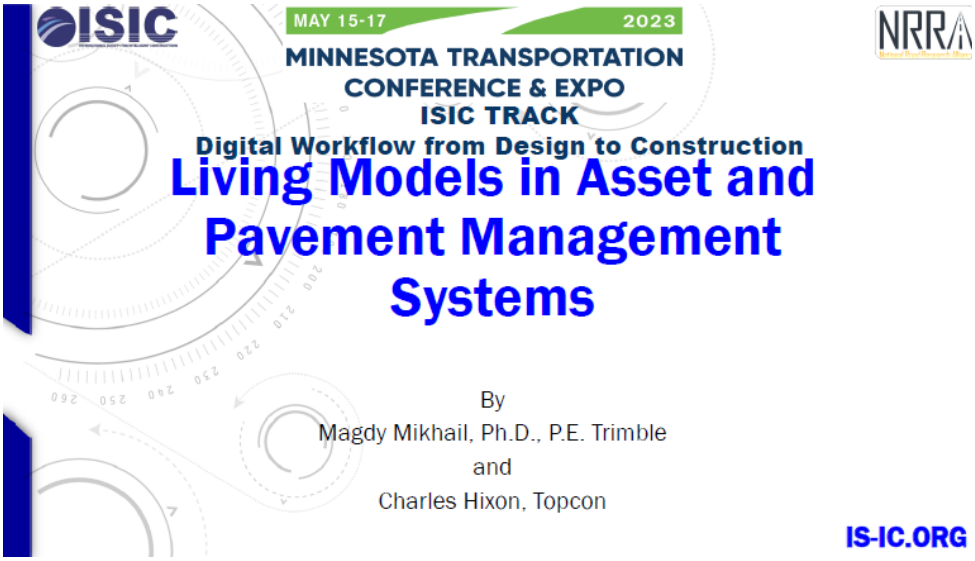

# SESSION 8

Contractor's Perspective on 3D Construction

## ABSTRACT

This session was a panel discussion comprised of Contractors providing their perspectives on 3D construction as it relates to items such as model creation, savings (e.g., cost, time, resources, fuel, etc.), lessons learned, digital as-builts, benefits, what does not work, quantities, and more.

The term "3D Construction Technologies" is a broad phrase related to construction equipment capability, digital modeling both in design and construction, as-builts, change orders during construction, and so on. During today's panel discussion, we would like to have an open discussion where you, the audience, have an opportunity to ask questions of our industry-leading panel members on how they are utilizing 3D Construction technologies on their projects and in their operations, some of the challenges and opportunities that may exist.

## MODERATOR AND SPEAKERS

The moderator for this session was Todd Mansell, Caterpillar. The speakers included Chad Mathiowetz, Mathiowetz Construction; Britton Lawson, Veit USA; and Don Matthew, Pavement Recycling.

## PRESENTATIONS

There were no presentations.
The planned see questions for the real-time poll were as follows (though not all questions were covered due to time constraints):

1. What are some of the drivers (reasons) for you and your Company to adopt more use of 3D Construction technologies?

2. What requirements do you need to be successful in implementing 3D technologies? Digital models. Digital As-Builts. Utilities. BIM models.

| Response |
| --- |
| Standards and common best practices for use, building models, checking models, ECT. |
| Quality between plans and what is needed for construction |
| partnership with contractor and agency |
| Understanding of how the data is interpreted in the field |
| Starts with good survey data. |
| Separate the model into smaller data files. |
| IFC Adoption |
| Willingness to adopt it |
| Communication |
| training |

3. What are some of the challenges you've faced implementing 3D technology and why?

4. How have you found the adoption of 3D technology by your field crews and staff operating the equipment and managing the jobs in the field? Is there a high level of "buy-in" and acceptance of these technologies by field staff, or has it been challenging to push them out to the job site?

5. What efficiencies in terms of cost – you don't need to give me numbers – are you experiencing? Time, resources were scheduling/managing, fuel use, etc.

6. Are you seeing Quality benefits related to using 3D Construction technologies?

7. Are there other future opportunities for 3D Construction technologies that are not being used yet? How can we work together to get the best results? Streamline data sharing.

8. How do we manage and work with conflicting models? E.g., Errors in the model from bid documents, how do we modify them / work with them?

9. Software package(s) and compatibility between the Contractor and Owner? E.g., Site Link 3D, Works OS, etc. Tools are not perfected.

10. How do we build our teams that work with these 3D technologies? Are they qualified? Experienced?

11. As-builts.

12. Two categories:

a. Real proven tech that is being used today.
b. "dream tech" future – where we may be headed, but not proven yet.

# CONCLUSIONS

The MTC&E attendance has increased from 1400 in 2022 to 1600 in 2023. The ISIC track was again successful and well-attended, with high-quality presentations summarized in this report to thoroughly cover the theme "Digital Workflow from Design to Construction."

ISIC will continue with this momentum to engage with ISIC members and friends for future webinars, local chapters' meetings, and international conferences to promote the advancements and implementation of intelligent construction technologies worldwide.

We invite you to participate in the 2024 ISIC conference, organized by the ISIC NA Chapter, from September 10th to 12, in Orlando, Florida.


ISIC president and ISIC NA Chapter officers (from left to right: Dr. George Chang, Chuck Hixton, Todd Mansell, Jim Preston, Amanda Gilliland, Laikram Narsingh (Nars), and Tim Kowalski).