

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF PENNSYLVANIA**

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RAILWARE, INC.,	:	
Plaintiff,	:	
-against-	:	Case No.: 2:24-cv-02963 (JMY)
SOUTHEASTERN PENNSYLVANIA	:	
TRANSPORTATION AUTHORITY,	:	JURY TRIAL DEMANDED
Defendant.	:	
	:	
-----	X	

**DECLARATION OF MEHDI AHMADIAN, Ph.D. IN SUPPORT
OF RAILWARE INC.'S CLAIM CONSTRUCTION SUBMISSIONS**

**CONTAINS INFORMATION DESIGNATED AS
HIGHLY CONFIDENTIAL – ATTORNEYS’ EYES ONLY**

WABTEC EX1025

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I, Mehdi Ahmadian, Ph.D., hereby declare as follows:

I. INTRODUCTION AND OVERVIEW

1. I have been retained in connection with the above-referenced matter on behalf of Railware, Inc. (“Railware”). I have been asked by counsel for Railware to review U.S. Patent Nos. 9,517,782 (the “’782 patent”), RE47,835 (the “’835 patent”), and RE49,115 (the “’115 patent”) (collectively, the “Asserted Patents”), as well as certain activities of Southeastern Pennsylvania Transportation Authority (“SEPTA” or “Defendant”) (collectively with Railware, the “Parties”) related to railway control and railway safety technology.

2. If asked at hearing or trial, I am prepared to testify regarding matters I discuss in this Declaration. I also reserve the right to give opinions on facts and other matters arising subsequent to this Declaration, including rebuttal to any matter raised by the Parties or their experts, either prior to or during any hearing or trial on this action. I expect to offer testimony and/or opinions to assist the Parties and the Court, including about the technology at issue in this case and/or of the Asserted Patents and/or the meanings of the claim terms to a person of ordinary skill in the art (“POSITA”). Such testimony and/or opinions could also include an explanation of the meaning of the claim terms in the context of the technology at issue in this case and/or the subject matter of the Asserted Patents, a description of the state of the technology relating to the claimed inventions prior to, at the time of, and after the filings of the applications for the Asserted Patents, a description of the qualifications of a person of ordinary skill in the art at or around the time of the filing of the applications for the Asserted Patents, and/or how a person of ordinary skill in the art would interpret and/or understand the claim terms at or around the time of the filings of the applications for the Asserted Patents.

II. QUALIFICATIONS

3. A copy of my curriculum vitae is attached hereto as **Exhibit 1**. It includes details of my educational, professional, research, and employment credentials. I may testify with respect to my responsibilities and experiences relating to the information listed in **Exhibit 1**. A more condensed summary, which focuses on my experience with railroad safety technology, appears below.

4. I am currently employed as J. Bernard Jones Chair of Mechanical Engineering at Virginia Polytechnic Institute and State University (“Virginia Tech”). I also hold the position of Director of the Center for Vehicle Systems and Safety (CVeSS), and the Railway Technologies Laboratory (RTL) at Virginia Tech, and am the founding director of CVeSS, RTL, Virginia Institute for Performance Engineering and Research (VIPER), and the Advanced Vehicle Dynamics Laboratory (AVDL).

5. To summarize my qualifications, I hold four degrees, three of which are in the field of Mechanical Engineering. I obtained my Doctor of Philosophy degree in Mechanical Engineering from the State University of New York at Buffalo in 1984. I obtained my Master of Business Administration (MBA) degree from Pennsylvania State University – Behrend College in 1994. I obtained my Master of Science (MS) degree in Mechanical Engineering from the State University of New York at Buffalo in 1982. I obtained my Bachelor of Science (BS) degree in Mechanical Engineering from the State University of New York at Buffalo in 1980. I worked at General Electric Transportation Systems from 1993-1995 before joining Virginia Tech as an assistant professor in 1995. Since joining Virginia Tech, a substantial portion of my research has been directed to the railroad industry and railroad systems. This research is evident in the hundreds of publications, books, book chapters, and presentations listed in my CV.

6. I have over 25 years of experience as an independent consultant on matters related to product liability and patent litigation cases involving a broad spectrum of passenger cars, commercial vehicles, and railway systems. I have also assisted clients on issues related to vehicle dynamics and handling, electromechanical systems, braking, rollover stability, and active safety systems. I have broad technical experience related to advanced vehicular systems for railway systems and heavy vehicles, including railway control and railway safety systems.

7. I have received several professional awards throughout my career, including most recently being awarded the 2024 Society of Automotive Engineers (SAE) Medal of Honor (the highest recognition of lifetime achievement bestowed on one SAE member per year) and the 2023 Virginia Tech Alumni Award for Research Excellence (regarded as the most prestigious Virginia Tech award for significant life-long research) for my research contributions.

8. I am an inventor on at least the following currently-issued patents:

- Kinetic Energy-Harvesting Device for Powering and Charging Railway and Other Applications, U.S. Patent 12,088,180, September 10, 2024.
- Dual-action rotary dynamic load stabilization pneumatic valve system, U.S. Patent 9,975,392, May 22, 2018.
- A Compact Lightweight Double-piston Magnetorheological (MR) Damper with large adjustable dynamics force, Chinese Patent # ZL 201110420869.8, December 25, 2013.
- A Compact Lightweight Double-piston Magnetorheological (MR) Damper, Chinese Patent # ZL 201110418073.9, January 9, 2014.
- Doppler Sensor for the Derivation of Torsional Slip, Friction, and Related Parameters, U.S. Patent 8,294,883, October 23, 2012.
- Doppler Sensor for the Derivation of Torsional Slip, Friction and Related Parameters, U.S. Patent 7,705,972, April 27, 2010.
- No Jerk Semiactive Suspension System, U.S. Patent 6,115,658, September 5, 2000.
- No Jerk Semi-active Skyhook Control Methods and Apparatus, Canadian Patent Application, No. 09/225,147, December 17, 1999.

- Self-Steering Locomotive Truck, U.S. Patent 6,006,674, December 28, 1999.
- Self-Steering Locomotive Truck, U.S. Patent 5,746,135, May 5, 1998.
- Self-Steering Locomotive Truck, U.S. Patent 5,613,444, March 25, 1997.
- Electromagnetically Operated Pneumatic Valve Assembly for an Electrical Contactor Actuator, U.S. Patent 5,409,036, April 25, 1995.

9. I am the author of numerous publications related to advanced vehicular systems for railway and heavy vehicles, as further detailed in my CV.

10. I am being compensated at a rate of \$500 per hour for my time in this case. The compensation received from this case is not contingent upon my opinions or performance, the outcome of the case, or any issues involved in or related to the case.

III. SCOPE OF OPINIONS

11. In rendering my opinions, I have reviewed and considered materials listed in **Exhibit 2** attached to this Declaration, in whole or in part, in addition to the materials expressly referenced herein. This materials list may be supplemented should any additional materials be produced, provided or identified in this matter.

12. At the present time, I expect to testify as to Railware's claim construction submissions regarding the Asserted Patents. I expect to offer testimony and/or opinions to assist the Parties and the Court, including about the technology at issue in this case and/or of the Asserted Patents and/or the meanings of the claim terms to a person of ordinary skill in the art. Such testimony and/or opinions could also include an explanation of the meaning of the claim terms in the context of the technology at issue in this case and/or the subject matter of the Asserted Patents, a description of the state of the technology relating to the claimed inventions prior to, at the time of, and after the filings of the applications for the Asserted Patents, a description of the qualifications of a person of ordinary skill in the art at or around the time of

the filing of the applications for the Asserted Patents, and/or how a person of ordinary skill in the art would interpret and/or understand the claim terms at or around the time of the filings of the applications for the Asserted Patents. I also expect to testify as to the state of the relevant art relating to railway control, railway safety technology, the state of the technology relating to the claimed inventions prior to, at the time of, and after the applications for the Asserted Patents were filed. I understand that if the Defendant is permitted by the Court to contest the validity of the Asserted Patents at this stage of the case, I may also testify regarding those issues.

13. The opinions stated in this Declaration are based on information currently available to me. I reserve the right to continue my investigation and study, which may include review of documents, declarations, expert reports, or other information that may yet to be produced, provided, or identified, as well as any testimony from depositions or hearings that may occur in this case. Therefore, I reserve the right to supplement my opinions in response to any additional information that becomes available to me, any matters raised by the Parties, and/or other opinions provided by the Parties' expert(s).

IV. BACKGROUND INFORMATION ON RAILWAY CONTROL AND RAILWAY SAFETY SYSTEMS

14. Many modern railroads control the movement of trains through a railway network using a centralized system known as centralized traffic control (CTC). CTC systems are used for monitoring, tracking, and operating trains traversing tracks throughout a railway network. CTCs are controlled by dispatchers. CTC systems typically include control consoles, which may take a variety of forms and have a variety of back-end and front-end components, that display various pieces of information, such as track conditions, train traffic, and scheduling. Through the control console, the dispatcher can view and control the movement of trains throughout the railway

network. Movement of trains within a sector of track is typically governed by interlocking signals, which are controlled by the dispatcher via a control console. Shown below is an example of a control center where dispatchers control train traffic using a CTC system¹:



15. When railway tracks require maintenance, railway field workers must physically enter the track area to perform the necessary maintenance, as shown below²:

¹ Pratima Bhattacharyya, Reporter's Notebook: Taking a look at SEPTA control, DAILY PENNSYLVANIAN (Oct. 5, 2010), https://www.thedp.com/article/2010/10/reporters_notebook_taking_a_look_at_septa_control.

² <https://x.com/SEPTAPHILLY/status/1250759355416432640/photo/1>.



16. Entering an active track area poses grave risks to the railway field workers, who are defenseless against train traffic. Over time, various safety systems were developed, such as alarm systems that alerted railway workers to incoming train traffic, ideally allowing them time to vacate the track area before the train approached. These systems proved inadequate in protecting railway field workers.

17. As one example, using the CTC system, the dispatcher could remotely control the tracks used by trains. *See* '782 patent at 1:48-62. This remote control enabled the remote dispatcher to “block” sections of track and to temporarily reroute trains away from blocked track sections that were being worked on by railway field workers. *Id.* at 5:50-54. But these systems suffered from certain drawbacks. *Id.* at 2:27-37. Specifically, the blocking of track sections was controlled entirely by the remote dispatcher. *Id.* at 1:46-47. Human error could and did lead to blocks being removed prematurely, errantly, or mistakenly by the dispatcher, such as either because the dispatcher falsely believed that the work was complete, or because the dispatcher

intended to remove a different block and mistakenly removed a block on a track section where railway field workers were still working. *See id.* at 2:27-37.

18. Other examples of inadequate safety precautions include NORAC's Operating Rules, including the "Form D" control system. NORAC's Operating Rules have existed since the mid-1980's and "Form D" has been an integral part of NORAC's Operating Rules since at least the early 1990's. A "Form D" contains "written authorization(s), restriction(s), or instruction(s) issued by the Dispatcher to specified individuals." NORAC Operating Rules, 6th ed., 6 (Jan. 1, 1997). These instructions can include a "Form D Line 4," which is used when "removing a track from service." *Id.* at 48. The Operating Rules require the dispatcher to determine that "controlled signals leading to the affected track are in Stop position" prior to issuing a "Form D Line 4." *Id.* Similarly, prior to releasing a "Form D," the dispatcher ostensibly must take certain actions, including "contact the addressee(s) and state his intent to cancel the Form D . . . , state the Form D number and, date, the cancellation time and date, and his initials, [and] ensure that all cancellation information is repeated [by the addressee] correctly." *Id.* at 66. Despite these protections, human errors and accidents continued to occur, resulting in railway worker injuries and fatalities and other damages, such as those recognized in the Federal Railroad Administration's (FRA) Final Rule and in the Asserted Patents. Such errors included mistakes such as where "the train dispatchers did not maintain the required blocking devices." Federal Railroad Administration, *Railroad Workplace Safety; Roadway Worker Protection Miscellaneous Revisions (RRR)* at 75-76 (May 26, 2016).

V. THE ASSERTED PATENTS

A. U.S. Patent No. 9,517,782

19. I have reviewed the '782 patent entitled "Tools for Railway Traffic Control" and the related prosecution and *inter partes* review ("IPR") history. I understand the '782 patent was duly and legally issued on December 13, 2016. I understand that the '782 patent is entitled to a priority date of at least October 21, 2013.

20. The '782 patent generally relates to methods, tools and systems provided to control traffic over a railway track section when a railway worker is working on or near the track section. *See, e.g.*, '782 patent, Abstract.

21. The '782 patent is directed "to railway traffic control, and more specifically, a system, apparatus, and method for railway traffic control to address concerns for safety of railway workers working on or near railroad tracks." '782 patent at 1:14-17. The '782 patent describes prior safety features present in railway systems and notes that despite these preexisting safety features, numerous "roadway worker accidents" resulted in the death of workers "while attending to tasks . . . on or near track." *Id.* at 2:27-37.

22. According to the '782 patent, in a standard railway system, "[i]nterlocking signals govern movement within a sector controlled by an interlock." *Id.* at 1:27-28. "[A] track may be divided into sections," and an "interlocking signal" is exhibited at the entrance to each track section. *Id.* at 1:28-32. "[T]he interlocking signal displays a color system which instructs the conductor of the train, or the train operating by automated response, how to move through the upcoming section of track." *Id.* at 1:32-35.

23. The '782 patent further explains that a centralized traffic control (CTC) system may be used "to place a block on one or more specified track sections to permit a railway field

worker to enter the track sections while blocking railway traffic.” *Id.* at 2:47-57. “[O]nce a block is placed, no train can traverse the blocked section of rail,” and “maintenance workers and railway personnel can travel, inspect and work on the rails without the danger of oncoming train traffic.” *Id.* at 5:43-44, 5:48-50; *see also id.* at 5:44-48 (stating that an interlock can “output a STOP signal, therefore, stopping any train traffic within the rails controlled by that interlock”), 5:50-54 (stating that “[t]rains that are scheduled to traverse said blocked tracks either come to a complete stop, electronically or mechanically, before passing the interlock or are rerouted using tracks that are not in a blocked state”). When “the block is removed,” the result is that train “traffic to that section of rail is then allowed.” *Id.* at 7:19-20. Thus, an errant, mistaken, or premature removal or release of the block could endanger a railway field worker still present in the specified track section. *Id.* at 2:27-37.

24. The ’782 patent further explains that “all of the interlocks” within a railway system may be controlled electronically through “a centralized traffic control (CTC).” *Id.* at 1:40-44. “The CTC is controlled by a single person known as a train dispatcher.” *Id.* at 1:46-47. “Information regarding track conditions, train traffic, scheduling, etc.” is displayed to the dispatcher “on a control console,” and “[t]hrough the control console, the dispatcher has control of each interlock signal.” *Id.* at 1:48-59. Thus, the dispatcher is responsible for both blocking a specified railway section and for removing/releasing this block from the railway section. *Id.* at 1:40-47, 2:47-57, 5:44-50, 7:19-20. And, as discussed above, an errant, mistaken or premature removal/release of the block would endanger a railway field worker still present in the specified

section of track. *Id.* at 2:27–37. Shown below is an example of a control center where dispatchers control train traffic using a CTC system³:



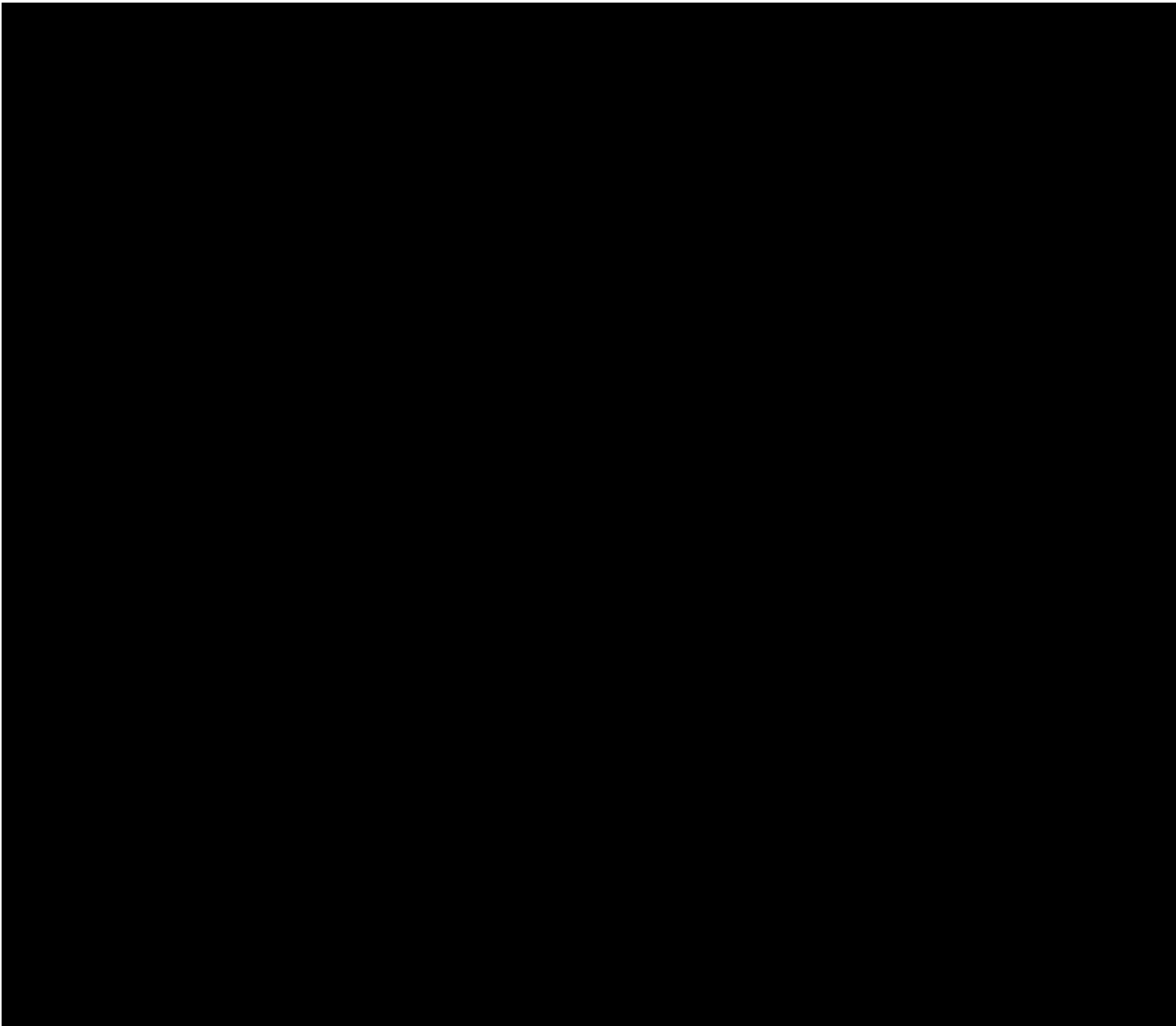
25. The '782 patent identifies as a fundamental goal of the inventions, the provision of systems, tools and methods that assure “the railway worker has more control over the traffic through the rail block in which the worker is working, and fatal on-track accidents can be reduced.” *Id.* at 11:12-14. To accomplish this goal, the '782 patent requires “generating a removal code and transmitting the removal code to the electronic contact address of the railway field worker, and permitting the block to the track sections to be removed only upon entry of the removal code in the centralized railway control system.” *Id.* at 2:47-57. Each of the claims of the

³ Pratima Bhattacharyya, Reporter’s Notebook: Taking a look at SEPTA control, DAILY PENNSYLVANIAN (Oct. 5, 2010), https://www.thedp.com/article/2010/10/reporters_notebook_taking_a_look_at_septa_control.

Asserted Patents requires an unconventional network architecture for generating, transmitting, receiving and using a “removal code” or “release code” or “secret code” that is transmitted to the railway field worker that is working on the track, but otherwise remains “secret” from the dispatcher.

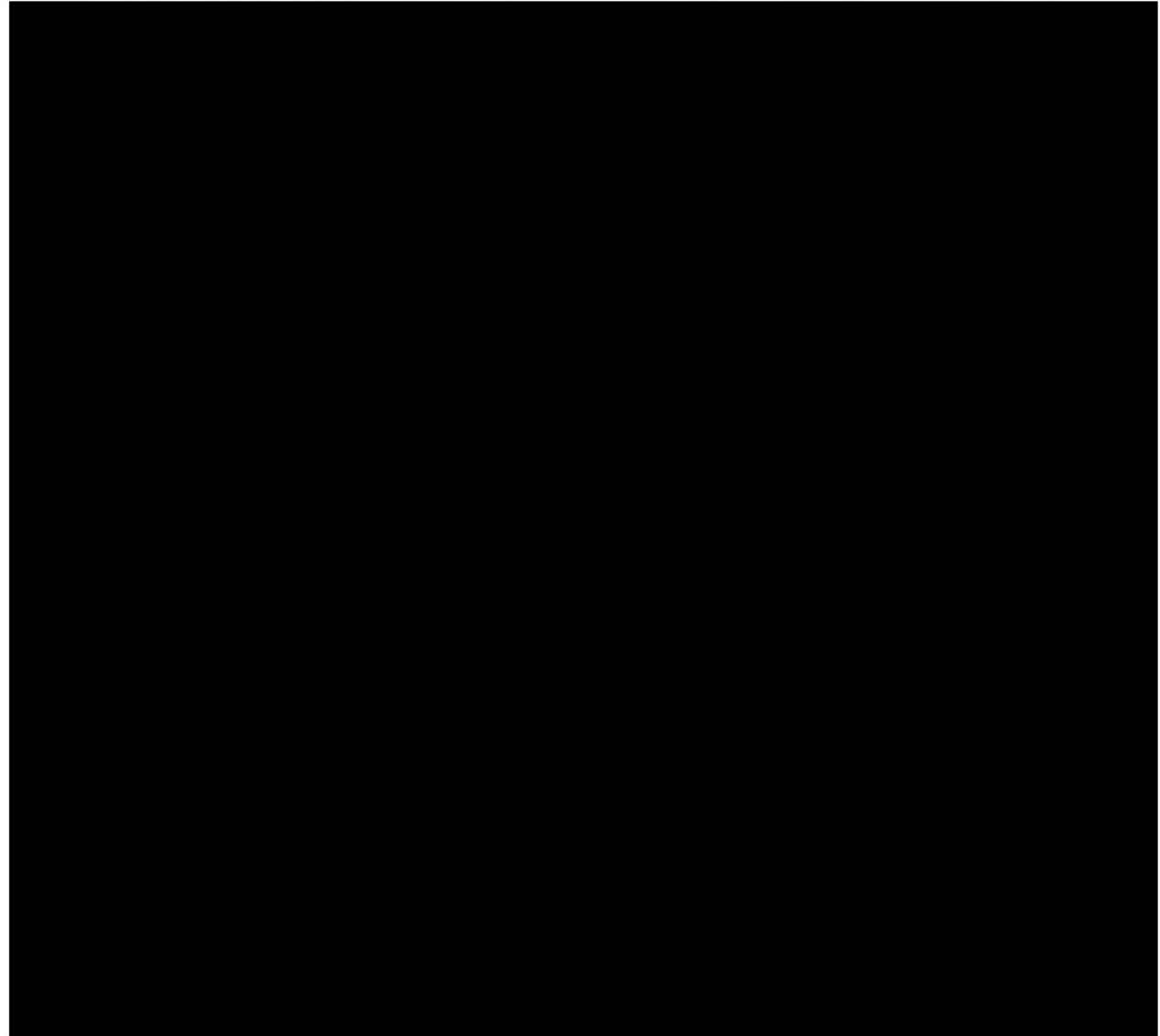
26. The '782 patent describes the inventions in further detail, explaining that, first, the dispatcher places a block on a specified rail section by inputting corresponding information into the control console via a user interface. *Id.* at 7:39-47. The image above shows an example of dispatchers at work controlling trains, including placing blocks.

27. As one example, the image below shows an example from Railware’s Dispatch X system of a user interface through which the dispatcher can place a block:



RAILWARE_(SEPTA)_0034115.

28. As another example, the image below shows an example from SEPTA's system of a user interface through which the dispatcher can place a block.

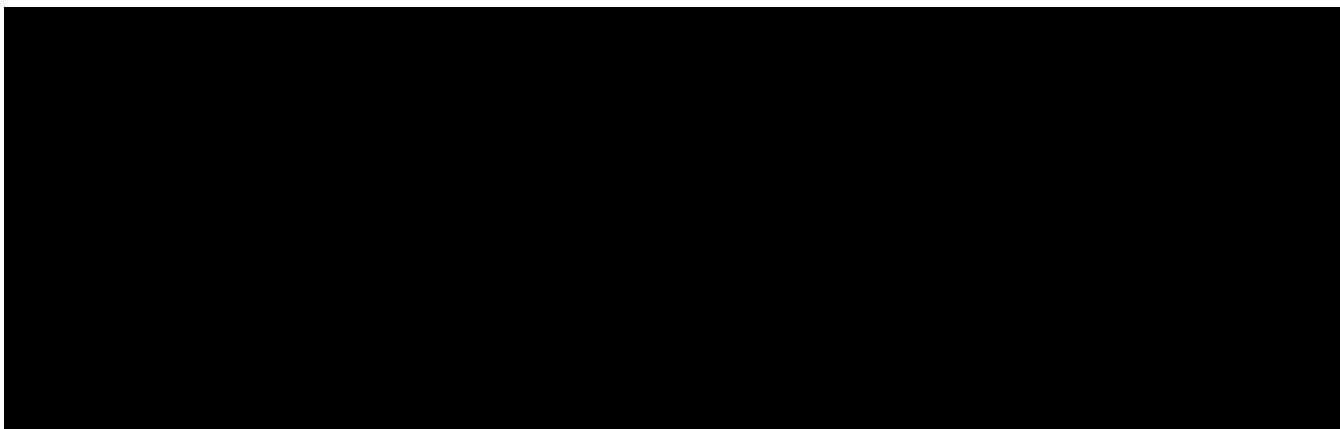


SEPTA_0004445.

29. “Once the block is put into place,” the railway traffic control terminal generates a removal or release code, saves this code to an internal storage, and “sends the code to the maintenance worker designated for track work.” *Id.* at 7:50-55; *see also id.* at 7:1-3 (stating “the railway traffic control apparatus . . . may then generate a release code and save it to an internal storage”).

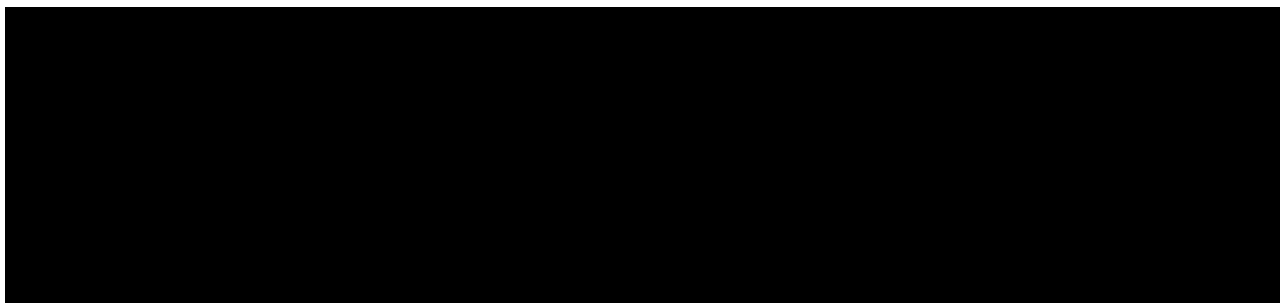
30. Information corresponding to the now-blocked railway section is displayed to the dispatcher on the user interface, but this displayed information does not include the computer-generated removal or release code. *See, e.g., id.*, Fig. 6; *see also id.* at 5:58-64, 7:4-10, 7:59-61, 10:23-36.

31. Below is an example from Railware's Dispatch X of the dispatcher user interface showing the active blocks, but not showing any release codes.



RAILWARE_(SEPTA)_0034128.

32. As another example, this aspect is illustrated in SEPTA's implementation of the blocking dialog box below, which shows the active blocks, but not showing any release codes:



SEPTA_0004445.

33. The '782 patent states that "where there are multiple maintenance workers assigned to a certain track section, there may be provided one release code to one, multiple or all

of maintenance workers assigned.” *Id.* at 8:32-35; *see also id.* at 8:35-39 (stating that the “train traffic controller may input that the release code be specified to one maintenance worker, preferably a supervisor or foreman, to multiple maintenance workers or to all of the maintenance workers assigned to work on a given track section”), 8:39-45 (stating “where there are multiple workers assigned for a certain track section, there may be provided multiple unique release codes which would then all be required to be input into the train traffic control terminal . . . by the train traffic controller in order to be able to remove blocks on certain track sections”).

34. The dispatcher “may not remove” the block on the specified track section “without the input of the release code.” *Id.* at 7:55-59; *see also id.* at 11:1-5 (“Once a block has been placed, the interlock remains in a blocked s[t]ate, until the maintenance worker supplies the release code” to the dispatcher). Thus, “[s]o long as the block is in place, [the] maintenance worker can perform on-track work, without interference of oncoming train traffic.” *Id.* at 11:5-7.

35. “After the maintenance worker finishes the assigned work and is clear of the train tracks, he/she may then supply the interlock control system with the release code, and the interlock control system in turn can release the interlock over the block.” *Id.* at 7:7-11.

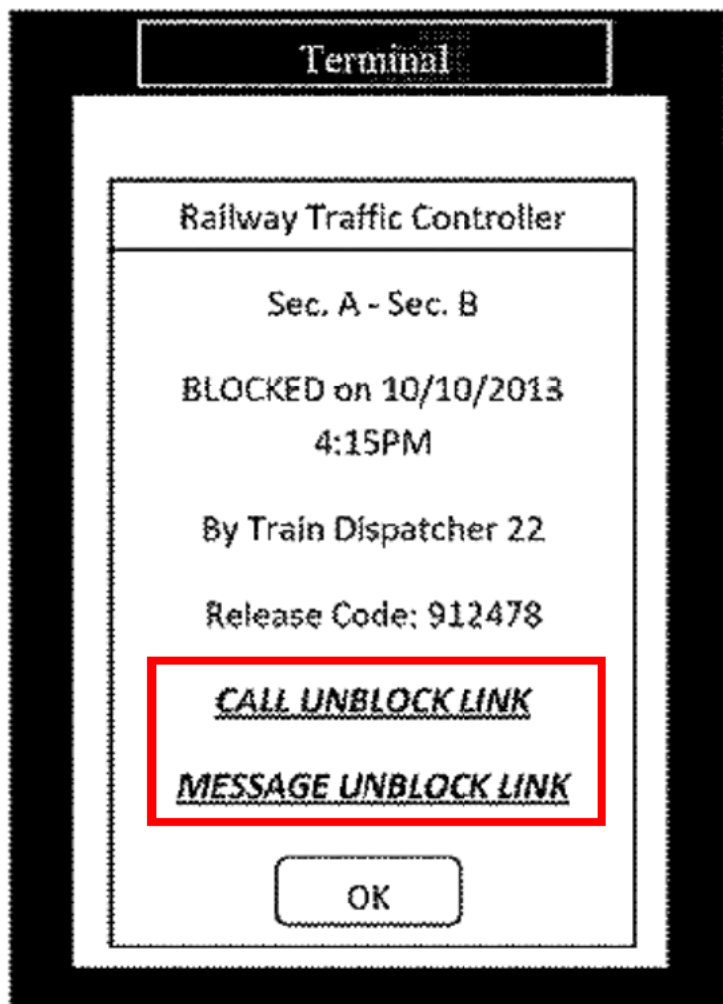
36. The ’782 patent discloses a number of different embodiments that describe how the maintenance or railway field worker can return the removal or release code to the dispatcher/railway control apparatus. Specifically, the ’782 patent provides that the “block removal user interface may be provided in any of various ways.” *Id.* at 3:11-12.

37. In some exemplar embodiments, the maintenance or railway field worker can interact directly with their own remote user terminal to lift a block. For example, in some embodiments, the railway field worker may be able to directly release the block through a block

removal user interface “provided within a mobile application or webpage through which the railway field worker can enter the removal code manually or orally.” *Id.* at 12-16.

38. Similarly, in some exemplar embodiments, the removal code may be “embedded in a link in a message transmitted by email or messaging to the electronic contact address of the railway field worker, and the railway field worker can simply cause the removal code to be entered by activating the link in the message received by the railway field worker.” *Id.* at 3:16-23.

39. Such an exemplar embodiment is shown, for example, in Figure 10 of the ’782 patent, which shows “an example of a user interface display that may be provided on the field worker side or triggering block removal.” (*Id.* at 4:20-22):

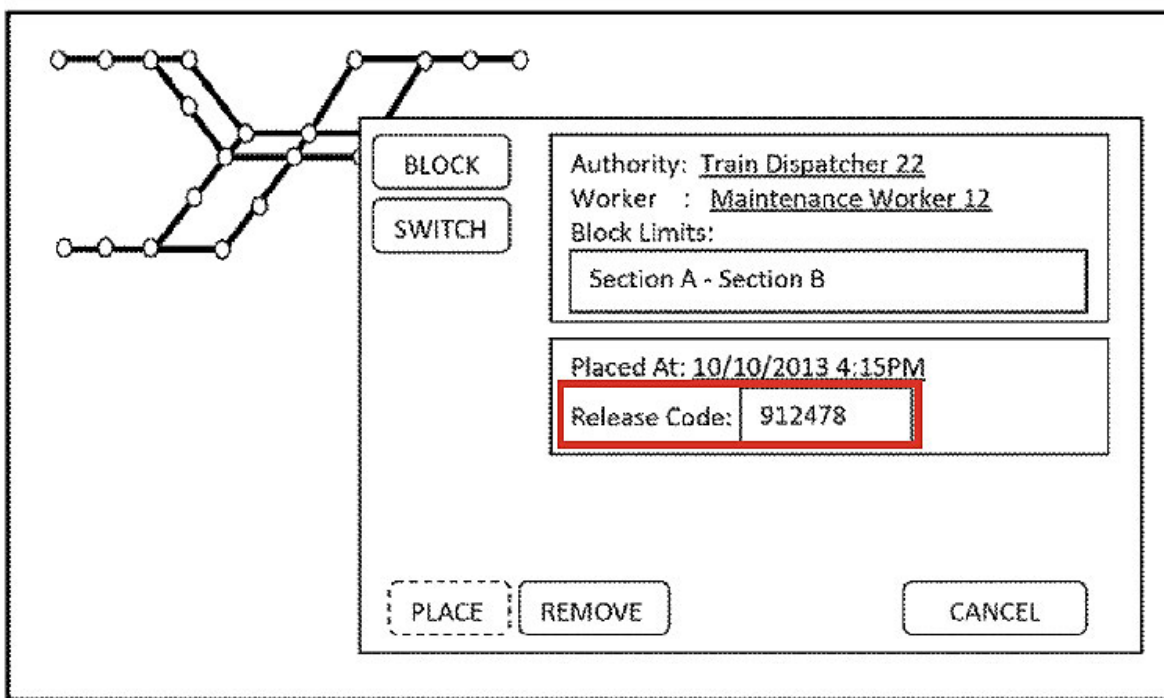
FIGURE 10

40. In other exemplar embodiments, “the block removal user interface may be provided on the same user terminal on which the block placing part is disclosed.” *Id.* at 3:23-25.

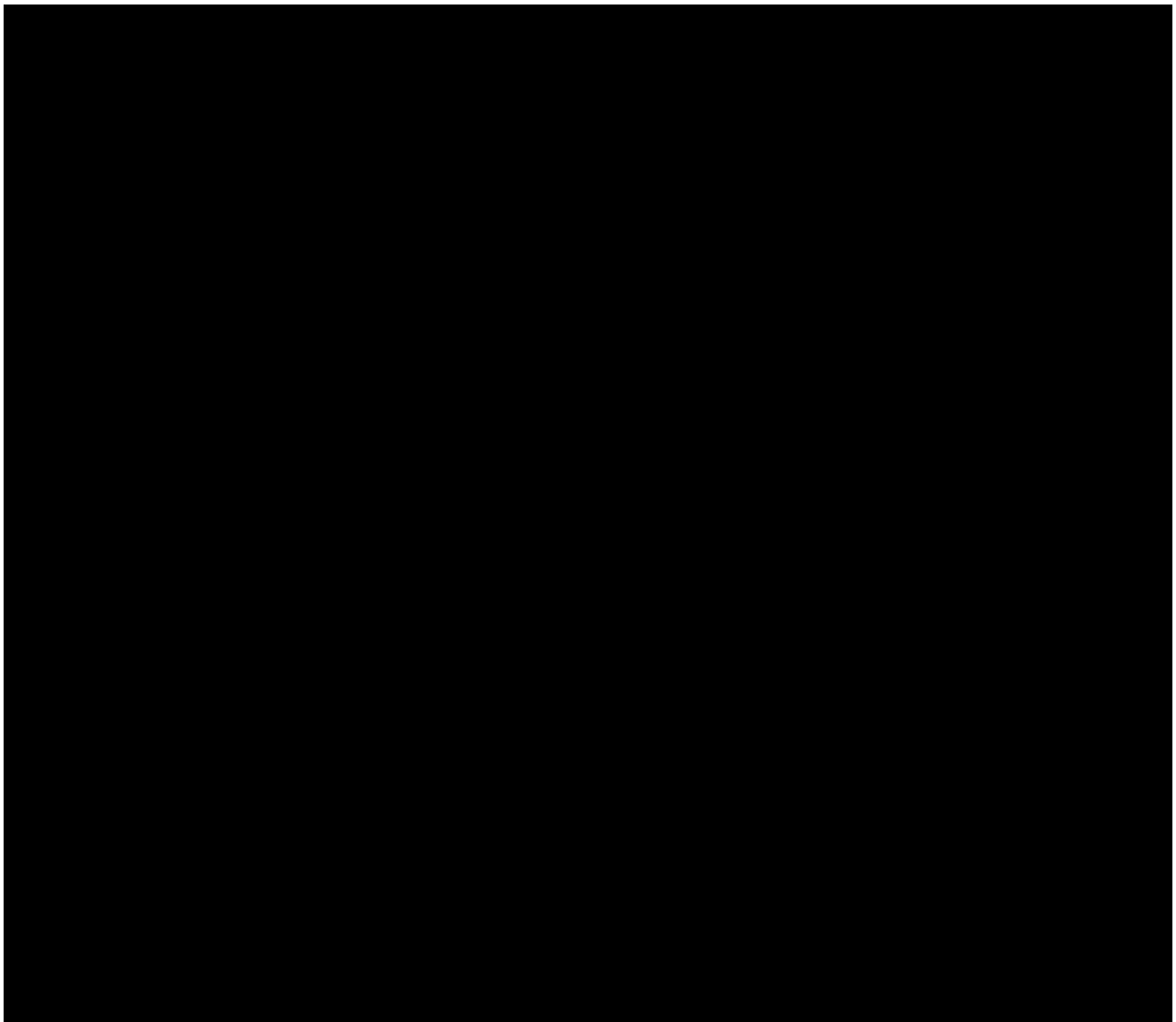
41. Again, the ’782 patent discloses a number of different embodiments in this configuration. For example, “a voice or speech interface part may be disposed on the system-side to process a voice message (such as received via a telephone call from the railway field worker), extract the removal code from the Voice message, and enter the block removal code.” *Id.* at 3:25-29.

42. As another example, the '782 patent makes clear that the maintenance or railway field worker may simply call the dispatcher and provide the removal or release code to the dispatcher, who then enters the code into the dispatcher's terminal to remove the block. For example, "FIG. 8 shows the user interface of the railway traffic control terminal 105 as the railway traffic controller inputs the release code to remove the block on certain track sections. (*Id.* at 8:21-24).

FIGURE 8

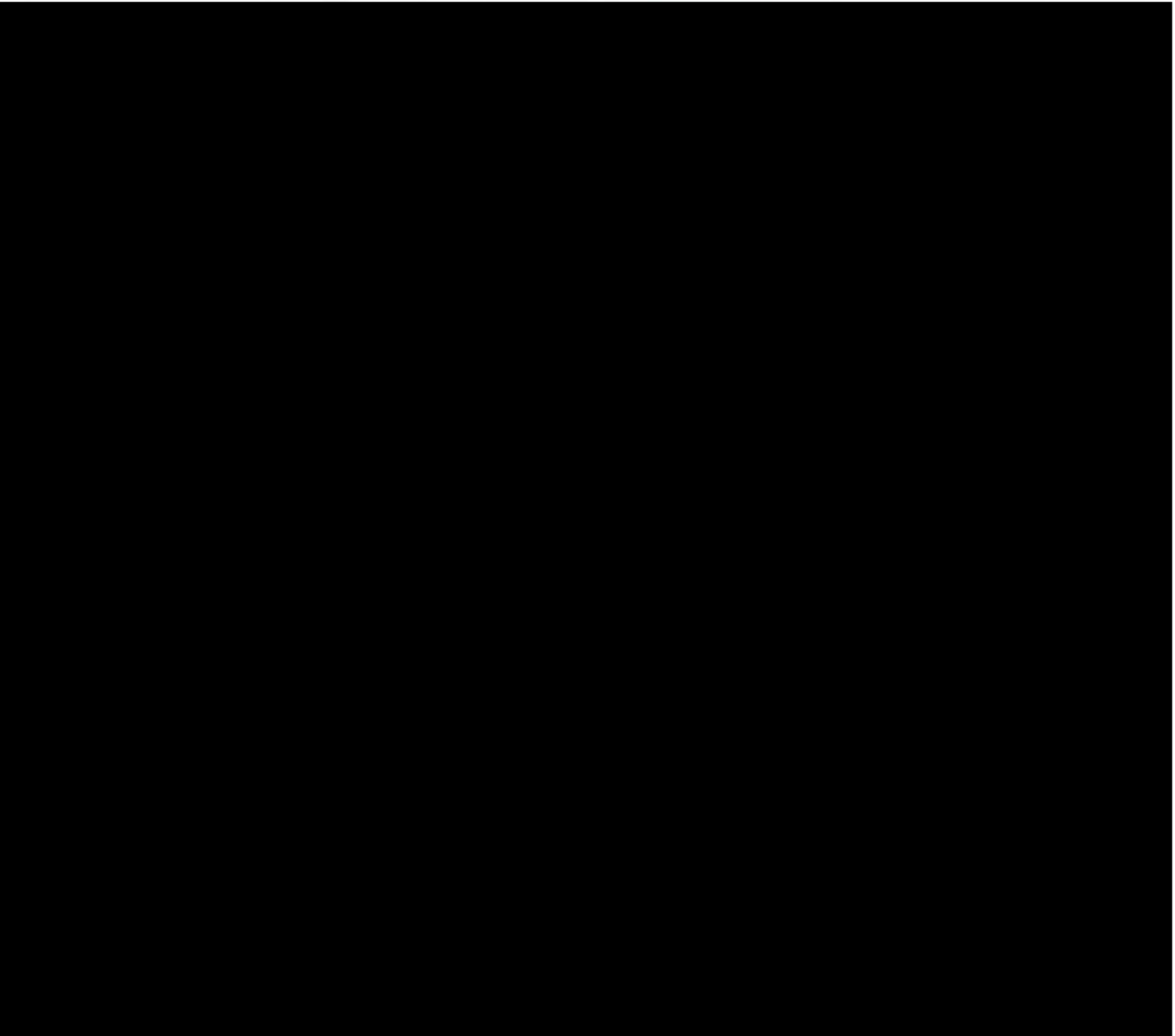


43. Consistent with this disclosure, as another example, below is an image of a user interface used to input a release code and release a block from Railware's Dispatch X system:



RAILWARE_(SEPTA)_0006659.

44. As another example, below is an image of a user interface used to input a release code and release a block from SEPTA's system:



SEPTA_0004454.

45. Further, the '782 patent provides that “in a case where there are multiple workers assigned for a certain track section, there may be provided multiple unique release codes which would then all be required to be input into the train traffic control terminal 105 *by the train traffic controller* in order to be able to remove blocks on certain track sections.” '782 patent at 8:40-45 (emphasis added). Further, the '782 patent makes clear that “[t]he user interface 101D is configured preferably for the ease of use for the railway traffic controller. As shown by way of

examples in FIGS. 6-9 and 11, the user interface 101D displays information and tools needed to enable/disable blocks on rail sections.” *Id.* at 6:4-8. This description demonstrates that the user interface 101D, which is the dispatcher’s user interface, can control the removal of blocks, such as the ways discussed above, including with respect to Figure 8 above.

46. In each of the above exemplar embodiments where the dispatcher is involved in the removal of the block, it is not until the railway field worker seeks to remove the block that the dispatcher receives the code for the first time. As explained in the specification:

Once the secret code is received, the secret code may be input to the designated field (S1308) . . . [T]he railway traffic control terminal 105 checks that all information input into all fields is correct and that all fields are filled in. *After* this check is performed by the railway traffic control terminal 105, the remove button is enabled on the form (01312) and the railway traffic controller may remove the block on the corresponding track section.

Id. at 10:23-36 (emphasis added). By using words like “once” and “after,” the specification makes clear that, in embodiments where the dispatcher is involved in the removal of the block, the dispatcher cannot remove the block until the dispatcher receives the code from the railway field worker.

47. In sum, the ’782 patent makes clear that the dispatcher does not have ready access to the removal or release code to lift the block until that code is provided by a maintenance or railway field worker. Further, the removal or release code can be returned to the railway control apparatus in any number of ways, including automatically by the railway field worker or manually by returning the code to the dispatcher, who then inputs the removal or release code into the dispatcher’s terminal to release the block.

48. The ’782 patent also describes instances where the removal or release code may be obtained by the dispatcher from the internal storage of the railway traffic control apparatus

rather than from the maintenance or railway field worker. *Id.* at 10:6-22. Indeed, the '782 patent explains that a block placed on a section of track may be removed by the dispatcher if an eligible maintenance or railway field worker transmits the removal or release code to the railway traffic control center, but that “[i]f there is no maintenance worker available to transmit the random secret code, the code can be retrieved from the train traffic control terminal . . . by the train traffic controller.” *Id.* at 10:6-22. A POSITA would understand that by using the words “retrieved from the railway control apparatus,” the otherwise “secret” nature of the “release code” creates a hurdle for the dispatcher to obtain the code and such a mechanism for retrieving the code is employed only in certain limited circumstances. By forcing the “release code” to be “retrieved from the train traffic control apparatus” (as opposed to simply displaying the “release code” in full view of the dispatcher, like in the prior art), the '782 patent makes clear that the claimed “release code” is not “readily” available to the dispatcher. Thus, the operation of the system, even in the absence of an available maintenance or railway field worker, is consistent with the '782 patent’s description of tools, systems and methods, as noted above, that assures “the railway worker has more control over the traffic through the rail block in which the worker is working, and fatal on-track accidents can be reduced.” *Id.* at 11:12-14.

49. Consistent with the above, the '782 patent provides methods, tools, and systems to mitigate the potential for errant, mistaken, or premature release of blocks by restructuring the methods, tools, and systems used to protect railway workers by putting the power to lift a block with the removal or release code in the hands of the railway field worker operating under the block’s protection, and not the dispatcher. *See generally*, the '782 patent.

50. The inventions described and claimed in the '782 patent (and the other Asserted Patents) are consistent with my understanding of Railware’s own Dispatch X system and the

tragic industry events that gave rise to the inventions described and claimed in the Asserted Patents.

51. Specifically, I understand that in 2013, a Metro-North passenger train struck and killed several track workers in West Haven, Connecticut. I further understand that Metro-North asked Railware's President, Ross Pirtle (and the inventor on the Asserted Patents), to determine and assess the cause of this accident. I understand Mr. Pirtle did so and determined that the accident was caused when two separate blocks were shown in close proximity on the dispatcher's user interface, and the dispatcher talked to one of the railway foremen and was told that the workers were clear of the railroad track and that the dispatcher could remove the block protection from that track. However, through his investigation, I understand that Mr. Pirtle determined that the dispatcher mistakenly removed the wrong block protection on another railroad track that appeared in close proximity to the block protection that should have been removed (the block that was removed was for a different railway foreman who had workers still working on the track). Through his investigation, I understand that Mr. Pirtle realized that the dispatcher, then believing the track to be clear, routed a train on the track where the workers were still working, which resulted in the train striking the workers on the track and tragically killing them.

52. I further understand that, in order to prevent this from happening in the future, Mr. Pirtle then developed his inventions that are described and claimed in the Asserted Patents and that are implemented in Railware's train control software (Dispatch X) and would ultimately become a commercial embodiment of the Asserted Patents called EEPS (Enhanced Employee Protection System). I discuss further below aspects of Railware's commercial embodiment, EEPS, as it relates to the issues herein. I further understand that Railware filed its first patent

application within months of the tragic incidents above and Mr. Pirtle's resulting investigation and development of the inventions described and claimed in the Asserted Patents.

B. U.S. Patent No. RE47,835

53. I have reviewed the '835 patent entitled "Tools for Railway Traffic Control" and the related prosecution and IPR history. I understand the '835 patent was duly and legally issued on February 4, 2020 as a reissuance of U.S. Patent No. 9,403,545 (the "'545 patent"), which was duly and legally issued on August 2, 2016. I have reviewed the '545 patent and the related prosecution history. I understand that the '835 patent is entitled to a priority date of at least October 21, 2013.

54. As with the '782 patent, the '835 patent generally relates to methods, tools and systems provided to control traffic over a railway track section when a railway worker is working on or near the track section. *See, e.g.*, '835 patent, Abstract. These methods, tools, and systems mitigate the potential for errant, mistaken or premature release of blocks by restructuring the methods, tools, and systems used to protect railway workers by putting the power to lift a block with the removal or release code in the hands of the railway field worker operating under the block's protection, and not the dispatcher. *See generally*, the '835 patent.

55. The '835 patent differs from the '782 patent in some terminology. For example, the '835 patent was amended to consistently use the terms "terminal" and "user terminal" to refer to the maintenance or railway field worker's terminal. In the '782 patent, the terms "terminal" and "user terminal" were used in both the claims and the specification to refer to either the railway field worker's terminal or the dispatcher's terminal depending on the context in which it was used. As discussed further below, a POSITA would readily understand, however, the context and how the terms are being used.

C. U.S. Patent No. RE49,115

56. I have reviewed the '115 patent entitled “Tools for Railway Traffic Control” and the related prosecution and IPR history. I understand the '115 patent was duly and legally issued on June 28, 2022 as a reissuance of U.S. Patent No. 9,403,545, which was duly and legally issued on August 2, 2016. As previously stated, I have reviewed the '545 patent and the related prosecution history. I understand that the '115 patent is entitled to a priority date of at least October 21, 2013.

57. As with the patents discussed above, the '115 patent generally relates to methods, tools and systems provided to control traffic over a railway track section when a railway worker is working on or near the track section. *See, e.g.*, '115 patent, Abstract.

58. These methods, tools, and systems mitigate the potential for errant, mistaken or premature release of blocks by restructuring the methods, tools, and systems used to protect railway workers by putting the power to lift a block with the removal or release code in the hands of the railway field worker operating under the block's protection, and not the dispatcher. *See generally*, the '115 patent.

59. Like the '835 patent, the '115 patent differs from the '782 patent in some terminology. For example, the '115 patent was amended to consistently use the terms “terminal” and “user terminal” to refer to the maintenance or railway field worker's terminal. In the '782 patent, the terms “terminal” and “user terminal” were used in both the claims and the specification to refer to either the railway field worker's terminal or the dispatcher's terminal depending on the context in which it was used. As discussed further below, a POSITA would readily understand, however, the context and how the terms are being used.

VI. DEFINITIONS AND LEGAL UNDERSTANDINGS

A. Claims Are Construed as Understood by a Person of Ordinary Skill in the Art (“POSITA”).

60. I have been advised that patents and relevant literature must be assessed from the perspective of a hypothetical “person of ordinary skill in the art.” I understand this to be a hypothetical person of ordinary creativity, imparted with knowledge of the relevant, publicly available art, and the education and skills ordinarily associated with carrying out research in the particular field to which the patents pertain.

61. I may use the term “person of ordinary skill” or “one of ordinary skill” or “one skilled in the art” or “skilled artisan” or “artisan” as shorthand for the hypothetical person of ordinary skill in the art. I may also use the acronym POSITA.

62. I further understand that the relevant date for assessing the perspective of the hypothetical person skilled in the art for the issues I address below is in or around 2013.

63. It is my opinion that a person of ordinary skill in the art of the Asserted Patents would have (i) at least a bachelor’s degree in electrical, mechanical, industrial or related engineering, and (ii) would have had at least two (2) years of experience in railway safety, railway operations, and/or railway control systems. A higher level of education or specific skill might make up for less experience, and vice-versa.

B. Evidence of Claim Construction

64. I understand that the purpose of claim construction is to ascertain the proper meaning and scope of a claim term, as understood by a POSITA. In district court litigation, I understand that patent claims are construed in light of (i) the claims themselves; (ii) the specification, including the drawings of the patent; and (iii) the prosecution history of the patent

and its family members, including the cited references. I understand that this material is typically referred to as “intrinsic” evidence.

65. I understand that the Court may consider additional evidence (“extrinsic” evidence), which is outside the items discussed above. I understand that extrinsic evidence can include expert testimony, dictionaries, treatises, prior art and the like. But it is my understanding that one should first look to the intrinsic evidence in construing claims.

66. A primary source for understanding a claim term is the plain and ordinary meaning of the claim term itself. Other claims in the patent also can be informative, even if those claims are not asserted. It is also my understanding that language in a claim should not be construed so as to render that language superfluous. Thus, I understand that when construing the claim terms each claim limitation should be given meaning. I also understand that the file history of a related patent can be useful in construing claim terms.

67. I understand that claims are read in light of the specification as understood by a POSITA. Where the meaning of a particular claim term is not plain and ordinary, one should look to the specification and other intrinsic evidence for assistance in understanding that term. However, it is my understanding that limitations from the specification should not be imported or read into the claims. In other words, a limitation from a preferred embodiment should not be read into a claim if that limitation is not present in the claim itself.

68. I also understand that claim terms are to be given the full scope of their plain and ordinary meaning, as understood by a POSITA, absent clear and unmistakable disavowal or disclaimer of claim scope. I understand that no disavowal or disclaimer of claim scope will be found unless the patentee uses language that is clear and unmistakable to make such disavowal or disclaimer.

69. I also understand that the same terms appearing in different claims are not presumed to have the same meaning if it is clear from the claims, specification, and prosecution history that the terms have different meanings at different portions of the claims.

70. The prosecution history of a patent provides the record of the examination of a patent application before the U.S. Patent and Trademark Office (PTO) with reference to the prior art cited during the examination.

71. I also understand that where a dependent claim adds a particular limitation, there is a presumption that that same limitation is not present in the independent claim. I understand this is referred to as claim differentiation.

72. I understand that the preamble to a claim will function as a limit on the scope of the claim where it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim.

73. I understand that in the process that leads to issuance of a U.S. patent, the future patentee or their representatives may make amendments to the pending claims. These amendments are conventionally indicated by underlining (to indicate additions) and strike-through (to indicate deletions). Further, I understand that the record of a patent's prosecution (the "file history" or "prosecution history") is relevant to understanding a patent and its claims.

74. I further understand that a patent may be "reissued" with certain changes to the specification and/or claims of the patent. I understand that such changes are conventionally indicated by italics (to show additions) and square brackets (to indicate deletions).

C. Indefiniteness

75. I understand that indefiniteness is not an issue that should be considered by the Court as part of the claim construction process. I also understand that SEPTA failed to timely

provide its positions on indefiniteness under the Court's Scheduling Order. However, should the Court allow SEPTA to raise indefiniteness issues as part of this process, I understand that the following standards apply.

76. I have been informed that a patent claim must particularly point out and distinctly claim the subject matter which the patentee regards as his/her invention. I also understand that, in the face of an allegation of indefiniteness, general principles of claim construction apply. I also understand that a claim term is sufficiently definite if, when read in light of the specification, claims and the prosecution history, it informs, with reasonable certainty, a POSITA about the scope of the invention.

77. I understand that patents are presumed valid. Thus, any fact(s) critical to a holding on indefiniteness must be proved by the challenger by clear and convincing evidence. I further understand that definiteness requires neither absolute nor mathematical precision. I also understand that claim language employing terms of degree has long been found definite where it provides reasonable certainty to a POSITA when read in the context of the invention, specification, claims and prosecution history. Although a claim term must inform a POSITA with reasonable certainty, I understand absolute precision is not required.

VII. OPINIONS REGARDING CLAIM CONSTRUCTION

78. Based on my review of the materials prepared by both Parties in support of their respective claim construction positions, it is my view that the issues related to construction fall, generally, into four categories: (1) claim construction issues common across all of the Asserted Patents, (2) claim construction issues common to the '835 patent and '115 patent, (3) claim construction issues specific to the '782 patent, and (4) claim construction issues specific to the

'835 patent. My Declaration and analysis will consider the claim construction issues presented in accordance with these categories.

A. Claim Construction Issues Common Across All of the Asserted Patents

79. Both Parties have raised a number of claim terms that appear, in some form or another, across all three of the Asserted Patents. For Railware, I understand that it is seeking construction of various claim terms that include the word “code,” specifically (i) “release code,” (ii) “removal code,” (iii) “secret code,” and (iv) “secret release code.” For SEPTA, I understand that it is seeking construction of various terms that include the word “apparatus,” specifically (i) “railway control apparatus” and (ii) “railway traffic control apparatus.” I address each of these groups of claims terms together.

1. “release code,” “removal code,” “secret code,” and “secret release code” [’782 patent claims 5-8; ’835 patent claims 1, 3, 5-6, 10, 12, 14-15, 19, 20, 23, 24, 26, 30, 33-34, 36, 40, 41; ’115 patent claims 20-36; proposed by Railware]

80. It is my understanding that Railware has asked the Court to construe the claim terms: (i) “release code,” which is used in the ’782 patent and ’835 patent, (ii) “removal code,” which is used in the ’835 patent, (iii) “secret code,” which is used in the ’835 patent and the ’115 patent, and (iv) “secret release code,” which is used in the ’835 patent. SEPTA has offered no constructions for these claim terms, and has, instead, asserted that each of these claim terms is indefinite. The below charts illustrate this, as well as the Parties’ respective positions on the construction of these claim terms.

'782 Patent

<u>Term(s)</u>	<u>Railware's Proposed Construction</u>	<u>SEPTA's Proposed Construction</u>
"release code"	A code that is not readily available to the terminal user (<i>i.e.</i> , the dispatcher). Not indefinite.	No construction offered. Indefinite

'835 Patent

<u>Term(s)</u>	<u>Railware's Proposed Construction</u>	<u>SEPTA's Proposed Construction</u>
"removal code"	A code that is not readily available to the user of the railway [traffic] control apparatus (<i>i.e.</i> , the dispatcher). Not indefinite.	No construction offered.
"release code"		Indefinite
"secret release code"		
"secret code"	A code that is not readily available to the user of the railway control apparatus (<i>i.e.</i> , the dispatcher). Not indefinite.	No construction offered. Indefinite

'115 Patent

<u>Term(s)</u>	<u>Railware's Proposed Construction</u>	<u>SEPTA's Proposed Construction</u>
"secret code"	A code that is not readily available to the user of the railway control apparatus (<i>i.e.</i> , the dispatcher). Not indefinite.	No construction offered. Indefinite

81. It is my opinion that a POSITA would have understood the claim terms "release code," "removal code," "secret code," and "secret release code," (collectively the "Code Terms")

as a code that is not readily available to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts), consistent with Railware’s proposed construction.

The intrinsic and extrinsic evidence supports this construction.

a. **The Specifications of the Asserted Patents Support Railware’s Proposed Construction.**

82. The specifications of the Asserted Patents support Railware’s proposed construction. The specifications of the Asserted Patents consistently and repeatedly describe the Code Terms as “secret,” “automatically” generated and transmitted, and saved to “internal storage.” When taken together, these concepts support the construction that the Code Terms mean a code that is not readily available to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts).

83. First, the Asserted Patents repeatedly and consistently refer to the Code Terms as “secret” across all embodiments.

84. Specifically, the Asserted Patents state “the code generator 101B is configured to produce [a] removal code []such as a cipher which is . . . **secret**.” ’782 patent at 5:58-60 (emphasis added); *see also id.* at 9:65-10:1 (“the railway traffic control terminal 105 . . . enables safety measures so that the block cannot be removed without the input of the **secret code** generated.”); 10:10-13 (“The remove button is disabled without the input of the **secret code**”); 10:15-22 (“the maintenance worker transmits the random **secret code** to the railway traffic control center 105 (S1305).”); ’835 patent at 6:3-5; *id.* at 10:22-25; *id.* at 10:35-38; *id.* at 10:41-48; ’115 patent at 6:6-9; *id.* at 10:22-25; *id.* at 10:34-37; *id.* at 10:39-46.

85. By repeatedly and consistently describing the code as “secret,” it is my opinion that a POSITA would understand from the Asserted Patents that the Code Terms are codes that

are not readily available to the dispatcher (*i.e.*, “secret” from the dispatcher (as that individual is referred to in each respective claim, noted in the above charts)).

86. Second, the Asserted Patents describe that the code is saved to ***internal*** storage of the railway control apparatus.

87. Specifically, the Asserted Patents state “the railway control apparatus 105 may then generate a release code and save it to an internal storage.” ’782 patent at 7:2-3; *see also, id.* at 8:29-31; ’835 patent at 7:16-19, 8:47-50; ’115 patent at 7:20-22, 8:50-53.

88. Third, the Asserted Patents describe the generation and transmission of the codes within the unconventional network architecture as “largely automated” such that the code is “automatically transmitted” by the railway control apparatus to the railway field worker. ’782 patent at 2:58-62; *see also, e.g., id.* at 2:53-55; 5:58-64, 7:1-10, 7:32-55, 8:54-59, 10:1-5; ’835 patent at 2:64-3:2, 2:59-61, 6:3-10, 7:15-27, 7:49-8:6, 9:7-12, 10:26-30; ’115 patent at 3:4-9, 2:66-3:1, 6:6-13, 7:20-30, 7:53-8:9, 9:9-14, 10:25-29.

89. The fact that the code is saved to internal storage of the railway control apparatus, largely automated, and automatically transmitted to the railway field worker further supports my opinion that a POSITA would understand the Code Terms to mean a code that is not readily available to the dispatcher because these operations explicitly do not involve displaying the code to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts).

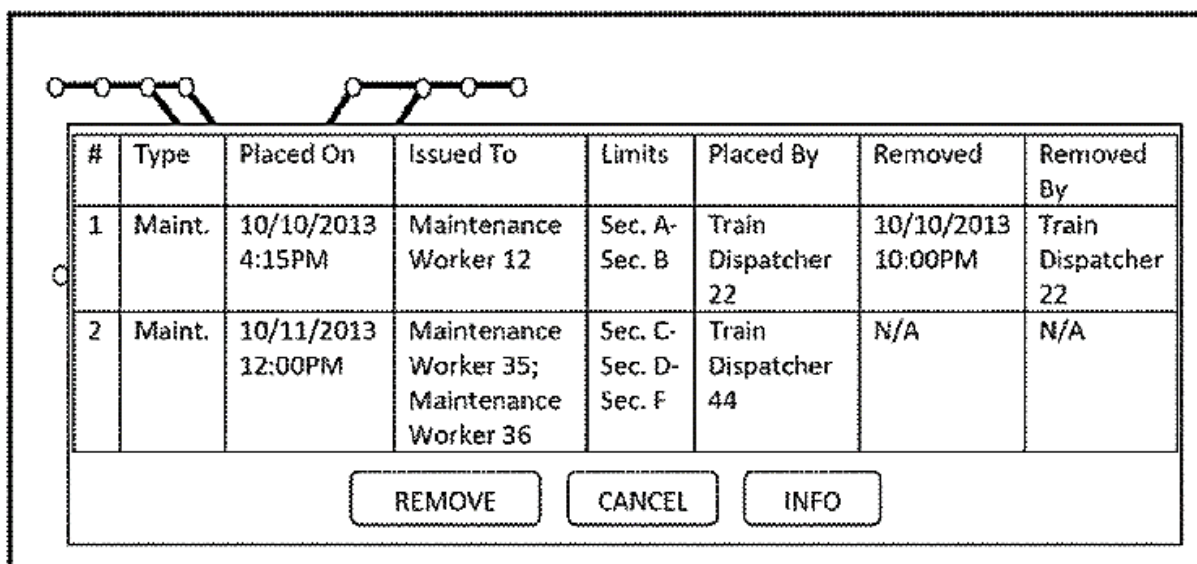
90. Additionally, the Figures of the Asserted Patents support the construction because none of the Figures displays any code to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts) prior to receiving the code from elsewhere (*e.g.*, the railway field worker or the railway control apparatus).

91. The Figures of the Asserted Patents, which show screen shots of the railway control apparatus and the railway field worker's terminal support the construction.

92. The Figures of the Asserted Patents never show the code displayed to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts) prior to receiving the code (*e.g.*, from the railway field worker or the railway control apparatus).

93. Figure 7, for example, shows various details about blocks that are displayed to the dispatcher on the railway control apparatus:

FIGURE 7



#	Type	Placed On	Issued To	Limits	Placed By	Removed	Removed By
1	Maint.	10/10/2013 4:15PM	Maintenance Worker 12	Sec. A- Sec. B	Train Dispatcher 22	10/10/2013 10:00PM	Train Dispatcher 22
2	Maint.	10/11/2013 12:00PM	Maintenance Worker 35; Maintenance Worker 36	Sec. C- Sec. D- Sec. F	Train Dispatcher 44	N/A	N/A

REMOVE CANCEL INFO

'782 patent, Fig. 7.

94. Notably absent from Figure 7 is any code that is associated with the blocks.

95. Figure 7 does include a sequential numbering of the blocks in the left-hand column, labeled "#." This left-hand column is a sequential number, which is effectively a "Form D" number (as I described above in the background section) and identifies a particular block and *is* readily available to the dispatcher at all times.

96. But the # column shown in Figure 7 is distinct from the Code Terms as used throughout the specification.

97. The fact that Figure 7 displays a sequential “Form D” number, but does not display the code to the dispatcher on the railway control apparatus, further supports my opinion that a POSITA would understand the Code Terms to mean a code that is not readily available to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts).

98. In contrast, Figure 10, which shows the railway field worker’s terminal, shows the code (called a “random code” in Figure 10) displayed to the railway field worker (not the dispatcher (as that individual is referred to in each respective claim, noted in the above charts)).

FIGURE 10

Terminal

Railway Traffic Controller

Sec. A - Sec. B

BLOCKED on 10/10/2013
4:15PM

By Train Dispatcher 22

Random Code: 912478

CALL UNBLOCK LINK

MESSAGE UNBLOCK LINK

OK

'782 patent, Fig. 10 (my annotations in red).

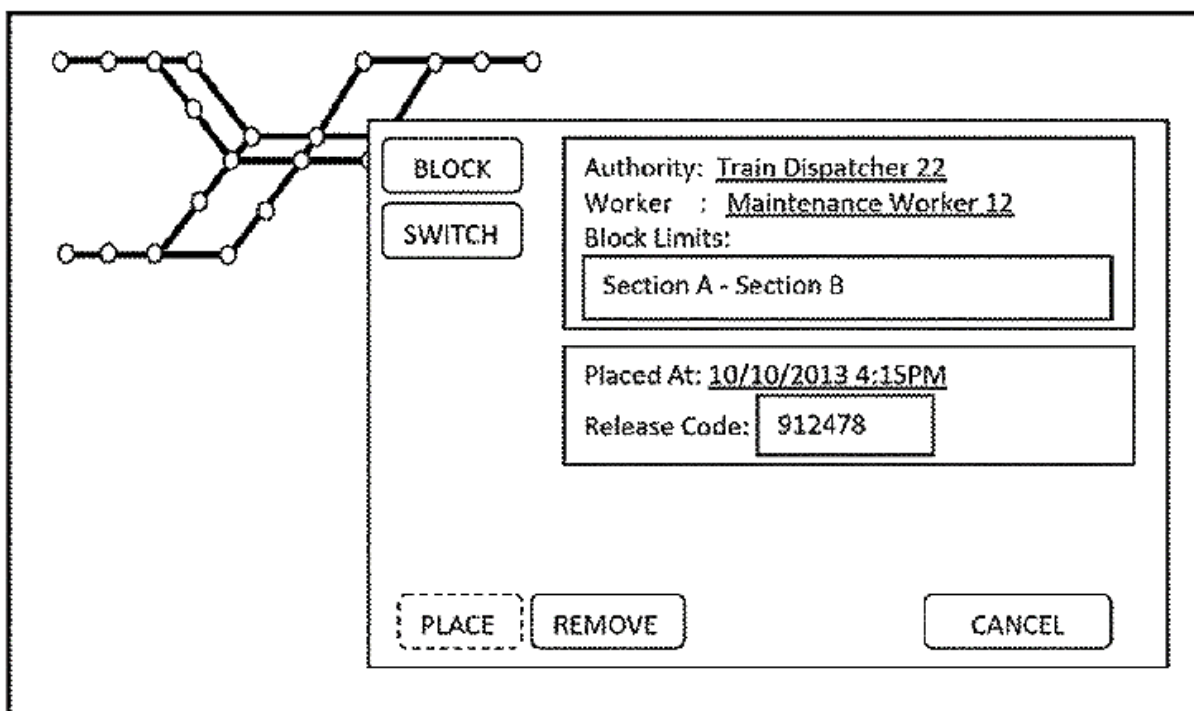
99. It is not until the railway field worker seeks to remove the block that the dispatcher receives the code for the first time, as explained in the specification:

In order for a block on a certain track to be lifted, the release code has to be input into the railway traffic control apparatus. The terminal 102 sends the release code to the railway traffic control apparatus 105. The release code is then input into the block remover 101C. After which, the block is removed and traffic to that section of rail is then allowed.

Id. at 7:14-20; '835 patent at 7:31-37; '115 patent at 7:35-41.

100. Figure 8, which illustrates a specific embodiment, “shows the user interface of the railway traffic control terminal 105 as the railway traffic controller inputs the release code to remove the block on certain track sections,” stands in further contrast to Figure 7.

FIGURE 8



'782 patent, Fig. 8.

101. As illustrated in Figure 8, only after the railway field worker transmits the code or provides the code to the dispatcher is the dispatcher able to enter the code into the railway control apparatus, to remove the block. *Id.* at 8:28-29 (“Without the input of release code, the

remove option is not available to be selected.”); *see also, e.g., id.* at 2:55-57, 3:30-33, 5:67-6:3, 7:8-10, 7:35-38, 7:55-60, 8:28-31, 8:46-53, 10:15-19, 10:23-36; ’835 patent at 8:47-50, 2:61-63, 3:37-41, 6:11-16, 7:24-27, 7:52-56, 8:6-12, 8:47-50, 8:65-9:6, 10:38-48, 10:49-64; ’115 patent at 8:50-51, 3:1-3, 3:43-46, 6:16-19, 7:27-30, 7:56-59, 8:9-13, 8:50-53, 9:1-9, 10:39-42, 10:47-78.

102. Similarly, in the embodiments in which the railway field worker can automatically return the removal or release code back to the railway control apparatus, the dispatcher may *never* see the removal or release code. In such embodiments, the removal or release code would not be readily available to the dispatcher because the dispatcher would never see the removal or release code. Such embodiments include embodiments where the block removal user interface is provided within a mobile application or web page through which the railway field worker can enter the removal or release code manually or orally, or where the code is returned automatically through an embedded link or the like, or where the railway control apparatus includes a voice or speech interface part or the like that can process a voice message from the railway field worker to extract the removal or release code and release the block. *See, e.g.,* ’782 patent at 3:11-29; ’835 patent at 3:20-38; ’115 patent at 3:26-42.

103. Railware’s proposed construction is consistent with a stated goal of the Asserted Patents to give “the railway worker [] more control over the traffic through the rail block in which the worker is working.” ’782 patent at 11:12-14; ’835 patent at 11:40-43; ’115 patent at 11:37-39.

104. It is my opinion that a POSITA would understand that the code is not readily available to the dispatcher, given the problems addressed by the Asserted Patents.

105. The Asserted Patents acknowledge that “railway transportation is run under strict operational guidelines or rules,” such as the “Form D” number. ’782 patent at 1:21-22; ’835 patent at 1:28-29; ’115 patent at 1:36-37.

106. Form D numbers, alone, are inherently unreliable because they are known to the dispatcher at all times.

107. The Asserted Patents note that “one study reported that there were 39 roadway worker accidents that occurred between January 1997 and the end of 2011, in which 41 roadway workers perished.” ’782 patent at 2:29-31; ’835 patent at 2:34-36; ’115 patent at 2:41-44.

108. Form D numbers were in operation during this entire span of time, yet accidents and fatalities persisted.

109. The Asserted Patents note that “even with all of the[] safety features present in a railway system, railway accidents occur, with many of them being fatal There remains a need for further safety measures to protect the lives of railway workers.” ’782 patent at 2:27-39; ’835 patent at 2:33-45; ’115 patent at 2:40-52.

110. The Federal Railroad Administration (“FRA”) agreed. The FRA stated in a 2016 Final Rule:

In [two accidents in 2007 and 2013] the train dispatchers did not maintain the required blocking devices, allowing train movements into the roadway work groups’ established working limits without the relevant RWIC’s knowledge. . . . Despite the fact that FRA’s regulations already prohibit the actions that led to these accidents, FRA recognizes more can be done to try to prevent these types of mistakes from causing future tragedies.

Federal Railroad Administration, *Railroad Workplace Safety; Roadway Worker Protection Miscellaneous Revisions (RRR)* at 75-76 (May 26, 2016).

111. The FRA specifically noted that railroads should “ensure appropriate safety redundancies are in place in the event of miscommunication or error,” including “where working limits were no longer protected due to dispatcher error.” *Id.* at 82.

112. The FRA explained it would “scrutinize a railroad’s PTC development and safety plans to determine if the plans left any opportunity for a single point human failure with regard to incursions into work zones (e.g., any opportunity for a dispatcher to remove a blocking device in error)” *Id.* at 85.

113. Along these lines, each of the claims of the Asserted Patents requires an unconventional network architecture for generating, transmitting, receiving and using one of the Code Terms that is transmitted to the railway field worker that is working on the track, but otherwise remains “secret” from the dispatcher (as that individual is referred to in each respective claim, noted in the above charts). ’782 patent at 5:58-64, claims 1, 5; ’835 patent at 6:3-10, claims 1-7, 9 -16, 18-41; ’115 patent at 6:6-13, claims 20-36.

114. It is my opinion that a POSITA would understand that, by keeping the code secret from the dispatcher, the Asserted Patents prevent the very miscommunications, mistakes or errors that plagued the industry and that the FRA ultimately acknowledged in its Final Rule report.

115. It is my opinion that a POSITA would readily understand, given this context, that the claimed Code Terms—which, *inter alia*, is “secret,” saved to “internal storage,” “automatically transmitted” to the railway field worker, and only after the railway field worker transmits the code to the railway control apparatus or provides the code to the dispatcher for the dispatcher to be able to enter the code into the railway control apparatus, to remove the block—

must not be readily available to the dispatcher, or else the objects of the unconventional, distributed network architecture would not be achieved.

116. The fact that the code is not “readily available” is further evident from the Asserted Patents’ description of what happens when the railway field worker cannot provide the code for some reason.

117. The specifications of the Asserted Patents support the construction because the specifications disclose, within an unconventional network architecture for generating, transmitting, receiving and using the claimed codes, a failsafe in which the code may be “retrieved” from the internal storage, for example, if the railway field worker is unable to provide the code. ’782 patent at 10:19-22; ’835 patent at 10:44-48; ’115 patent at 10:42-46.

118. Specifically, the Asserted Patents state, “[i]f there is no maintenance worker available to transmit the random secret code, the code can be retrieved from the train traffic control terminal 105 by the train traffic controller (S1306).” ’782 patent at 10:19-22; ’835 patent at 10:44-48; ’115 patent at 10:42-46.

119. A POSITA would understand that by using the words “retrieved from the railway control apparatus,” the otherwise “secret” nature of the “release code” creates hurdles for the dispatcher to obtain the code and such a mechanism for retrieving the code is employed only in limited circumstances. By forcing the “release code” to be “retrieved from the train traffic control apparatus” (as opposed to simply displaying the “release code” in full view of the dispatcher), the Asserted Patents make clear that the claimed Code Terms cover a code that is not “readily” available to the dispatcher. This is consistent with the Asserted Patents’ stated goal to give the railway field worker more control over the release of blocks.

120. Thus, the dispatcher must not have the code prior to (1) receiving the code from a railway field worker or (2) going through a retrieval process to obtain the code when, for example, there is no railway field worker to provide the code. '782 patent at 10:15-22 ("If there is an eligible maintenance worker available, the maintenance worker transmits the random secret code to the railway traffic control center 105 (S1305). If there is no maintenance worker available to transmit the random secret code, the code can be retrieved from the train traffic control terminal 105 by the train traffic controller (S1306)."); '835 patent at 10:41-48 (similar); '115 patent at 10:39-46 (similar).

121. A POSITA would understand that by using the words "retrieved from the railway control apparatus," the otherwise "secret" nature of the code creates hurdles for the dispatcher to obtain the code and such a mechanism for retrieving the code is employed only in limited circumstances. This is a fundamental concept of the inventions of the Asserted Patents that achieves the goal of giving the railway field worker more control over the blocks on the track while the railway field worker is working on the track. '782 patent at 11:12-14; '835 patent at 11:40-43; '115 patent at 11:37-39.

122. By forcing the code to be "retrieved from the train traffic control apparatus" (as opposed to simply displaying the code in full view of the dispatcher), the Asserted Patents make clear that the claimed code is not "readily" available to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts).

b. The Claim Language of the Asserted Patents Supports Railware's Proposed Construction.

123. Consistent with the specifications, it is my opinion that the claim language of the Asserted Patents support this construction.

124. For example, independent claim 5 of the '782 patent specifies that the “release code” is generated and transmitted “to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal.” '782 patent at claim 5.

125. Claim 5 and the other claims specifically do not say that the “release code” is displayed to the dispatcher. Further, claim 5 requires that a track block be removed “only upon receiving the release code from the user terminal in return.” *Id.*

126. Similarly, with respect to the '835 patent, independent claims 1, 10, and 19 each specify that the “removal code” is generated and transmitted “to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal.” '835 patent at claims 1, 10, 19.

127. The claims specifically do not say that the “removal code” is displayed to the dispatcher.

128. Claims 20, 30, and 40 of the '835 patent further support Railware's proposed construction. Each of claims 20, 30, and 40 expressly require that the claims “secret release code”/“secret code” is “secret.” *Id.* at claims 20, 30, 40. This express recitation of secrecy makes clear to a POSITA that the “secret release code”/“secret code” is not readily available to the dispatcher, particularly because the claims also recite that the “secret release code”/“secret code” is expressly transmitted to the user terminal of the railway field worker. *Id.* Given that the Asserted Patents have the “secret release code”/“secret code” sent to the railway field worker, a POSITA would understand that the “secret release code”/“secret code” is secret from the dispatcher (as that individual is referred to in each respective claim, noted in the above charts).

129. Similarly, with respect to the '115 patent, claims 20, 30, and 31 each expressly require that the code be “secret.” '115 patent at claims 20, 30, and 31. This express recitation of

secrecy makes clear to a POSITA that the “secret code” is not readily available to the dispatcher, particularly because the claims also recite that the “secret code” is transmitted to the user terminal of the railway field worker. *Id.*

130. Independent claims 20, 30, and 31 each also specify that the “secret code” is generated and transmitted “to a remote user terminal.” *Id.* at claims 20, 30, and 31. The claims specifically do not say that the “secret code” is displayed to the dispatcher. If, on the other hand, the dispatcher had ready access to the “secret code,” then the code would not be “secret” at all, and the dispatcher could remove the block at any time and particularly due to miscommunication, mistake or error.

131. Considering the above, my opinion is that the proper construction of the Code Terms is a code that is not readily available to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts), which is consistent with Railware’s proposed construction.

c. The Patent Trial And Appeal Board’s Decisions Further Confirm Railware’s Proposed Construction.

132. I understand that the Patent Trial and Appeal Board (the “Board”) issued three decisions denying institution of *inter partes* review of the Asserted Patents. I have reviewed these decisions, and it is my opinion that these decisions support Railware’s proposed construction.

133. I understand that the Board did not adopt an explicit construction for the Code Terms in order to deny institution. *See Decision Denying Institution of Inter Partes Review*, IPR2023-01179, Paper 8 at n.11 (P.T.A.B. Jan. 22, 2024) (“for purposes of this Decision we need not resolve whether Patent Owner’s proposed express construction of ‘release code’ is the

proper meaning of the term in light of the Specification, which we note does not appear to expressly address how a person of ordinary skill in the art would have distinguished a code that is ‘readily available’ to the dispatcher from a code that was not ‘readily available.’”).

134. Despite not adopting a construction, the Board determined that, Amtrak failed to show that the Code Terms “encompass[] a non-public code that is received by any railway personnel that may be used to release a track block without further limitations on the accessibility to the code by, for example, the dispatcher prior to a release of a track block.” *Id.* at 19. In other words, the Code Terms require “limitations on the accessibility to the code by, for example, the dispatcher prior to a release of a track block.” *See id.* This supports Railware’s proposed construction.

135. I disagree, however, with the Board’s statement that the specifications “do[] not appear to expressly address how a person of ordinary skill in the art would have distinguished a code that is ‘readily available’ to the dispatcher from a code that was not ‘readily available.’” *Id.* at n.11. As an initial matter, I understand that the question of indefiniteness was not before the Board, and therefore the Board did not need to and did not analyze whether the claims provided a POSITA with reasonable certainty as to the scope of the claims. However, as discussed above, a POSITA would understand, based on the stated goals of the Asserted Patents, the unambiguous claim language, the described embodiments, the Figures, and the repeated emphasis on secrecy and the like, when the code would be considered readily available to the dispatcher and when it would not.

136. In my opinion, the Board’s conclusion in denying institution is consistent with and supportive of Railware’s proposed construction of the Code Terms, because Railware’s

proposed construction encompasses the concept of “limitations on the accessibility to the code” in slightly different, but more understandable, terms (*i.e.*, “not readily available”).

137. Considering the above, my opinion is that the proper construction of the Code Terms is a code that is not readily available to the dispatcher (as that individual is referred to in each respective claim, noted in the above charts), consistent with Railware’s proposed construction.

d. SEPTA’s Indefiniteness Arguments are Incorrect; the Code Terms Inform a POSITA with Reasonable Certainty About the Scope of the Inventions Claimed.

138. Again, I understand that indefiniteness is not an issue that should be considered by the Court as part of the claim construction process. I also understand that SEPTA failed to timely provide its positions on indefiniteness under the Court’s Scheduling Order. However, should the Court allow SEPTA to raise indefiniteness issues as part of this process, I provide the following.

139. It is my understanding that SEPTA contends that the Code Terms, as well as the term “second secret code,” are indefinite. I disagree.

140. I have reviewed SEPTA’s Identification of Proposed Constructions of Claim Terms. I note that SEPTA does not provide any basis in that document for its position that the Code Terms or the “second secret code” term are indefinite. I have also reviewed SEPTA’s Supplemental Preliminary Invalidity Contentions, which consist of a series of thirty-seven (37) charts, and note that SEPTA’s discussion of indefiniteness with respect to the Code Terms and the term “second secret code” is cursory and lacking in detail or explanation. Based on these SEPTA’s submissions, I do not understand SEPTA’s positions.

141. I have also reviewed a ninety-two (92) page document that SEPTA styled as a “cover pleading” to its Supplemental Preliminary Invalidity Contentions. While this document provides more detail than the other documents, I have been informed that this document was served by SEPTA beyond the Court-ordered deadline, and is therefore not part of the current case. I understand from counsel that, absent a Court Order to the contrary, SEPTA has likely waived its indefiniteness arguments discussed therein on the Code Terms and the term “second secret code.” Nevertheless, based on the limited information provided by SEPTA to date and a host of assumptions, I provide my opinions on the indefiniteness of the Code Terms and the term “second secret code” below. As I will explain in more detail below, I disagree with SEPTA’s positions.

142. To the extent that SEPTA is permitted to or does expand upon, supplement, or introduce new or additional explanation regarding its positions, I reserve the right to supplement or amend my opinions to address such positions.

143. It is my opinion that the Code Terms, as well as the term “second secret code,” are not indefinite because these terms, viewed in light of the claims, specification and prosecution history, inform a POSITA about the scope of the invention with reasonable certainty.

144. As discussed above, it is my opinion that the context in which the claimed Code Terms are used throughout the specifications and claims make it such that it would have been clear to a POSITA what the terms mean, and more specifically that the Code Terms must mean a code that is not readily available to the dispatcher, which is consistent with Railware’s proposed construction.

145. Further, it is also my opinion that the context in which the claimed “second secret code” term is used throughout the specification and the claims of the ’115 patent make it such

that it would have been clear to a POSITA what the term means. That is, a POSITA would understand that “second secret code” refers to the string of characters relayed from the railway field worker back to the railway control apparatus or the dispatcher (via message, voice, embedded link, or otherwise). A POSITA would further understand that the use of the word “secret” in “second secret code” is done not to indicate the secrecy of the “second secret code,” itself, but rather to indicate the “second secret code’s” relationship to the “secret code” described earlier in the claims. That is, that to release the block, the “secret code” (which was sent to the railway field worker) and the “second secret code” (that was provided or sent from the railway field worker back to the dispatcher or the railway control apparatus) must be the same. *See*, ’115 patent at Fig. 13, step S1309; *id.* at 10:47-61.

i. SEPTA’s arguments regarding code secrecy are incorrect.

146. Again, I understand that indefiniteness is not an issue that should be considered by the Court as part of the claim construction process. I also understand that SEPTA failed to timely provide its positions on indefiniteness under the Court’s Scheduling Order. However, should the Court allow SEPTA to raise indefiniteness issues as part of this process, I provide the following.

147. I have reviewed SEPTA’s Supplemental Preliminary Invalidity Contentions. Therein, SEPTA has asserted that the Asserted Patents “do[] not make clear . . . whether the . . . [Code Terms]⁴ must be secret as a definitional matter . . . in order to fall within the scope of the claimed invention.” SEPTA’s Supplemental Preliminary Invalidity Contentions at 60. In other

⁴ SEPTA uses the defined term “Release Code” in their cover pleading. However, it is my understanding that the terms signified therein are identical to the terms I refer to as “Code Terms” throughout this Declaration.

words, SEPTA seems to argue that the Asserted Patents fail to inform, with reasonable certainty, those skilled in the art about whether the Code Terms are “secret.” I disagree.

148. As indicated in paragraphs 81 to 131, above, it is my opinion that the Asserted Patents are resolute in their indication that the Code Terms are secret.

149. For example, the ’835 patent states “the code generator 101B is configured to produce [a] removal code []such as a cipher which is . . . secret.” ’835 patent at 6:3-5. This is reinforced repeatedly throughout the specification. *Id.* at 10:22-25 (“Once the place button is selected, the railway traffic control [terminal] *apparatus* 105 . . . enables safety measures so that the block cannot be removed without the input of the secret code generated.”); 10:35-36 (“The remove button is disabled without the input of the secret code.”); 10:42-44 (“the maintenance worker transmits the random secret code to the railway traffic control [center] *apparatus* 105 (S1305).”).

150. The same is true of the ’782 patent. ’782 patent at 5:58-60 (“the code generator 101B is configured to produce [a] removal code []such as a cipher which is . . . secret.”), *see also id.* at 9:65-10:1 (“the railway traffic control terminal 105 . . . enables safety measures so that the block cannot be removed without the input of the secret code generated.”); 10:10-13 (“The remove button is disabled without the input of the secret code.”); 10:15-22 (“the maintenance worker transmits the random secret code to the railway traffic control center 105 (S1305).”).

151. The same is true of the ’115 patent. ’115 patent at 6:6-8 (“the code generator 101B is configured to produce [a] removal code []such as a cipher which is . . . secret.”); *see also id.* at 10:22-25 (“Once the place button is selected, the railway traffic control terminal 105 . . . enables safety measures so that the block cannot be removed without the input of the secret code generated.”); 10:34-35 (“The remove button is disabled without the input of the secret code.”);

10:40-42 (“the maintenance worker transmits the random secret code to the railway traffic control center 105 (S1305).”).

152. Furthermore, it is my opinion that the Asserted Patents inform, with reasonable certainty, those skilled in the art that “secret,” as applied to the Code Terms, means a code that is not readily available to the dispatcher, which is consistent with Railware’s proposed construction.

153. Moreover, as discussed above, it is my opinion that a POSITA would understand what “not readily available” means based on, *inter alia*, the stated goals of the Asserted Patents, the unambiguous claim language, the described embodiments, the Figures, and the repeated emphasis on secrecy and the like, when the code would be considered readily available to the dispatcher and when it would not.

154. Specifically, it is my view that a POSITA would understand a code to not be “readily available” to the dispatcher in instances, for example, where the code is not displayed on the dispatcher’s terminal, prior to the dispatcher receiving the code back from the railway field worker. As discussed above, this understanding is supported by the specifications of the Asserted Patents. *Compare* Figure 7 of the Asserted Patents (illustration of a screen shot of the railway control apparatus prior to return of the code, showing no code viewable by the dispatcher) *with* Figure 8 of the Asserted Patents (illustration of a screen shot of the railway control apparatus after return of the code, showing a code viewable by the dispatcher). This is consistent with the stated goals of the Asserted Patents, which are to give the railway field worker more control over the release of blocks and to reduce errant, mistaken or premature block removal by the dispatcher. ’782 patent at 11:12-14; ’835 patent at 11:40-42; ’115 patent at 11:37-39. Thus, a POSITA would understand with reasonable certainty whether a code qualifies as not readily

available to the dispatcher based on whether the dispatcher can see or easily access the code before it is time for removal the block.

155. Therefore, it is my opinion that the Asserted Patents inform, with reasonable certainty, those skilled in the art about whether the Code Terms are “secret.”

ii. SEPTA’s arguments regarding code generation and composition are incorrect.

156. Again, I understand that indefiniteness is not an issue that should be considered by the Court as part of the claim construction process. I also understand that SEPTA failed to timely provide its positions on indefiniteness under the Court’s Scheduling Order. However, should the Court allow SEPTA to raise indefiniteness issues as part of this process, I provide the following.

157. SEPTA also asserts “nothing in the specification presents any data structure for the . . . [Code Terms] or specific algorithm for generating it.” SEPTA’s Supplemental Preliminary Invalidity Contentions at 59. In other words, SEPTA seems to argue that the Asserted Patents fail to inform, with reasonable certainty, those skilled in the art about the contents of the Code Terms or how they are created. I disagree.

158. As discussed above, there is substantial discussion of the Code Terms throughout the Asserted Patents, including descriptions of the Code Terms, how they are created, and their contents. I incorporate my discussion of the Code Terms above.

159. The Asserted Patents describe the Code Terms and how they are created.

160. As a specific example, the ’782 patent states “[t]he code generator 101B is configured to produce removal code (such as a cipher which is random, pseudo-random, secret, etc.[)], and stored on the terminal.” ’782 patent at 5:58-60.

161. The '835 patent and '115 patents similarly state “[t]he code generator 101B is configured to produce a removal or release code, such as a cipher which is random, secret, etc., and stored on the computer.” ’835 patent at 6:3-6; ’115 patent at 6:6-9.

162. Thus, a POSITA would readily understand that the Code Terms are created by a code generator, which can produce a random or pseudo-random cipher that is secret.

163. It is my opinion that a POSITA would understand the Asserted Patents to not be limited to any particular method of generating the string of symbols, and any method of generating the string of symbols to serve as the Code Terms would be within the scope of the inventions.

164. Additionally, it is my opinion that, by using terms “such as” and “etc.,” a POSITA would understand these descriptors to be exemplary, except in the case of “secret,” which, as discussed above, is fundamental to the goals of the Asserted Patents.

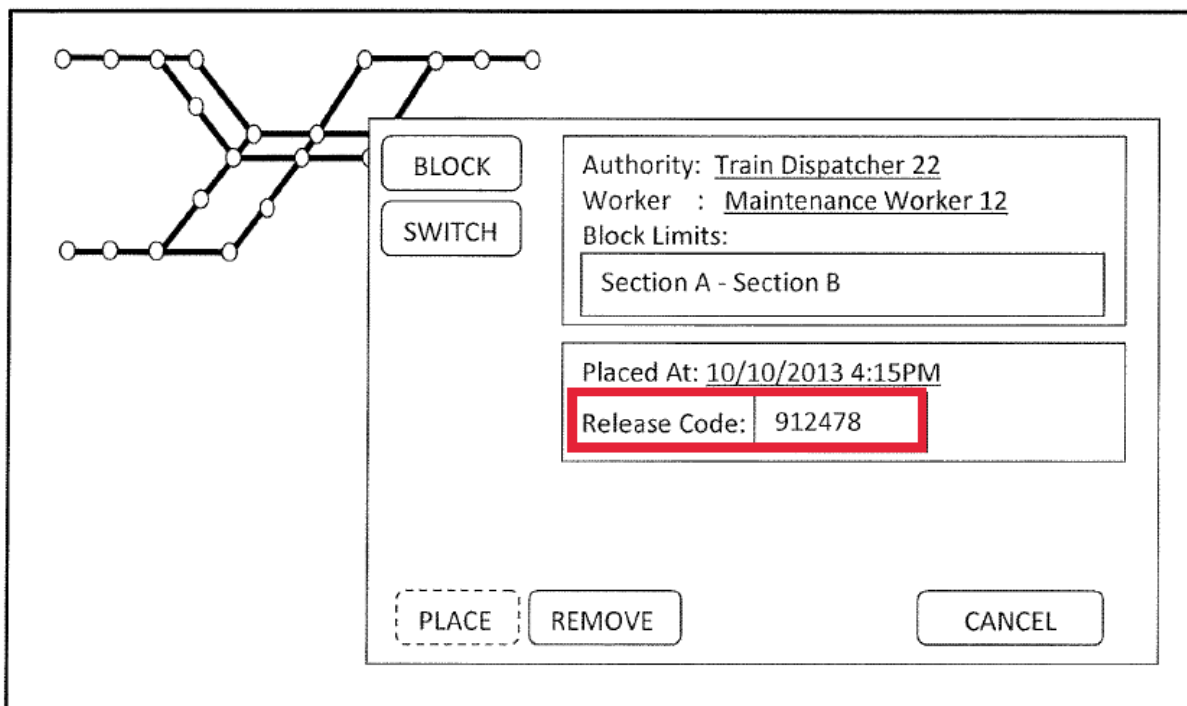
165. Therefore, it is my opinion that the Asserted Patents describe the Code Terms and how they are created.

166. The Asserted Patents also describe the contents of the Code Terms such that a POSITA would readily understand what the Code Terms are. As an initial matter, based on my knowledge and experience, a POSITA would readily understand that, as used in the Asserted Patents, a “code” means “a system of signals or symbols for communication.” Merriam-Webster’s Collegiate Dictionary, 11th Ed. (2012) at 239 ; *see also* Collins English Dictionary, 9th Ed. (2007) at 328 (“a system of letters or symbols, and rules for their association by means of which information can be represented or communicated for reasons of secrecy, brevity, etc.”); Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 276 (“a series of letters or numbers assigned to something to classify or identify it.”) A POSITA would understand that

symbols can be letters, numbers, or other characters. A POSITA would, therefore, understand the contents of the Code Terms to be symbols, such as letters, numbers, or other characters.

167. In support of this opinion, Figures 8, 9, and 10 each show examples of specific codes. I provide annotated versions of these figures below with examples of specific codes highlighted with red boxes.

FIGURE 8

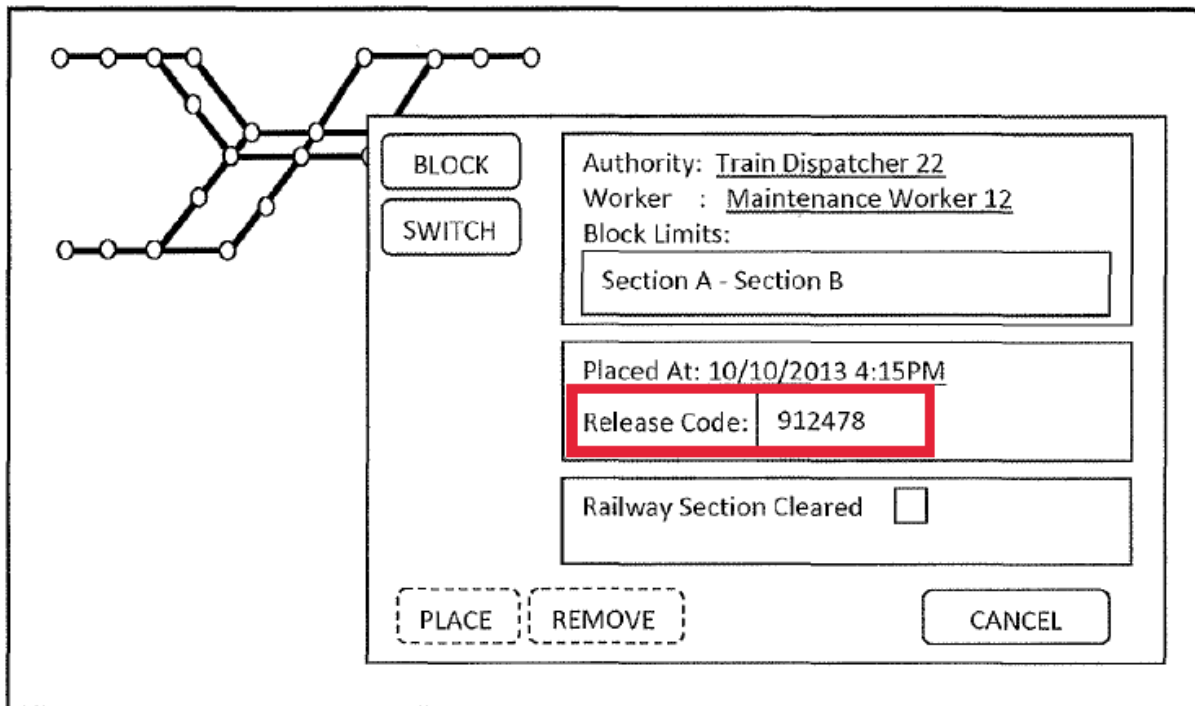


The screenshot shows a software interface for managing train blocks. On the left is a track diagram with a crossing. A pop-up window is open with the following fields:

- BLOCK** (button)
- SWITCH** (button)
- Authority:** Train Dispatcher 22
- Worker :** Maintenance Worker 12
- Block Limits:** Section A - Section B
- Placed At:** 10/10/2013 4:15PM
- Release Code:** 912478 (highlighted with a red box)

At the bottom of the window are three buttons: **PLACE** (dashed border), **REMOVE**, and **CANCEL**.

FIGURE 9



BLOCK

SWITCH

Authority: Train Dispatcher 22

Worker : Maintenance Worker 12

Block Limits:

Section A - Section B

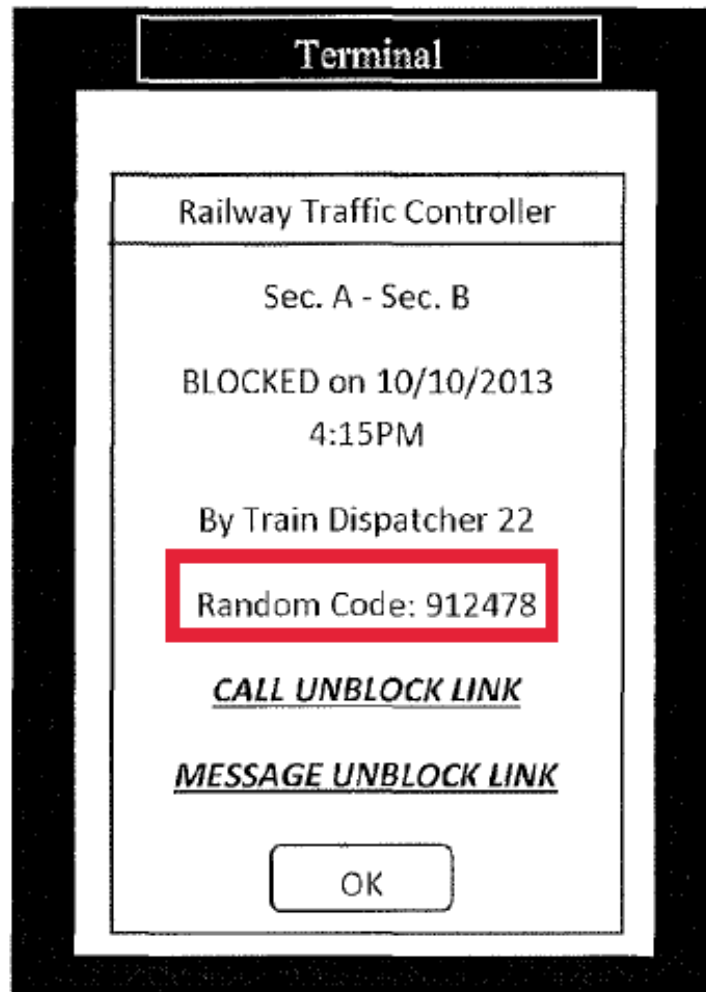
Placed At: 10/10/2013 4:15PM

Release Code: 912478

Railway Section Cleared ☐

PLACE REMOVE CANCEL

FIGURE 10



168. Therefore, it is my opinion that the Asserted Patents inform, with reasonable certainty, those skilled in the art about the contents of the Code Terms and how they are created.

iii. SEPTA’s arguments regarding “second secret code” are incorrect.

169. Again, I understand that indefiniteness is not an issue that should be considered by the Court as part of the claim construction process. I also understand that SEPTA failed to timely provide its positions on indefiniteness under the Court’s Scheduling Order. However,

should the Court allow SEPTA to raise indefiniteness issues as part of this process, I provide the following.

170. Although not proposed for construction by either Party, SEPTA seems to assert, with respect to the '115 patent, that the term “second secret code” is unclear as to how the “second secret code” remains unknown to the dispatcher “throughout the temporal scope of these claims.” SEPTA’s Supplemental Preliminary Invalidity Contentions at 65. In other words, SEPTA seems to argue that the Asserted Patents fail to inform, with reasonable certainty, those skilled in the art as to how “second secret code” remains unknown to the dispatcher. I disagree.

171. To begin, SEPTA’s emphasis on whether or not the “second secret code” is “secret” is misplaced, and itself indicates a fundamental misunderstanding by SEPTA of the specification and claims of the '115 patent. A POSITA would not share in SEPTA’s misunderstanding.

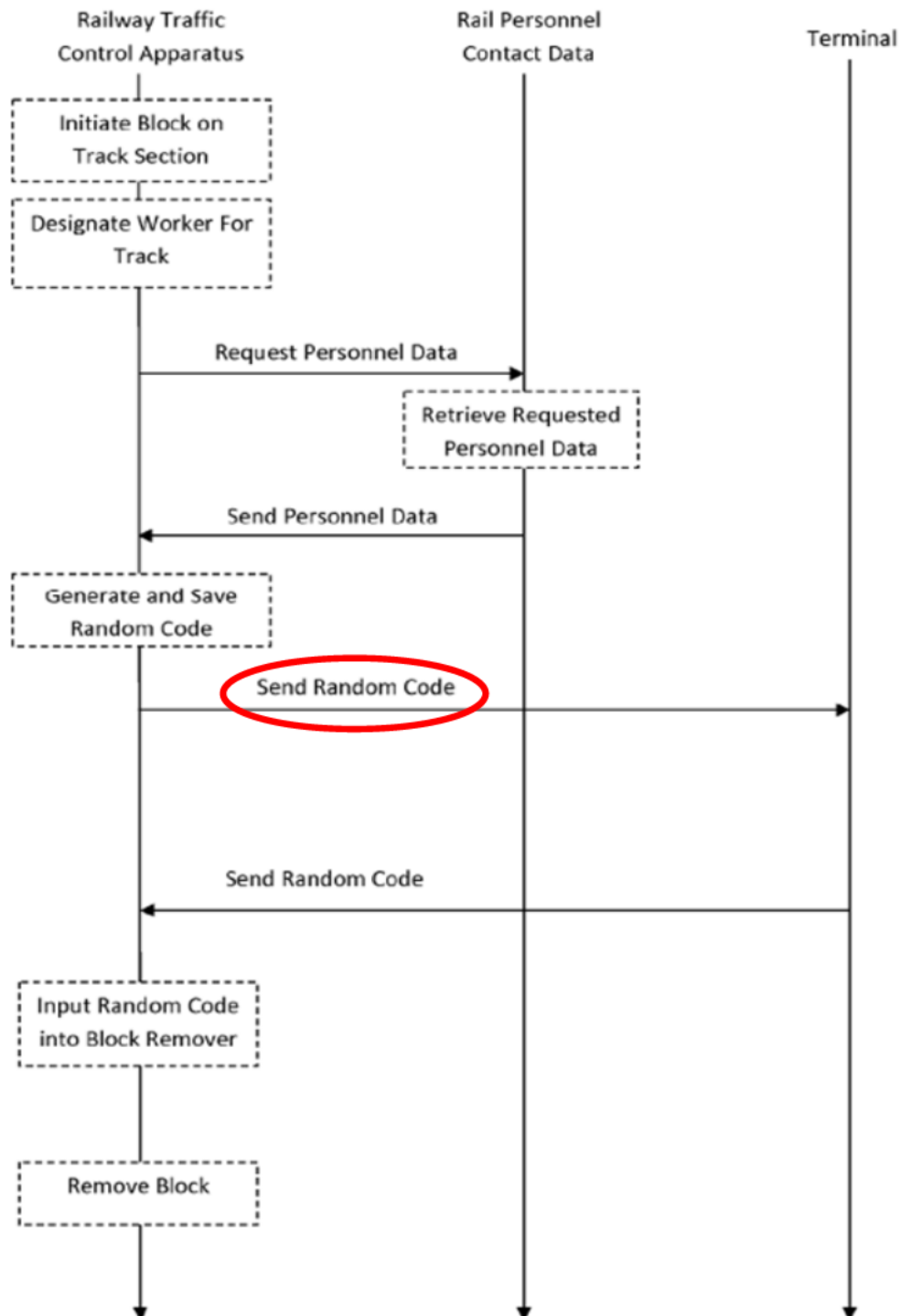
172. Rather, it would be clear to a POSITA that “second secret code” refers to the string of characters relayed from the railway field worker back to the dispatcher or the railway control apparatus (via message, voice, embedded link, or otherwise). A POSITA would further understand that the use of the word “secret” in “second secret code” does not indicate endless secrecy of the “second secret code,” itself, but rather signifies the “second secret code’s” relationship to the “secret code” described earlier in the claims. This is due to the fact that the railway control apparatus is configured such that, prior to releasing a block, it will compare the “second secret code” (*i.e.*, the string of characters relayed from the railway field worker back to the dispatcher or the railway control apparatus) with the “secret code” that the railway control apparatus generated, transmitted to the remote user terminal of the railway field worker, and saved in its internal memory or the like.

173. This understanding finds grounding in the specification of the '115 patent.

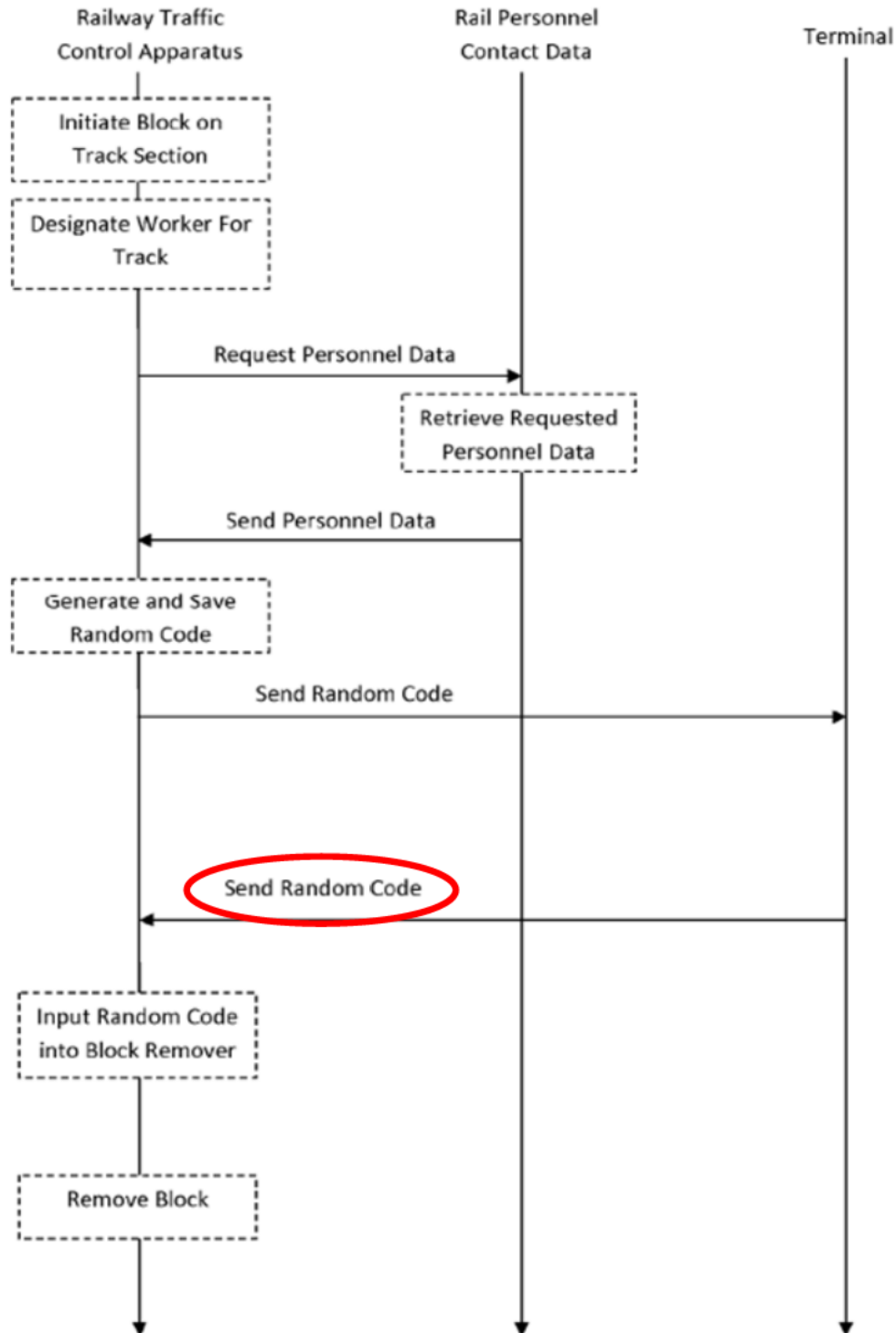
174. For example, and as discussed in detail above, the claims and specification of the '115 patent are clear that a “secret code” will be generated by the railway control apparatus and transmitted to the remote user terminal of the railway field worker. *See, e.g.*, '115 patent at Fig. 4; *id.* at Fig. 12, step S1213; *id.* at 10:25-29.

175. The claims and specification of the '115 patent are also clear that, once the secret code is received by the remote user terminal of the railway field worker, the railway field worker must return that secret code to the dispatcher or the railway control apparatus in order for the block to be removed. *See, e.g.*, '115 patent at 10:39-42; claims 20-23, 31-34.

176. For example, claim 20 states clearly that the railway control apparatus is configured to “transmit the secret code to a remote user terminal.” *Id.* at claim 20. This is also clearly illustrated in Fig. 4 of the '115 patent:

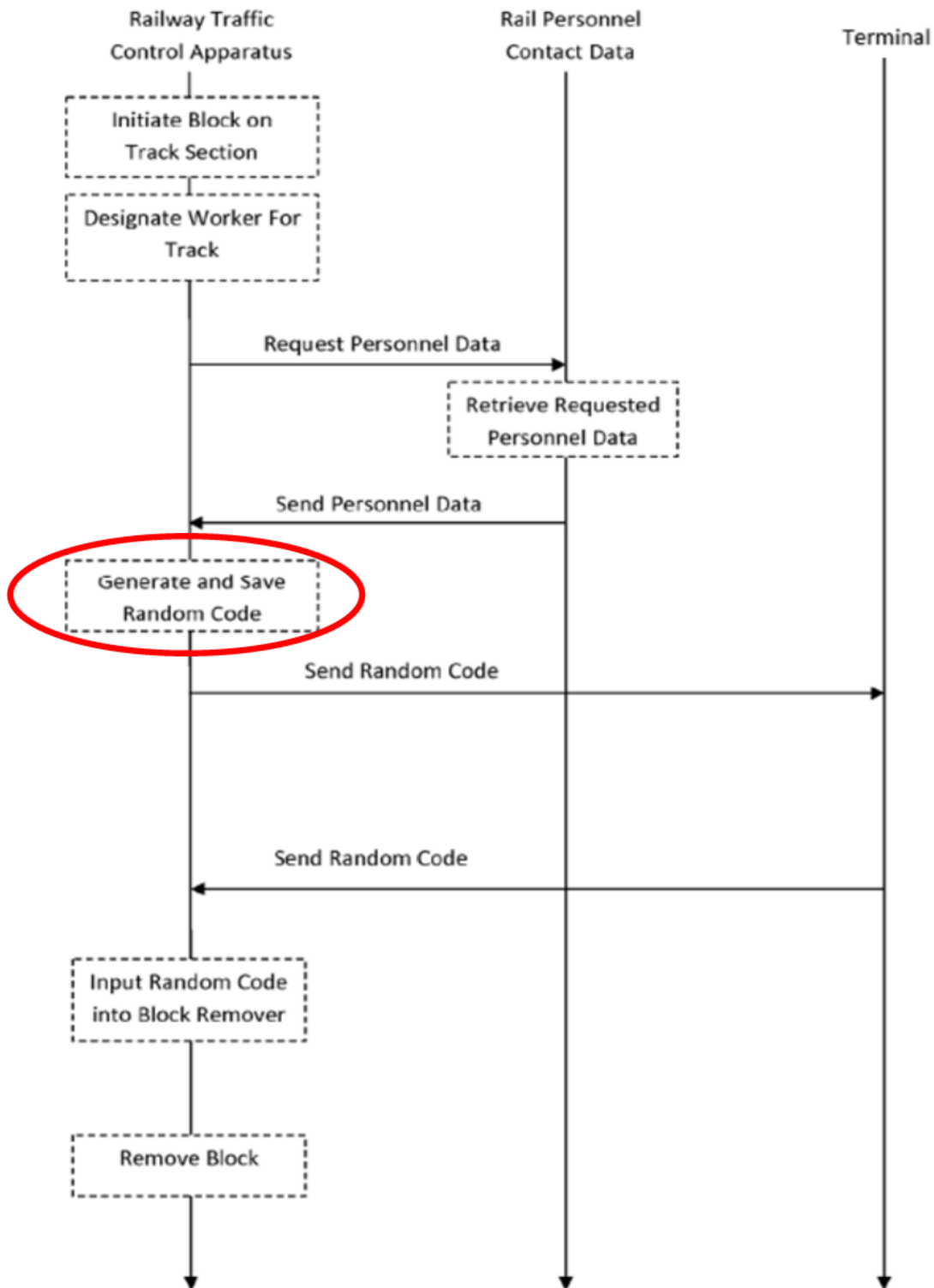
FIGURE 4

177. Further, claim 22 – which incorporates the elements of claim 20 (and 21) – is clear that the railway control apparatus is configured to “receive a second secret code.” *Id.* at claim 22. The received “second secret code” is clearly the return transmission of the code back from the railway field worker as illustrated in Fig. 4.

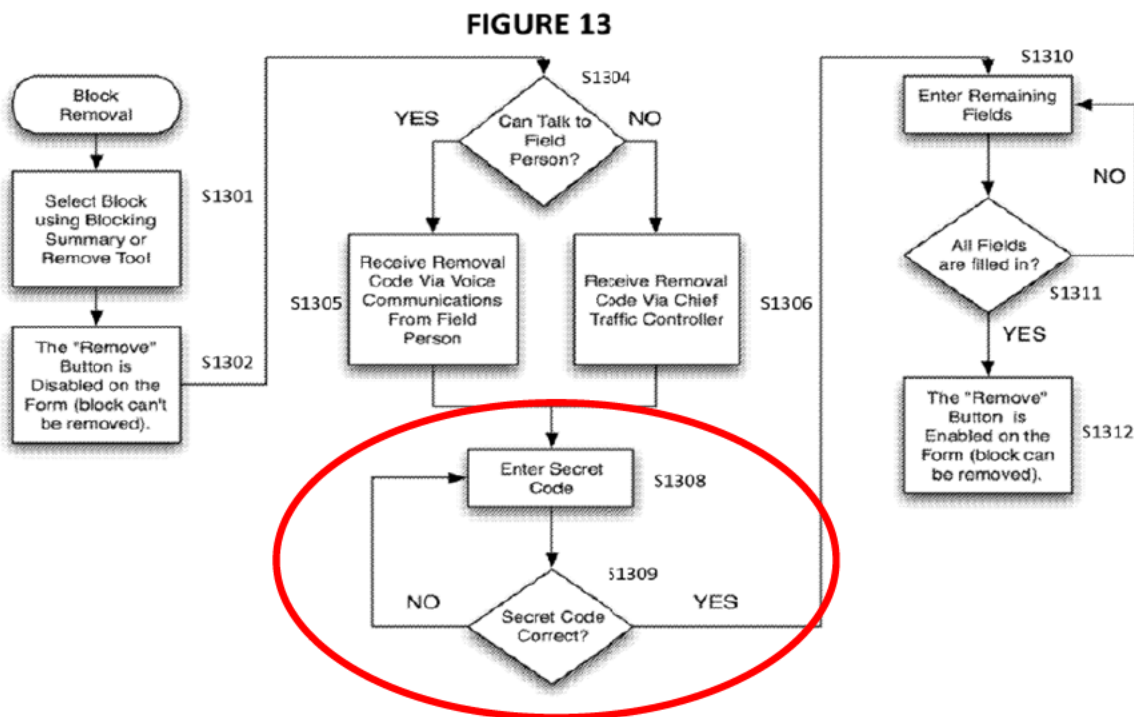
FIGURE 4

178. The claims and specification of the '115 patent are also clear that, prior to the block being removed, the system must compare the “second secret code” relayed from the railway field worker back to the railway control apparatus with the “secret code” stored in the systems memory or the like in order to determine that this string of characters matches the “secret code,” and is therefore the correct code for releasing the block. *See, e.g.*, '115 patent at 10:47-61 (“Once the secret code is received. . .”); claims 20-23, 31-34.

179. For example, Figure 4 illustrates that, in one embodiment of the inventions, the original (and correct) “secret code” is saved in the system. The below illustrates:

FIGURE 4

180. Further, Figure 13 demonstrates that, in one embodiment of the inventions, “secret code” must be determined to be the correct code prior to the block being released. The below illustrates:



181. Accordingly, SEPTA’s alleged indefiniteness position misses the point in a way that a POSITA would not. It is, therefore, my opinion that the Asserted Patents provide the requisite reasonable certainty as to the meaning of “second secret code.”

182. Thus, it is my opinion that the Asserted Patents provide reasonable certainty regarding the scope of the claimed inventions as to the Code Terms, as well as “second secret code.”

**2. “railway control apparatus” and “railway traffic control apparatus”
[’782 patent claim 5; ’835 patent claims 1, 10, 19, 20, 30, 40; ’115
patent claims 20, 30; proposed by SEPTA]**

183. It is my understanding that SEPTA has asked the Court to construe the terms:

(i) “railway control apparatus,” which is used in the ’782 patent, ’835 patent, and ’115 patent, and (ii) “railway traffic control apparatus,” which is used in the ’835 patent. SEPTA has offered the same construction for each term. Railware proposes that the terms do not need construction, or should be afforded their plain and ordinary meaning. The below chart illustrates this, as well as the Parties’ respective positions on the construction of these terms.

<u>Railware’s Proposed Construction</u>	<u>SEPTA’s Proposed Construction</u>
No construction necessary or plain and ordinary meaning.	centralized traffic control (CTC) console used by the train dispatcher

184. It is my opinion that the claim terms “railway control apparatus” and “railway traffic control apparatus” do not require construction.

185. It is my opinion that a POSITA would readily understand the claim terms “railway control apparatus” and “railway traffic control apparatus” without further construction.

186. As an initial matter, the claim terms themselves are self-descriptive. A POSITA would readily understand that a “railway control apparatus” is an apparatus or collection of hardware and software components that controls a railway. Similarly, “a railway traffic control apparatus” is an apparatus or collection of hardware and software components that controls railway traffic. These are commonly understood words being used according to their commonly understood meaning.

187. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. **The Claim Language of the Asserted Patents Supports Railware’s Proposal that No Construction Is Necessary.**

188. Each of the claims in which “railway control apparatus” and “railway traffic control apparatus” are used provides clarifying context as to the meaning of these terms.

189. For example, claim 5 of the ’782 patent states that the railway control apparatus can “place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections.” ’782 patent at claim 5.

190. Additionally, claim 5 of the ’782 patent states that the railway control apparatus “generat[es] a release code” and “transmit[s] the release code.” ’782 patent at claim 5.

191. Additionally, claim 5 of the ’782 patent states that the railway control apparatus “permit[s] the block to said one or more track sections to be removed . . . only upon receiving the release code from the user terminal in return.” ’782 patent at claim 5

192. A POSITA would understand from these claims that the railway control apparatus is an apparatus or collection of hardware and software components that controls a railway (*e.g.*, through placing and removing blocks).

193. The claims of the ’835 patent contain similar support. *See, e.g.*, ’835 patent at claim 1 (“the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;” “a block removal part to remove . . . by said centralized control

operation from the railway control apparatus, the block placed by the block placing part on said one or more track sections.”).

194. The claims of the ’835 patent further support my opinion that a POSITA would appreciate that what comprises an “apparatus” is broadly understood and encompasses a number of hardware (such as processor and memory components) and software components beyond just the dispatcher’s console.

195. For example, claim 1 of the ’835 patent states that the “railway traffic control apparatus” is “configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, for controlling access to railway tracks.” A POSITA would readily understand that in order to be configured to control traffic of a centrally controllable railway network, the “railway traffic control apparatus” would have to include a variety of hardware and software components beyond just the dispatcher’s console.

196. Further, claim 40 of the ’835 patent recites a “processor,” a “memory device,” and “wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to” perform certain functions. ’835 patent at claim 40.

197. Further, in claim 22 of the ’835 patent, the railway traffic control apparatus specifically causes a block to be placed “by causing one or more of the plurality of railway traffic interlocks to display a STOP signal.” ’835 patent at claim 22. This further demonstrates that a POSITA would understand the railway traffic control apparatus to encompass more than just the dispatcher’s console because the railway traffic control apparatus must interact with and control various components in the railway network including interlocks that are dispersed throughout the railway network, far from the dispatcher’s console.

198. The claims of the '115 patent contain similar support. *See, e.g.*, '115 patent at claim 20 (railway control apparatus comprises “a processor for controlling a plurality of track sections in the railway network, wherein each track section is associated with a corresponding interlock and is disposed in any of said plural railways of said railway network that is managed by centralized control operation from the railway control apparatus, the processor controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway interlocks dispersed in said plural railways of said railway network, to block railway traffic to one or more specified track sections.”).

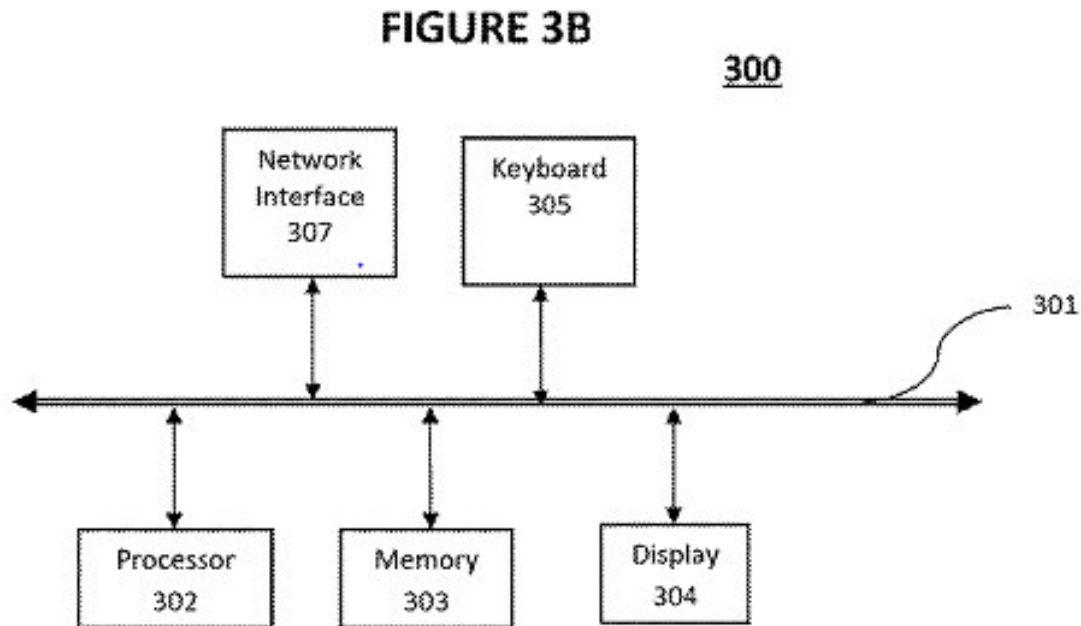
199. The claims of the '115 patent further support my opinion that a POSITA would appreciate that what comprises an “apparatus” is broadly understood and encompasses a number of hardware (such as processor and memory components) and software components beyond just the dispatcher’s console. For example, claim 20 of the '835 patent recites a “processor for controlling a plurality of track sections in the railway network,” “a memory device storing computer-executable instructions, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to” perform certain functions. '115 patent at claim 20.

200. As such, it is my opinion that a POSITA would understand from these examples that what comprises an “apparatus” is broadly understood and encompasses a number of hardware (such as processor and memory components) and software components beyond just the dispatcher’s console.

b. **The Specifications of the Asserted Patents Support Railware's Proposal that No Construction Is Necessary.**

201. It is my opinion that a POSITA would appreciate that what comprises an “apparatus” is broadly understood and encompasses a number of hardware (such as processor and memory components) and software components, which the specification of the Asserted Patents supports. *See, e.g.*, ’782 patent at 6:42-54; 5:32-39; ’835 patent at 6:57-7:2; 5:42-51; ’115 patent at 6:60-7:5; 5:45-54.

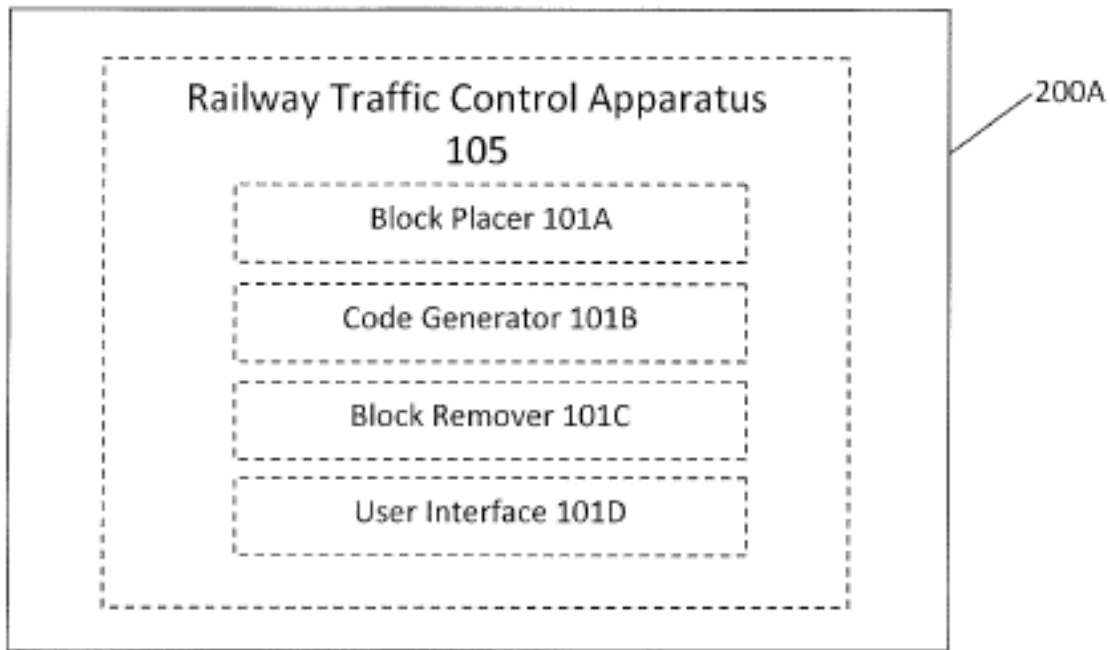
202. For example, Fig. 3B of the Asserted Patents illustrate embodiments whereby the “railway control apparatus” and “railway traffic control apparatus” are comprised of processor, memory, display, keyboard, and network interface components.



203. Likewise, Figure 2 of each of the Asserted Patents illustrate an embodiment whereby the “railway control apparatus” and “railway traffic control apparatus” are comprised of block placer, code generator, block remover, and user interface components.

(Amended)

FIGURE 2



204. The discussion in the specifications are also consistent with the usage of related terms at the time of the Asserted Patents. For example, a commonly used railroad dictionary at the time defines “centralized traffic control” to mean “a system of rail operation by means of which the movement of trains over routes and through blocks on a designated section of track or tracks is directed by signals controlled from a designated central point.” Railway Age’s Comprehensive Railroad Dictionary, 2nd Ed. (2002) at 55.

205. This is further supported through how contemporaneous dictionaries have defined the term “apparatus,” such as (i) “a set of materials or equipment designed for a particular use,” Merriam-Webster’s Collegiate Dictionary, 11th Ed. (2012) at 59; (ii) “a collection of

instruments, machines, tools, parts, or other equipment used for a particular purpose,” Collins English Dictionary, 9th Ed. (2007) at 76; (iii) “the technical equipment or machinery needed for a particular activity or purpose,” Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 62. Here, the claim terms themselves make clear that the “particular purpose” that the apparatus is being used for is railway control or railway traffic control.

c. SEPTA’s Proposed Construction of “railway control apparatus” and “railway traffic control apparatus” as a “centralized traffic control (CTC) console used by the train dispatcher” Is Inconsistent with the Claims and the Specifications and Improperly Reads Limitations into the Claims Beyond how a POSITA Would Understand the Claim Terms.

206. I understand that SEPTA has proposed that terms “railway control apparatus” and “railway traffic control apparatus” to both be construed to mean “centralized traffic control (CTC) console used by the train dispatcher.” As discussed above, I disagree that a POSITA would understand these terms to have the meaning that SEPTA proposes for a variety of reasons. Specifically, SEPTA’s proposed construction is inconsistent with the claims and the specifications and improperly reads limitations into the claims beyond how a POSITA would understand the claim terms.

207. Based on my knowledge and experience and review of the documents provided to me, including SEPTA’s contentions regarding non-infringement, it appears to me that SEPTA’s construction is formed primarily to advance arguments it makes in support of the various non-infringement positions, rather than grounding its proposed construction in the perspective of a POSITA or any intrinsic or extrinsic evidence.

208. It is my view that SEPTA’s focus on limiting the terms “railway control apparatus” and “railway traffic control apparatus” to both be construed to mean “centralized

traffic control (CTC) console used by the train dispatcher” is an attempt by SEPTA to buttress its non-infringement positions by creating an improper and unsupported limitation in the Asserted Patents (that does not exist), which would require, *inter alia*, the operations performed by the “railway control apparatus” or “railway traffic control apparatus” to be performed exclusively within a singular “console” to the exclusion of any sort of distributed or networked computing environment for railway traffic control that a POSITA would understand was common in CTC systems at the time the Asserted Patents were filed (and is still common today). But the Asserted Patents do not support SEPTA’s construction, and SEPTA’s proposed construction is problematic for a host of reasons.

209. First, SEPTA’s proposal introduces considerable ambiguity by invoking a new term, “console,” which is not part of the claims. The term “console” is used only two (2) times in each of the Asserted Patents. It is done so identically across all of the Asserted Patents, and refers to a “control console” that “may include a map of the entire rail system controlled by the CTC,” and through which “the dispatcher has control of each interlock signal.” ’782 patent at 1:52-56; ’835 patent at 1:59-62; ’115 patent at 1:66-2:2. Accordingly, a POSITA would understand the “console” referred to in the background section of the Asserted Patents to refer to the interface through which a dispatcher interacts with the rest of the railway control apparatus. Stated differently, a POSITA would not understand the “console” to necessarily be synonymous with the “railway control apparatus”/“railway traffic control apparatus” itself (as SEPTA proposes), but rather one of the many components that make-up the apparatus for controlling the railway, which includes various backend systems, such as servers, memories, network connections, railway traffic signals, interlockings, and the like.

210. Second, as discussed in my analysis above at paragraphs 188 to 205, the terms “railway control apparatus” and “railway traffic control apparatus” refer to more than simply the console used by the dispatcher, as SEPTA proposes. A POSITA would understand the “railway control apparatus” and “railway traffic control apparatus” to refer more broadly to the complete collection of hardware and software components used to control the railway, beyond just the dispatcher’s console. A POSITA would understand that the “console” referenced in SEPTA’s proposed construction and in the background sections of the Asserted Patents can be part of the “railway control apparatus” and “railway traffic control apparatus,” but the console is not coextensive with or the same as the “railway control apparatus” or “railway traffic control apparatus.”

211. Further, as noted in my analysis above, claim 1 of the ’835 patent states that the “railway traffic control apparatus” is “configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, for controlling access to railway tracks.” A POSITA would readily understand that in order to be configured to control traffic of a centrally controllable railway network, the “railway traffic control apparatus” would have to include a variety of hardware and software components beyond just the dispatcher’s console.

212. The specification further supports my opinion that SEPTA’s proposed construction is incorrect, inconsistent with the specifications of the Asserted Patents, and should be rejected.

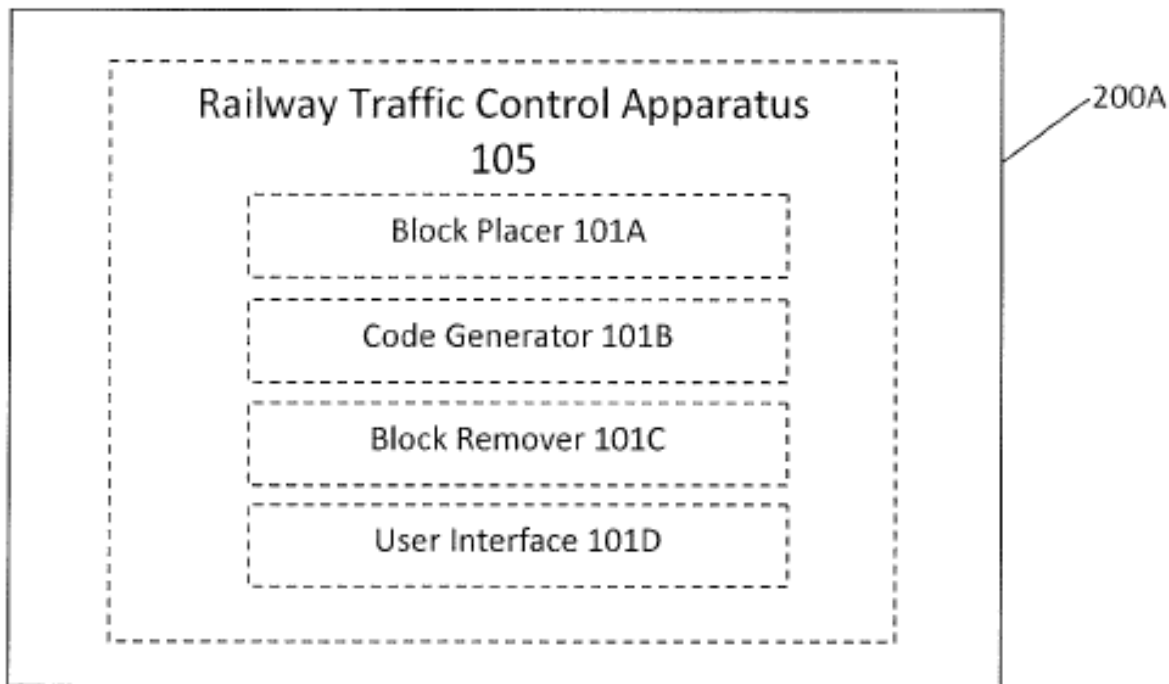
213. For example, Figures 1A and 2A show the “railway traffic control apparatus 105” containing the specific traffic control parts discussed above in paragraphs 188 to 200 with

respect to the claims. *See, e.g.*, Figs. 1A and 1B (showing the “Block Pacer 101A,” “Code Generator 101B,” and “Block Remover 101C” as part of the railway traffic control apparatus).

214. Figure 2, shown below, shows an exemplar embodiment where the “user interface 101D” as further included as part of the “railway traffic control apparatus 105.” Fig. 2.

(Amended)

FIGURE 2



215. Consistent with my understanding, the “User Interface 101D” (*e.g.*, the interface of the “terminal” including the display, keyboard, mouse, graphical user interface and the like with which the dispatcher interacts with the railway control apparatus) is shown as only one part of the railway traffic control apparatus. The terminal and the railway traffic control apparatus are not necessarily coextensive or one in the same thing. Rather, the terminal can be simply one of the several components (hardware and software) that make-up the apparatus that controls the railway. A POSITA would understand this distinction.

216. Further to that point, a POSITA would understand from the teachings in the specifications that variations can be introduced without departing from the scope of the inventions, and would inform a POSITA that other technical environments are within the scope of the inventions, including environments where the dispatcher's terminal or console is not synonymous with the railway control apparatus or railway traffic control apparatus. This is further contrary to SEPTA's proposed construction, which effectively collapses the terms "railway control apparatus," "railway traffic control apparatus," "terminal," and "console" into one.

217. Additionally, the specification of the '782 patent states that "[t]he drawings show examples of implementations of the subject matter of this patent disclosure in several computing environments. However, it should be understood that the subject matter of this disclosure can be utilized by any computing device including but not limited to PDAs (personal digital assistants), cell phones, personal, notebook and workstation computers, kiosks, other information terminals, WIC (or another) pager, etc. In addition, the subject matter of this disclosure might be provided as services in a modular fashion by other devices connected by a communication network." '782 patent at 4:44-53.

218. The specification of the '835 and '115 contain similar statements. *See* '835 patent at 4:54-64; '115 patent at 4:57-67.

219. The specifications of the Asserted Patents further state "[t]he aforementioned specific embodiments are illustrative, and many variations can be introduced on these embodiments without departing from the spirit of the disclosure or from the scope of the appended claims. For example, elements and/or features of different examples and illustrative embodiments may be combined with each other and/or substituted for each other within the

scope of this disclosure and appended claims.” ’782 patent at 10:37-44; ’835 patent at 10:65-11:5; ’115 patent at 10:62-11:2.

220. It is therefore my opinion that a POSITA would understand the claims and specifications to support Railware’s proposed construction and not SEPTA’s overly narrow proposed construction.

221. SEPTA’s own documents support Railware’s construction and not SEPTA’s. For example, according to SEPTA’s document entitled [REDACTED]

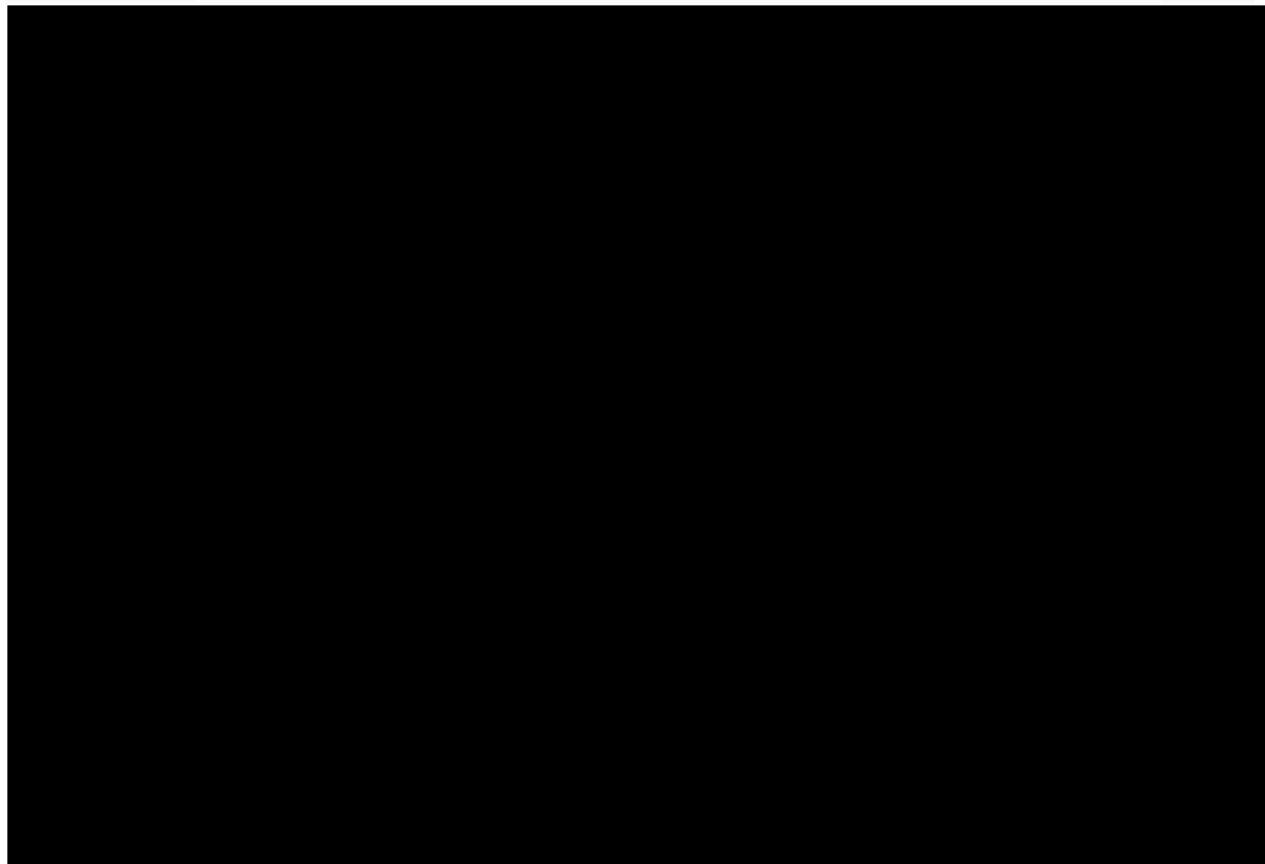
[REDACTED], [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] SEPTA_0004897. The image below, from that same document, shows the extent of SEPTA’s system that, like the claimed “railway control apparatus”/“railway traffic control apparatus,” is “configured for centralized control of traffic of a centrally controllable railway network”:



222. This figure illustrates that the CTC system (*e.g.*, a “railway control apparatus”/“railway traffic control apparatus”) is much more than just the dispatcher’s “console” (labeled above as “”).

223. This further supports my opinion that a POSITA would not understand the terms “railway control apparatus”/“railway traffic control apparatus” would mean only the “centralized traffic control (CTC) console used by the train dispatcher.” Rather, a POSITA would readily understand that the terms “railway control apparatus”/“railway traffic control apparatus” to be an apparatus or collection of hardware and software components that controls a railway. These terms do not require any further construction and are self-descriptive.

224. Thus, it is my opinion that claim terms “railway control apparatus” and “railway traffic control apparatus” require no construction. It is further my opinion that SEPTA’s

proposed construction is inconsistent with the claims and specifications of the Asserted Patents and should be rejected.

B. Claim Construction Issues Common to the '835 Patent and the '115 Patent

225. I now address the claim terms and issues that are common across the '835 patent and the '115 patent.

1. **“user terminal” [’835 patent, claims 1, 20, 30, 40; proposed by SEPTA and Railware; ’835 patents, claims 23, 33, 41; proposed by Railware] and “remote user terminal” [’115 patent, claims 20, 30, 31; proposed by SEPTA and Railware; ’115 patent, claims 24-27, 29, 35, 36; proposed by Railware]**

226. It is my understanding that both Parties have asked the Court to construe the terms (i) “user terminal,” as this term is used in the '835 patent, as well as (ii) “remote user terminal,” as this term is used in the '115 patent. Railware proposes that both terms be construed as “user terminal of a railway field worker.” SEPTA proposes that both terms be construed as “railway field worker’s mobile user device.” The below chart illustrates this, as well as the Parties’ respective positions on the construction of these terms.

<u>Railware’s Proposed Construction</u>	<u>SEPTA’s Proposed Construction</u>
user terminal of a railway field worker	railway field worker’s mobile user device

227. I have reviewed SEPTA’s Identification of Proposed Constructions of Claim Terms. It is my opinion that the terms “user terminal” and “remote user terminal” should be construed as “user terminal of a railway field worker” in line with Railware’s proposed construction.

228. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. **The Claim Language of the '835 Patent and the '115 Patent Support Railware's Proposal that the "user terminal" and "remote user terminal" Are Those of the Railway Field Worker.**

229. To begin, it is my understanding that the Parties are in agreement that both the "user terminal" and the "remote user terminal" refer to the user terminal of the railway field worker.

230. To that end, claim 20 of the '835 patent is clear that the "user terminal" in question is the terminal that the railway traffic control apparatus "transmit[s] the secret release code to." '835 patent at claim 20. This usage is consistent across claims 1, 20, 23, 30, 33, 40 and 41 of the '835 patent as well. A POSITA would understand, from this claim language alone, that the "user terminal" in these claims is to be understood as the terminal where the railway field worker receives the release or removal code generated by the railway control apparatus.

231. Likewise, claim 20 of the '115 is also clear that the "remote user terminal" in question is the terminal that the railway traffic control apparatus "transmit[s] the secret release code to." '115 patent at claim 20. This usage is also consistent across all claims of the '115 patent. A POSITA would understand, from this claim language alone, that the "remote user terminal" in these claims is to be understood as the terminal where the railway field worker receives the release or removal code generated by the railway control apparatus.

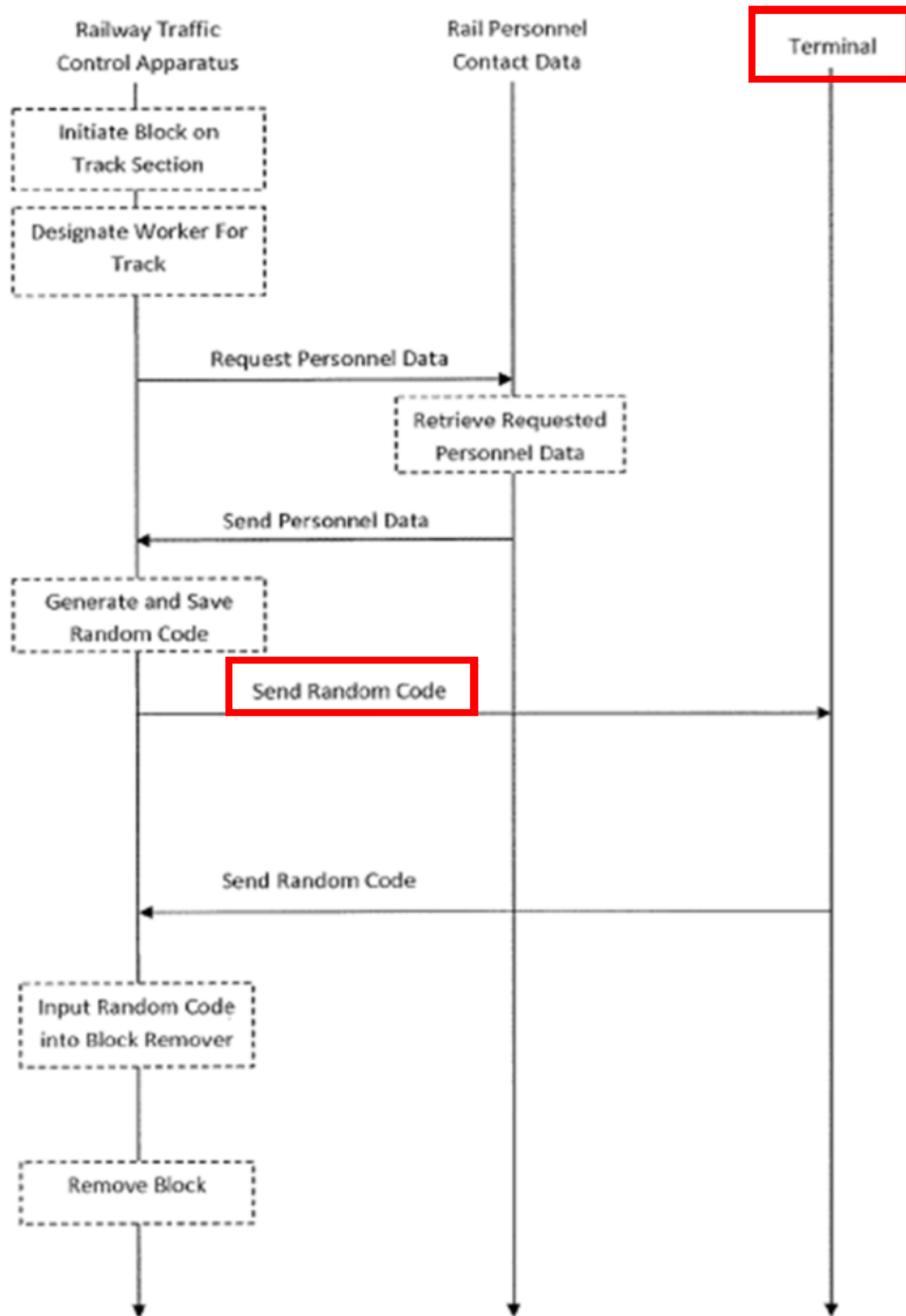
232. The '115 patent further specifies that the user terminal is "remote." *See, e.g.*, '115 patent at claim 20. A POSITA would understand that the term "remote" means that the terminal may be at some distance from the railway control apparatus, which can mean the user terminal of the railway field worker in the context of the inventions claimed. As one example, a POSITA would understand that claim 20 is directed to a "railway control apparatus for centralized control

of traffic of a centrally controllable railway network” and that the “remote user terminal” is “remote” with respect to the “centralized” “railway control apparatus.” Because the “railway control apparatus” is the system through which the dispatcher controls the railway network, a POSITA would readily understand that the “remote user terminal” refers to the user terminal of a railway field worker in the context of the claimed inventions of the ’115 patent.

b. The Specifications of the ’835 Patent and the ’115 Patent Support Railware’s proposal that the “user terminal” and “remote user terminal” Are Those of the Railway Field Worker.

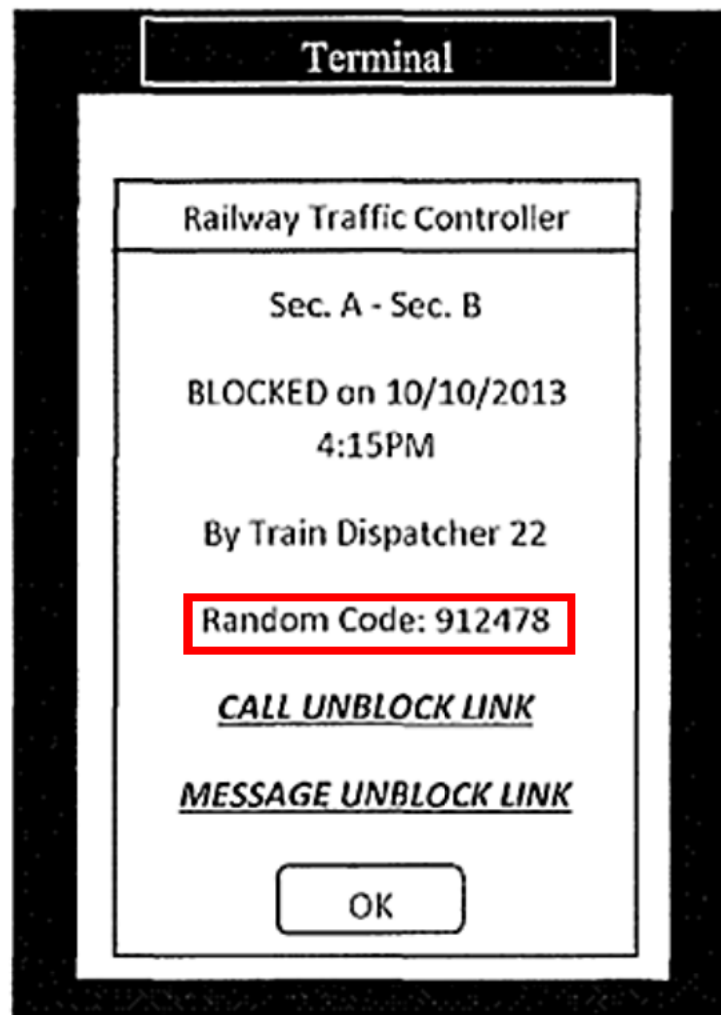
233. The specification and figures in the ’835 patent and the ’115 patent provide further support that the “user terminal” and “remote user terminal” refer to the user terminal of a railway field worker.

234. For example, Figure 4 of both patents (annotated below) depicts an embodiment whereby the terminal of the railway field worker (indicated by the right-hand vertical line labeled “Terminal”) receives the code from the railway control apparatus. Below illustrates:

FIGURE 4

235. As a further example, Figure 10 of both patents depicts an embodiment whereby the terminal of the railway field worker displays the release or removal code to the field worker. Below illustrates.

FIGURE 10



236. Accordingly, it is my opinion that the specifications of both patents make clear that the claimed “user terminal” in the ’835 patent and the “remote user terminal” in the ’115 patent is the user terminal of a railway field worker, as the Parties agree.

c. **SEPTA’s Proposed Construction of “user terminal” and “remote user terminal” as “mobile user device of the railway field worker” in the ’835 and ’115 Patents is Inconsistent with the Claims and the Specifications and Improperly Reads Limitations into the Claims Beyond how a POSITA Would Understand the Claim Terms.**

237. In view of the above analysis, I understand that the sole dispute between the Parties is whether the terms “user terminal” and “remote user terminal” should be replaced in the construction to mean “mobile user device.” It is my opinion that a POSITA would not understand the terms to necessarily be limited to a “mobile user device” and that such a construction injects unnecessary surplusage and uncertainty into the meaning of the claims. Specifically, SEPTA’s proposed construction is inconsistent with the claims and the specifications and improperly reads limitations into the claims beyond how a POSITA would understand the claim terms.

238. The term “mobile user device” is not a term that is used in the claims of either the ’835 patent or the ’115 patent. Rather, that term is used exclusively in the claims of the ’782 patent. Therefore, introduction of a new term for the ’835 patent and the ’115 patent is confusing.

239. Moreover, the ’835 patent describes the user terminal of the railway field worker in broad terms. Specifically, the specification of the ’835 patent states that “the terminal 103 could be *any communication device* such as but *not limited to*, mobile phone or smartphone, tablet, pager, PDA, *etc.*” ’835 patent at 9:23-25 (emphasis added). The specification of the ’115 patent indicates the same. ’115 patent at 9:25-27. From these disclosures, a POSITA would understand that the railway field worker’s user terminal is broadly understood to be any

communication device and not necessarily just a “mobile user device” (however SEPTA seems to interpret the phrase “mobile user device”).

240. The specification of the ’835 patent also broadly identifies the components of the user terminal, stating “terminal device 200 includes a controller (or processor) 202 that communicates with a number of other components, including storage 203, display 204, input/output (such as mouse, touchpad, stylus, microphone and/or speaker with voice/speech interface and/or recognition software, etc.) 205 and a network interface 206, by way of an internal bus 201.” ’835 patent at 6:33-39. The specification of the ’115 patent indicates the same. ’115 patent at 6:36-42. Again, a POSITA would understand this recitation of components to apply broadly to any device that contains such components.

241. My opinion is further supported through how contemporaneous dictionaries have defined terms such as “terminal,” which include definitions such as (i) “combination of a keyboard and output device (as a video display unit) by which data can be entered into or output from a computer or electronic communications system,” Merriam-Webster’s Collegiate Dictionary, 11th Ed., 1289 (2012), (ii) “of or relating to an end, extremity, boundary, or terminus,” *id.*, (iii) “a part that forms the end,” *id.*, (iv) “computing a device having input/output links with a computer but situated at a distance from the computer,” Collins English Dictionary, 9th Ed. (2007) at 1663, (v) “[a] device at which a user enters data or commands for a computer and which displays the received output,” Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 1487, (vi) “[a] functional unit in a system or communication network at which data may enter or leave,” IBM Dictionary of Computing, 9th Ed. (1993) at 686, (vii) “[a] point in a system or communication network at which data can either enter or leave,” *id.*, (viii) “[a] device, usually equipped with a keyboard and display device, capable of sending and receiving

information. . . .” *id.* This is consistent with the ’115 patent’s description of the terminal 105 discussed above.

242. In contrast, SEPTA’s proposal that the “user terminal” and “remote user terminal” be construed as the “railway field worker’s mobile user device” is inconsistent with the claim language, the specification, and the figures contained in the ’835 patent and the ’115 patent. A POSITA would not understand the terms “user terminal” or “remote user terminal” as used therein to be limited only to a “mobile user device” of the railway field worker.

243. Unlike the ’782 patent, the claims of the ’835 patent and the ’115 patent do not use the term “mobile” or “mobile user device” once. This alone would suggest to a POSITA that “remote user terminal” is not limited to only a “mobile user device.”

244. Furthermore, the specifications of the ’835 patent and the ’115 patent are clear that the inventions described therein are intended to capture several configurations of technology, including “any computing device including but not limited to PDAs (personal digital assistants), cell phones, personal, notebook and workstation computers, kiosks, other information terminals, [WIC (or another)] pager, etc.” ’835 patent at 4:56-61; 115 patent at 4:60-64 (same). Further, the “subject matter of this disclosure might be provided as services in a *modular fashion* by other devices connected by a communication network.” ’835 patent at 4:61-64 (emphasis added); ’115 patent at 4:64-67 (same). As such, a POSITA would not understand the claim language at issue to necessarily require that the “user terminal” or “remote user terminal” be a “mobile user device,” as SEPTA contends.

245. Accordingly, it is my view that a POSITA would not understand the terms “user terminal” or “remote user terminal” to be limited only to a “mobile user device” of the railway field worker. Therefore, SEPTA’s construction should not be adopted. Rather, it is my opinion

that “user terminal” and “remote user terminal” should be construed as “user terminal of a railway field worker,” in line with Railware’s proposed construction.

C. Claim Construction Issues Specific to the ’782 Patent

246. I now address the claim terms and issues that are specific to the ’782 patent.

1. “user terminal” [’782 patent, claim 5; proposed by Railware and SEPTA]

247. It is my understanding that both Parties have asked the Court to construe the term “user terminal,” as applied to claim 5 of the ’782 patent. The below chart illustrates this, as well as the Parties’ respective positions on the construction of this term.

<u>Railware’s Proposed Construction</u>	<u>SEPTA’s Proposed Construction</u>
user terminal of a terminal user (<i>i.e.</i> , the dispatcher)	railway field worker’s mobile user device

248. I have reviewed SEPTA’s Identification of Proposed Constructions of Claim Terms. It is my opinion that the term “user terminal” should be construed as the “user terminal of a terminal user (*i.e.*, the dispatcher),” in line with Railware’s proposed construction.

249. It is my opinion that the “user terminal” referred to in claim 5 of the ’782 patent is the “terminal” where the terminal user (*i.e.*, the dispatcher) places and removes blocks on tracks.

250. I understand from counsel that the same term is generally used to refer to the same thing across patents in a single family. I also understand, however, that the same terms appearing in different claims are not presumed to have the same meaning if it is clear from the claims, specification, and prosecution history that the terms have different meanings at different portions of the claims.

251. Thus, while the term “user terminal” appears in all three of the Asserted Patents, it is my opinion that the usage of “user terminal” in claim 5 of the ’782 patent would be understood by a POSITA to have a different meaning from its usage in the ’835 patent, the ’115 patent, and claim 1 of the ’782 patent. Specifically, it is my opinion that the “user terminal” referred to in claim 5 of the ’782 patent is the “terminal” where the terminal user (*i.e.*, the dispatcher) can control the railway network by entering instructions for the railway control apparatus to place and remove blocks on tracks and **not** the user terminal of the railway field worker (which is how the term is used in the ’835 and ’115 patents, and that I discuss above at paragraphs 226 to 245 of this Declaration).

252. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. **The Specification of the ’782 Patent Supports Railware’s Proposed Construction.**

253. According to claim 5, the “user terminal” is used by the terminal user to enter instructions for the railway control apparatus to perform the operations of “plac[ing] a block on one or more specified track sections,” “generating . . . a release code,” “transmitting the release code to an electronic contact address accessible by the railway field worker,” and “permitting the block . . . to be removed.” ’782 patent at claim 5. Each of the above operations are associated with the dispatcher’s terminal, not the railway field worker’s terminal. The specification confirms this.

254. For example, Figures 1A, 1B, and 2 each show that the block placer, code generator, and block remover are part of the railway control apparatus, and that the railway control apparatus includes a “user interface 101D,” which “is configured preferably for the ease

of use for the railway traffic controller [*e.g.*, the dispatcher].” ’782 patent at Figs. 1A-2, 6:4-5. The ’782 patent further states “the adaptation may include a RTC user interface to permit a user (*e.g.*, *train dispatcher*) to specify a track section(s) to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track section(s).” ’782 patent at 3:1-5 (emphasis added).

255. The ’782 patent also states that “[t]he user interface 101D may be a mobile application, a web page or some other software component, on a terminal device. Such terminal preferably is configured to communicate through a computer or data network to obtain content and data from an external source.” ’782 patent at 6:9-13.

256. Figure 3B further states “an exemplary constitution of a computer 300 which can be configured by appropriate programming to operate as the railway traffic control apparatus 105 (FIG. 1A). The computer 300 shown in FIG. 3B includes a processor 302, and various elements connected to the processor 302 by an internal bus 301, such as a memory 303, display 304, keyboard 305 and network interface 306. The processor 302 processes incoming requests transmitted through the network interface 306. The network interface 306 enables the railway traffic control terminal to communicate with other network-connected devices such as a terminal (*e.g.*, the terminal 103 of FIG. 1A or FIG. 1B) and receive data or service requests.” ’782 patent at 6:42-54; *see also, id.* at 6:60-7:10.

257. Based on my knowledge and experience, a POSITA would understand that, as used in claim 5 of the ’782 patent and the related portions of the specification, the “user terminal” or “terminal” is the device by which the dispatcher interacts with the rest of the railway control apparatus for placing and removing blocks and controlling railway traffic.

258. Extrinsic sources also support my opinions. For example, a contemporaneous dictionary defines “terminal” as “combination of a keyboard and output device (as a video display unit) by which data can be entered into or output from a computer or electronic communications system.” Merriam-Webster’s Collegiate Dictionary, 11th Ed. (2012) at 1289. Similar definitions across similar source further confirm this understanding, including: (i) “of or relating to an end, extremity, boundary, or terminus,” *id.*, (ii) “a part that forms the end,” *id.*, (iii) “computing a device having input/output links with a computer but situated at a distance from the computer,” Collins English Dictionary, 9th Ed. (2007) at 1663, (iv) “[a] device at which a user enters data or commands for a computer and which displays the received output,” Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 1487, (v) “[a] functional unit in a system or communication network at which data may enter or leave,” IBM Dictionary of Computing, 9th Ed. (1993) at 686, (vi) “[a] point in a system or communication network at which data can either enter or leave,” *id.*, (vii) “[a] device, usually equipped with a keyboard and display device, capable of sending and receiving information. . . .” *id.* This is consistent with the ’782 patent’s description of the terminal 105 discussed above and as used in claim 5. ’782 patent at 6:42-54.

b. The Claim Language of the ’782 Patent Supports Railware’s Proposed Construction.

259. The claim language also supports Railware’s proposed construction. Indeed, a POSITA would understand that “user terminal” referred to in claim 5 of the ’782 patent refers back to the “terminal” that is introduced earlier in the claim. Specifically, there is only one “terminal” described in claim 5, namely “a terminal user interface on a *terminal* to permit a terminal user of *the terminal* [to] request the railway control apparatus to place a block on one or

more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections.” (Emphasis added.) This language follows through in the next claim element, where “the user terminal” is also referenced, namely “via operation of the user interface of the *user terminal*.” (Emphasis added.) And, then finally, the last claim element again refers to “the user terminal,” namely “receiving the release code from the *user terminal* in return.” (Emphasis added.) All of the references to “user terminal” (highlighted in green in screenshot below) relate back to “a terminal”/“the terminal” (also highlighted in green in the screenshot below) introduced earlier in claim 5:

5. A method to enhance railway control, to protect safety of railway workers on or near railway tracks, said method comprising:
 configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon;
 providing a terminal user interface on a terminal to permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;
 generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal;
 and
 permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return.

260. As discussed above, each of these references to “terminal” (in green) refers to the terminal of a terminal user (*i.e.*, the dispatcher), not the terminal or device of the railway field worker, as SEPTA proposes. Indeed, each of these operations in claim 5 is associated with the

dispatcher's terminal through which they can control the railway network by placing and removing blocks.

261. Therefore, the claims further support my opinion that "user terminal" as referenced in claim 5 of the '782 patent would be understood by a POSITA to mean "user terminal of a terminal user (*i.e.*, the dispatcher)."

c. SEPTA's Proposed Construction is Inconsistent with the Plain Language of Claim 5 and the Specification of the '782 Patent.

262. It is my opinion that SEPTA's proposed construction of "user terminal" in claim 5 of the '782 patent as "railway field worker's mobile user device" is incorrect, contradicted by the plain language of claim 5, and inconsistent with the specification of the '782 patent.

263. SEPTA's proposal that the "user terminal" be construed as "railway field worker's mobile user device" is inconsistent with the plain claim language of claim 5. Specifically, claim 5 recites a "mobile user device of a railway field worker" separately from "terminal"/"user terminal."

264. Stated differently, claim 5 separately introduces "mobile user device" and "terminal"/"user terminal" to refer to different aspects of the claimed invention. '782 patent at claim 5. The claim specifically associates "mobile user device" with the "railway field worker" and "terminal"/"user terminal" with the dispatcher's terminal for controlling the railway network by placing and removing blocks. '782 patent at claim 5.

265. To illustrate this point, below is a color-coded image of claim 5, in which "mobile user device of the railway field worker" is shown in blue highlighting, "railway control apparatus" is shown in yellow highlighting, and "terminal"/"user terminal" is shown in green highlighting.

5. A method to enhance railway control, to protect safety of railway workers on or near railway tracks, said method comprising:

configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon;

providing a terminal user interface on a terminal to permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and

permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return.

266. From this claim language, a POSITA would understand that the “terminal”/“user terminal” and “mobile user device” are different devices, with “mobile user device” being the railway field worker’s device (noted in blue and specifically stated in the claim as “mobile user device *of a railway field worker*”) and “terminal”/“user terminal” being the “terminal”/“user terminal” of the dispatcher through which the dispatcher interacts with the “railway control apparatus” (noted in green and yellow, respectively).

267. Under SEPTA’s proposed construction, claim 5 would include two separate and distinct terms for the same device—*i.e.*, the device of the railway field worker, and nothing for the dispatcher.

268. SEPTA's proposed construction is nonsensical and inconsistent with the basic principles of claim construction. Specifically, under SEPTA's construction, both the "mobile user device" and the "terminal"/"user terminal" would refer to the railway field worker's device.

269. Additionally, under SEPTA's proposed construction, SEPTA ignores that there are two names for the referenced user interfaces. Specifically, the "mobile user device" has a "device user interface" and the "terminal"/"user terminal" has a "terminal user interface." Under SEPTA's proposed construction, the "device user interface" and the "terminal user interface" would be the same thing, despite being two different and distinct terms in claim 5.

270. Further, under SEPTA's proposed construction, claim 5 would not include *any* term that refers to the dispatcher's terminal for controlling the railway network by placing and removing blocks. This is not only inconsistent with the plain language of the claim, but the specification, which consistently describes exemplar embodiments of the inventions in terms of providing for the interaction between the field worker's device, on the one hand, and the dispatcher's terminal, on the other.

271. Therefore, it is my opinion that SEPTA's proposed construction of "user terminal" as "railway field worker's mobile user device" is incorrect, inconsistent with the plain language of claim 5, and contrary to the specification of the '782 patent.

272. Separately, it is possible that SEPTA may be relying on the fact that there are certain exemplary figures in the specification that label the railway field worker's device as a "terminal" and the dispatcher's computer as a "computer" or "apparatus." *See, e.g.,* Fig. 1A. This, however, still does not support SEPTA's proposed construction in view of the plain language of claim 5 and the specification of the '782 patent.

273. Indeed, the '782 patent is not so strict in its use of these terms. For example, the '782 patent refers, at various points, to where the dispatcher sits as a “terminal.” *See, e.g.*, '782 patent at 5:24-25, 6:58, 7:28, 7:38, 7:40, 7:48, 8:22, 8:31, 8:43, 8:50, 8:55, 8:66, 9:8, 9:27-30, 9:33, 9:36, 9:39, 9:44. More, the '782 patent refers to the “railway traffic control *terminal* 105” no less than 33 times. Therefore, the specification of the '782 patent is clear that the term “terminal” can apply to the user terminal of the dispatcher. And, this is consistent with how the term is clearly used in claim 5 of the '782 patent.

274. I also understand that SEPTA may rely on amendments that were made during the reissue proceedings of the '835 and '115 patents. While these amendments may have made certain language in the reissue patents more consistent, they do not change how a POSITA would understand claim 5 of the '782 patent because those amendments are not part of the specification of the '782 patent, and the language of claim 5 of the 782 patent makes clear to a POSITA what is being claimed by the term “terminal”/“user terminal” in claim 5.

275. Accordingly, it is my opinion that “user terminal” of claim 5 should be construed as “user terminal of a terminal user (*i.e.*, the dispatcher),” and SEPTA’s proposed construction should be rejected.

2. “from the user terminal in return” [’782 patent, claim 5; proposed by SEPTA]

276. It is my understanding that SEPTA has asked the Court to construe the term “from the user terminal in return,” as this term is applied in claim 5 of the '782 patent. Railware proposes that the term does not need construction, or should be afforded its plain and ordinary meaning. The below chart illustrates this, as well as the Parties respective positions on the construction of these terms.

<u>Railware's Proposed Construction</u>	<u>SEPTA's Proposed Construction</u>
No construction necessary or plain and ordinary meaning.	transmitted from the user terminal (as previously defined)

277. It is my opinion that the claim term “from the user terminal in return” does not require construction beyond Railware’s proposed construction for “user terminal” discussed above.

278. It is my opinion that a POSITA would readily understand the claim term “from the user terminal in return” without further construction.

279. As an initial matter, the claim term is self-descriptive. As discussed in my analysis of “user terminal,” above, it is my opinion that a POSITA would readily understand the meaning of the terms “user terminal” and “terminal” in the context of the ’782 patent to mean the “user terminal of a terminal user (*i.e.*, the dispatcher).” Based on this understanding, a POSITA would readily understand the meaning of “from the user terminal in return.” A POSITA would understand this phrase to mean that the railway control apparatus must receive back a release code via the user terminal of the dispatcher before a block will be removed by the railway control apparatus.

280. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. **The Claim Language of the ’782 Patent Supports Railware’s Proposal that No Construction Is Necessary.**

281. To begin, this is not a term at all as proposed by SEPTA, but rather an (incomplete) phrase that derives much of its meaning from the rest of language in the claim element that it modifies. Below is a reproduction of the full claim language at issue:

5. A method to enhance railway control, to protect safety of railway workers on or near railway tracks, said method comprising:

configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon;

providing a terminal user interface on a terminal to permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and

permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return.

282. The language highlighted in green is the language that SEPTA proposes for construction. However, it is my view that, at a minimum, the language in yellow would also be considered by a POSITA in determining what the green language means.

283. In both cases, the highlighted language is clear on its face.

284. It is my opinion that a POSITA would understand “from the user terminal in return,” as indicating that the railway control apparatus (the broader system for controlling the railway network) must receive back a release code, and that the receipt of that code must be done through the user terminal of the dispatcher in order to release a block.

b. The Specification of the '782 Patent Supports Railware's Proposal that No Construction Is Necessary.

285. This understanding is consistent with the specification of the '782 patent.

286. As discussed in detail above (*see* paragraphs 36 to 48, which I incorporate here by reference), the specification of the '782 patent describes numerous ways through exemplar embodiments in which the release code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release code first to the dispatcher (*e.g.*, through oral communication or otherwise), who then manually enters the release code into the user terminal of the dispatcher, so that the block can be removed by the railway control apparatus.

287. Given the breadth of descriptions regarding how the removal or release code can be returned or transmitted, and the figures that specifically show embodiments in which the dispatcher enters the code into the user terminal, a POSITA would not understand the claim language of claim 5 to be limited to requiring that the “release code” be transmitted to the railway control apparatus only via the user terminal of the railway field worker, as SEPTA proposes. Indeed, consistent with the specification of the '782 patent, the code can be returned in a number of different ways, including through the railway field worker providing it to the dispatcher orally to enter into the dispatcher’s terminal, through the railway field worker interacting with features on the user terminal, and the like. *See e.g.*, '782 patent at 3:13-34.

288. My opinion is further supported through how contemporaneous dictionaries have defined terms such as “return,” which include definitions such as (i) “the act of returning something to a former place, condition, or ownership,” Merriam-Webster’s Collegiate Dictionary, 11th Ed. (2012) at 1065-66, (ii) “to give, take, or carry back; replace or restore,”

Collins English Dictionary, 9th Ed. (2007) at 1381, and (iii) “give or send back or put back in place,” Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 1230.

289. Thus, it is my opinion that “from the terminal” and “from the user terminal” to require no construction beyond Railware’s proposed construction for “user terminal” discussed above with respect to the ’782 patent.

c. SEPTA’s Proposed Construction Is Inconsistent with the Claims and the Specification of the ’782 Patent and Improperly Reads Limitations into the Claims Beyond how a POSITA Would Understand the Claim Terms.

290. I understand that SEPTA has proposed that the term “from the user terminal in return” be construed to mean “transmitted from the user terminal (as previously defined).” As discussed above, I disagree that a POSITA would understand these terms to have the meaning that SEPTA proposes for a variety of reasons. Specifically, SEPTA’s proposed construction is inconsistent with the claims and the specifications and improperly reads limitations into the claims beyond how a POSITA would understand the claim terms.

291. Based on my knowledge and experience and review of the documents provided to me, including SEPTA’s contentions regarding non-infringement, it appears to me that SEPTA’s proposed construction is formed primarily to advance arguments it makes in support of its various non-infringement positions, rather than grounding its proposed construction in the perspective of a POSITA or in any intrinsic or extrinsic evidence.

292. I understand that SEPTA intends to argue that it does not infringe the Asserted Patents because “in the [accused systems and methods], to release a block, the railway field worker provides the dispatcher with the code verbally by means of a separate radio call over a

separate radio network, not through the railway field worker's mobile user device." *See, e.g.,* Non-Infringement Contentions Chart A, at 11.

293. It is my view that SEPTA's focus on limiting the term "from the user terminal in return" to "*transmitted* from the user terminal (as previously defined)" is a further attempt by SEPTA to buttress this non-infringement position by creating an improper and unsupported limitation in the Asserted Patents (that does not exist), which would require, *inter alia*, any release code to be transmitted only directly from the device of the railway field worker to the railway control apparatus, thereby potentially excluding SEPTA's radio-based return operation. But the specification and claims do not support this construction, and SEPTA's proposed construction is, again, problematic for a host of reasons.

294. First, SEPTA's proposed construction is flawed because it incorporates its flawed understanding of how "user terminal" would be understood by a POSITA with respect to claim 5 of the '782 patent. Stated simply, SEPTA's proposed construction incorrectly points to the opposite end of the system than what is plainly called for by the plain language of claim 5 of the '782 patent. I explain why this is problematic, and why a POSITA would not have this same misunderstanding as SEPTA, above in paragraphs 248 to 275 of this Declaration.

295. Second, SEPTA's reading improperly adds a limitation into claim 5 that is not present by requiring that the "release code" from claim 5 can only be *transmitted* from the terminal of the railway field worker to the railway control apparatus, and in no other way. This limitation is not in the claims at issue at all. And as discussed above, the '782 patent provides a broad description of how the release code can be returned to the user terminal or railway control apparatus, including having the code provided orally to the dispatcher, who then manually enters the code into the user terminal of the dispatcher. *See e.g.,* 782 patent at 3:13-34.

296. Third, SEPTA's proposed construction is inconsistent with the specification of the '782 patent because, as discussed above, the '782 patent discloses numerous ways through exemplar embodiments in which the release or removal code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release or removal code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release or removal code first to the dispatcher (*e.g.*, through oral communication or otherwise), who then manually enters the release code into the user terminal of the dispatcher, so that the block can be released by the railway control apparatus. SEPTA's proposed construction seemingly limits the claim to only the "automatic" embodiments.

297. Additionally, SEPTA's reading seemingly implies that the "release code" from claim 5 must be transmitted *directly from* the terminal of the railway field worker to the railway control apparatus. But requiring the "release code" to be transmitted directly from the terminal of the railway field worker to the railway control apparatus (*i.e.*, with no intervening steps) would render impossible and read-out other aspects of the inventions that contemplate that the release code is transmitted from the terminal of the railway field worker to the railway control apparatus through an intermediary – specifically a network – such as the one illustrated in Figures 1A and 1B, illustrated below.

FIGURE 1A

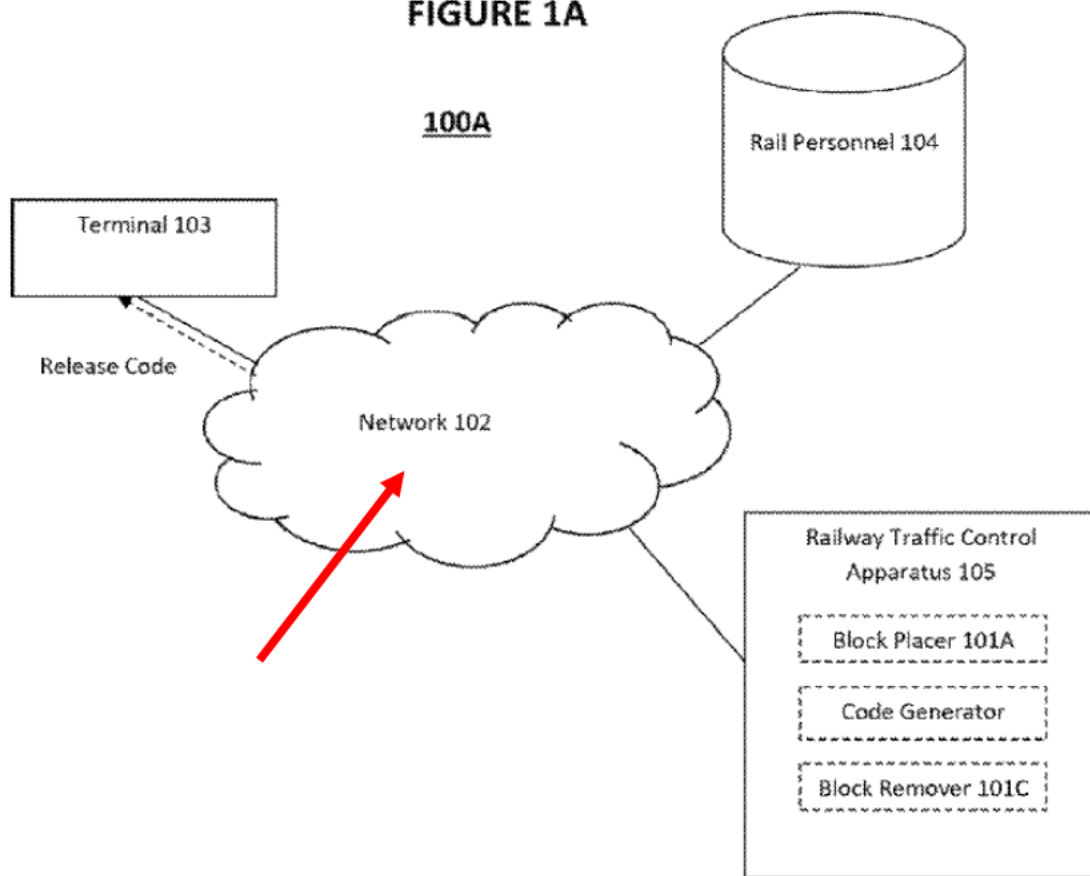
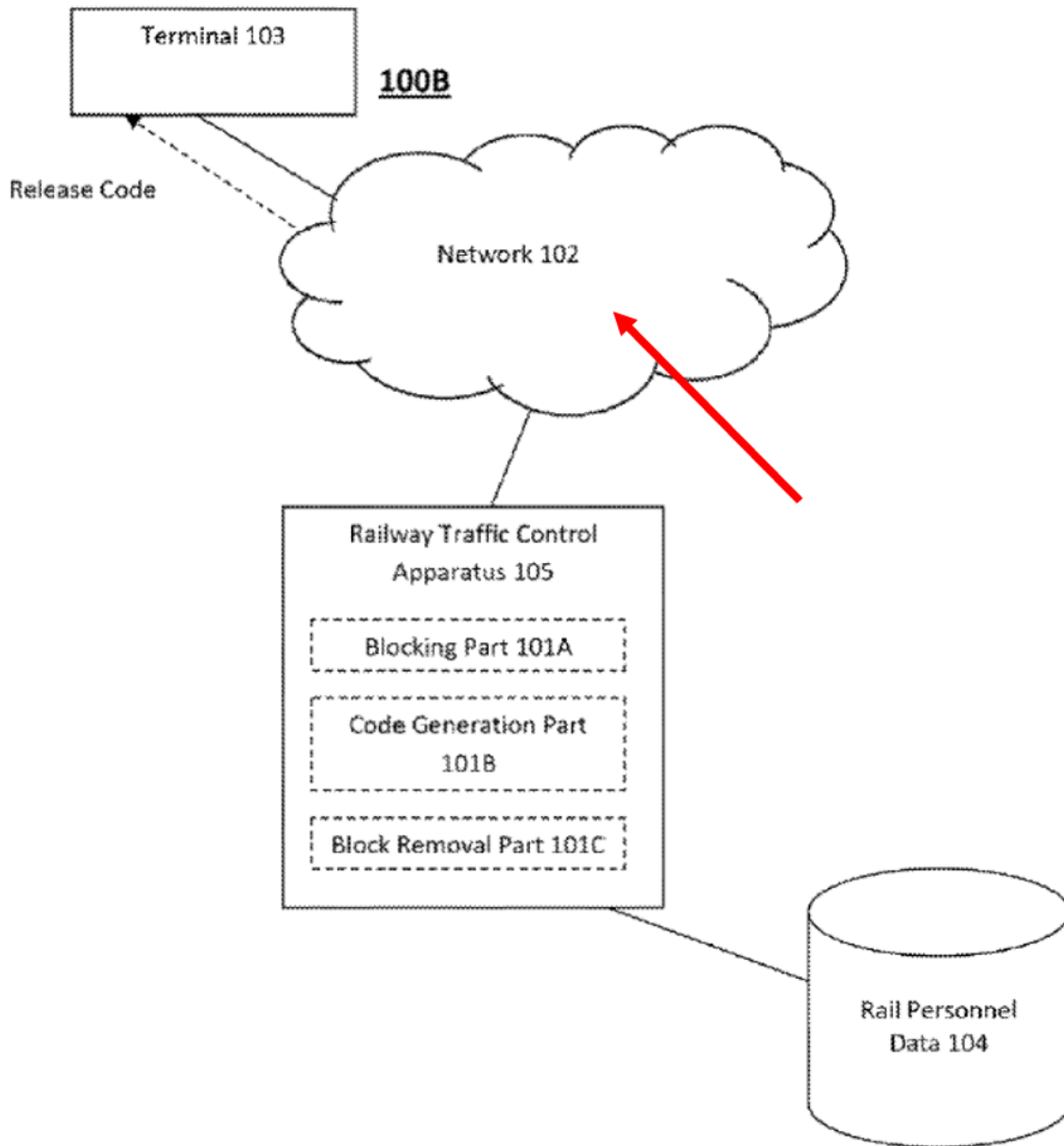


FIGURE 1B

298. Further, it my understanding that SEPTA's proposed construction would read-out Railware's own commercial embodiment, EEPS, which was the foundation for and genesis of the Asserted Patents. In Railware's commercial embodiment, the release code is provided by the

field worker through a phone call, who then enters the release code into the railway control apparatus. This is consistent with the exemplar embodiments in the '782 patent (discussed above), where the dispatcher enters the code into the dispatcher's "user terminal" to return the code to the railway control apparatus to release the block. Under SEPTA's proposed construction, the release code must be returned *only* by transmitting it directly from the railway field worker's device, which is inconsistent with Railware's commercial embodiment and the exemplar embodiments of the '782 patent. This further indicates that SEPTA's proposed construction is inconsistent with the '782 patent.

299. Based on this, it is my view that a POSITA would not understand claim 5 of the '782 patent to require that the "release code" from claim 5 can only be transmitted from the terminal of the railway field worker to the railway control apparatus, and in no other way.

300. Accordingly, it is my opinion that "from the user terminal in return" does not require construction beyond Railware's proposed construction for "user terminal" discussed above with respect to the '782 patent, and that SEPTA's proposed construction should be rejected.

3. "to respond to prompts displayed thereon" and "to respond to the message to release the block" ['782 patent, claims 5 & 6; proposed by SEPTA]

301. It is my understanding that SEPTA has asked the Court to construe the terms: (i) "to respond to prompts displayed thereon" and (ii) "respond to the message to release the block," as these terms are applied in claims 5 and 6 of the '782 patent. Railware proposes that the terms do not need construction, or should be afforded their plain and ordinary meaning. The below chart illustrates this, as well as the Parties' respective positions on the construction of these terms.

<u>Terms:</u>	<u>Railware's Proposed Construction</u>	<u>SEPTA's Proposed Construction</u>
to respond to prompts displayed thereon	No construction necessary or plain and ordinary meaning.	to respond through the mobile user device user interface to prompts displayed thereon
to respond to the message to release the block	No construction necessary or plain and ordinary meaning.	to respond through the mobile user device user interface to the message to release the block

302. It is my opinion that the claim terms “to respond to prompts displayed thereon” and “to respond to the message to release the block” do not require construction. It is my opinion that a POSITA would readily understand the claim terms “to respond to prompts displayed thereon” and “to respond to the message to release the block” without further construction.

303. To begin, the claim terms themselves are self-descriptive. A POSITA would readily understand “to respond to prompts displayed thereon” in the context of the invention described in claim 5 of the '782 patent to indicate that a user device of a railway field worker must be configured to permit the worker to respond to prompts displayed on the user device. Likewise, a POSITA would readily understand “to respond to the message to release the block” in the context of the invention described in claim 6 of the '782 patent to indicate that a railway field worker must be able to respond in some way to a message in order for a block to be released.

304. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

305. As with other purported “terms” that SEPTA has offered for construction, both of these terms are not terms at all as proposed by SEPTA, but rather (incomplete) phrases that

derive much of their meaning from the rest of language in the claim element that they modify.

Below is a reproduction of the full claim language at issue.

Claim 5

5. A method to enhance railway control, to protect safety of railway workers on or near railway tracks, said method comprising:

configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon;

providing a terminal user interface on a terminal to permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and

permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return.

Claim 6

6. The method of claim 1, further comprising:

displaying, upon the railway control apparatus placing the block of railway traffic to said one or more specified track sections and transmitting the release code to the electronic contact address accessible by the railway field worker, a message through the device user interface provided on the mobile user device and permitting the railway field worker to respond to the message to release the block.

306. The language highlighted in green is the language that SEPTA proposes for construction. However, it is my view that, at a minimum, the language in yellow would also be considered by a POSITA in determining what the green language means.

a. **The Claim Language of the '782 Patent Supports Railware's Proposal that no Construction Is Necessary.**

307. In both cases, the highlighted language is clear on its face.

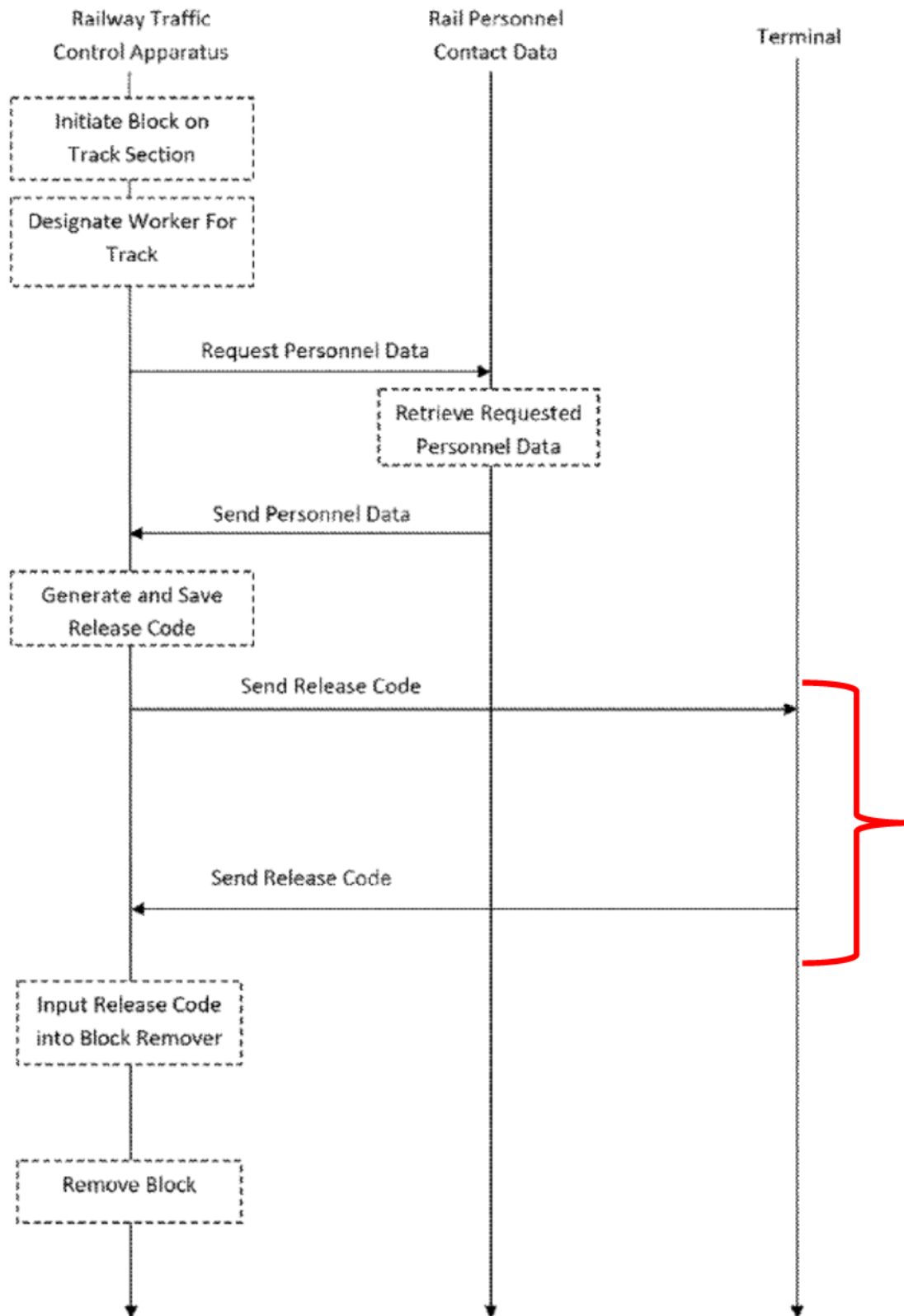
308. It is clear to me from the claim language of claim 5 that a POSITA would understand “to respond to prompts displayed thereon” to indicate that a user device of a railway field worker must be configured to permit the worker to respond to prompts displayed on the user device. Importantly, however, the claim does not require that the response take any particular format or serve any particular purpose. Rather, a POSITA would understand the claim to simply be providing a standard type of user interface.

309. Similarly, while claim 6 specifies that the response to the prompt must serve a particular purpose (“to release the block”), the plain language of claim 6 does not require that the response take any particular format or come from any particular source.

b. **The Specification of the '782 Patent Supports Railware's Proposal that no Construction Is Necessary.**

310. This understanding is consistent with the specification of the '782 patent.

311. For example, Figure 4 illustrates the release code must be sent, and then returned, prior to the release of the block.

FIGURE 4

**CONTAINS INFORMATION DESIGNATED AS
HIGHLY CONFIDENTIAL – ATTORNEYS’ EYES ONLY**

WABTEC EX1025

312. As discussed in detail above (*see* paragraphs 36 to 48, which I incorporate here by reference), the specification of the '782 patent describes numerous ways through exemplar embodiments in which the release code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release code first to the dispatcher (*e.g.*, through oral communication or otherwise), who then manually enters the release code into the user terminal of the dispatcher, so that the block can be released by the railway control apparatus.

313. Given the breadth of description regarding how the release code can be returned, a POSITA would not understand “to respond to prompts thereon” as recited in claim 5 to be so limited as SEPTA proposes (*i.e.* limited to “respon[ses] through the mobile user device user interface”). Notably, nothing in the specification of the '782 patent is limited to only allowing the “release code” to be returned to the railway control apparatus automatically by interacting with prompts or messages displayed on the user terminal of the railway field worker, as SEPTA proposes.

314. The same conclusion is true with respect to claim 6 and its use of the claim language “to respond to the message to release the block.” Given the breadth of description regarding how the release or removal code can be returned to release a block, a POSITA would not understand the claim language “to respond to the message to release the block” to be limited to any particular form in which the release or removal code is returned to the railway control apparatus to remove the block. Rather, a POSITA would understand “to respond to the message to release the block” broadly to include any sort of response to release the block, including by

orally providing the code to the dispatcher (*e.g.*, through oral communication or otherwise via the railway field worker's user terminal or some other device).

315. My opinion is further supported through how contemporaneous dictionaries have defined terms such as “respond,” as also discussed above with regard to the claim term “to respond to prompts displayed thereon.” This is further supported through how contemporaneous dictionaries have defined terms such as “prompt,” which include definitions such as (i) “something that prompts,” Merriam-Webster's Collegiate Dictionary, 11th Ed. (2012) at 994, (ii) “to urge (someone to do something),” Collins English Dictionary, 9th Ed. (2007) at 1297, (iii) “*computing* a word or symbol on a VDU screen to show that input is required,” Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 1149, (iv) “a visual or audible message sent by a program to request a user's response,” IBM Dictionary of Computing, 9th Ed. (1993) at 540.

c. **SEPTA's Proposal Is Inconsistent with the Claims and the Specification of the '782 Patent and Improperly Reads Limitations into the Claims Beyond how a POSITA Would Understand the Claim Terms.**

316. I understand that SEPTA has proposed that the term “to respond to prompts displayed thereon” be construed to mean “to respond through the mobile user device user interface to prompts displayed thereon.” Similarly, I understand that SEPTA has proposed that the term “respond to the message to release the block” be construed to mean “to respond through the mobile user device user interface to the message to release the block.” As discussed above, I disagree that a POSITA would understand these terms to have the meaning that SEPTA proposes for a variety of reasons. Specifically, SEPTA's proposed construction is inconsistent with the

claims and the specification and improperly reads limitations into the claims beyond how a POSITA would understand the claim terms.

317. Based on my knowledge and experience and my review of the documents provided to me, it appears to me that SEPTA's proposed construction is formed primarily to advance arguments it makes in support of its various non-infringement positions, rather than grounding its proposed construction in the perspective of a POSITA or in any intrinsic or extrinsic evidence.

318. As discussed in paragraph 292 of this Declaration, I understand that SEPTA intends to argue that it does not infringe the Asserted Patents because "in the [accused systems and methods], to release a block, the railway field worker provides the dispatcher with the code verbally by means of a separate radio call over a separate radio network, not through the railway field worker's mobile user device." *See, e.g.*, Non-Infringement Contentions Chart A, at 11.

319. It is my view that SEPTA's focus on limiting the terms "to respond to prompts displayed thereon" and "respond to the message to release the block" to only describe configurations whereby the railway field worker must respond to the prompt/message directly through the user interface provided on the worker's mobile device to release the block is a further attempt by SEPTA to buttress its non-infringement position by creating an improper and unsupported limitation in the Asserted Patents (that does not exist), which would require, *inter alia*, any release code to only be transmitted directly from the device of the railway field worker that received the code to the railway control apparatus, thereby potentially excluding SEPTA's radio-based return operation. But the specifications and claims do not support this construction, and SEPTA's proposed construction is problematic for a host of reasons.

320. First, SEPTA’s proposed construction is inconsistent with the plain language of the claims because it improperly imports limitations into the claims. Specifically, SEPTA’s proposed construction imports limitations that require that the “response” to the prompts occur in a specific way, *i.e.* “through the mobile user device user interface.” No such limitation is found in the claims.

321. Second, SEPTA’s proposed construction is inconsistent with the specification of the ’782 patent because, as discussed above, the ’782 patent discloses numerous ways through exemplar embodiments in which the release or removal code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release or removal code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release or removal code first to the dispatcher (*e.g.*, through oral communication or otherwise), who then manually enters the release or removal code into the user terminal of the dispatcher, so that the block can be released by the railway control apparatus. SEPTA’s proposed construction seemingly limits the claim to only the “automatic” embodiments.

322. To that end, SEPTA’s proposed construction that both “to respond to prompts displayed thereon” and “respond to the message to release the block” be construed such that the *only way* a railway field worker may respond to the message/prompt to release a block is directly through the user interface provided on the worker’s mobile device is far narrower than contemplated by the ’782 patent. Stated differently, the ’782 patent is not so rigid as SEPTA claims, and indeed, all of the intrinsic evidence cited by SEPTA on this point is clear that what is discussed therein is exemplary and not exhaustive. SEPTA also ignores important disclosures of

the '782 patent that I discuss above, including the multitude of ways by which the release or removal code may be returned to the dispatcher or the railway control apparatus.

323. More, as discussed above, SEPTA's proposed construction would read-out Railware's own commercial embodiment, EEPS. In Railware's commercial embodiment, the release code is provided by the field worker back to the dispatcher through a phone call, not necessarily through the mobile user device user interface, as SEPTA contends. This further indicates that SEPTA's proposed construction is inconsistent with the Asserted Patents.

324. Further, the '782 patent specifically reinforces that several means of communication may be utilized, and may be utilized in "a modular fashion by other devices connected by a communication network." *See* '782 patent at 4:44-53.

325. Accordingly, it is my opinion that neither "to respond to prompts displayed thereon" nor "respond to the message to release the block" requires construction, and that SEPTA's proposed construction is improper and should be rejected.

D. Claim Construction Issues Specific to the '835 Patent

326. I now address the claim terms and issues that are specific to the '835 patent.

1. "from the terminal" and "from the user terminal" ['835 patent, claims 20, 30, 41; proposed by SEPTA]

327. It is my understanding that SEPTA has asked the Court to construe the terms: (i) "from the terminal" and (ii) "from the user terminal," as these terms are applied in claims 20, 30, and 41 of the '835 patent. Railware proposes that the terms do not need construction, or should be afforded their plain and ordinary meaning. SEPTA has offered the same construction for each term. The below chart illustrates this, as well as the Parties' respective positions on the construction of these terms.

<u>Railware's Proposed Construction</u>	<u>SEPTA's Proposed Construction</u>
No construction necessary or plain and ordinary meaning.	transmitted from the user terminal (as previously defined)

328. It is my opinion that the claim terms “from the terminal” and “from the user terminal” do not require construction beyond Railware’s proposed construction for “user terminal” discussed above with respect to the ’835 patent. It is my opinion that a POSITA would readily understand the claim terms “from the terminal” and “from the user terminal” without further construction.

329. The claim terms “from the terminal” and “from the user terminal” are self-descriptive.

330. A POSITA would readily understand that “from the terminal” and “from the user terminal” are simply identifying prepositional phrases. These terms, in the context of claims 20, 30, and 41 of the ’835 patent, are used to simply identify that the secret code/secret release code is the *same code* that was transmitted to the user terminal of the railway field worker in a prior step.

331. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. **The Claim Language of the ’835 Patent Supports Railware’s Proposal that No Construction Is Necessary.**

332. To begin, both terms are incomplete phrases that derive much of their meaning from the rest of language in the claim element that they modify. Below is a reproduction of the full claim language at issue:

Claim 20

20. A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:

place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;

generate a secret release code associated with the blocked one or more sections of railway track;

transmit the secret release code to a user terminal via a network;

receive the secret release code via the network; and

responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track.

Claim 30

30. A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:

placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;

generating a secret release code associated with the blocked one or more sections of railway track;

transmitting the secret release code to a user terminal via a network;

receiving the secret release code via the network; and responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track.

Claim 41

41. The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:

receive the secret code from the user terminal via the network;

verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;

receive an instruction to remove the block from the selected track sections, after verifying the secret code; and

responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks.

333. The language highlighted in green is the language that SEPTA proposes for construction. However, it is my view that, at a minimum, the language in yellow would also be considered by a POSITA in determining what the green language means.

334. In both cases, the highlighted language is clear on its face.

335. It is clear to me from this claim language that a POSITA would understand “from the terminal” and “from the user terminal” as indicating that the secret code/secret release code discussed in the claims is simply the same code that was transmitted to the user terminal of the railway field worker in a prior step.

336. In other words, the secret code/secret release code is “the code from the terminal” in the sense that it is the same code that was sent to the user terminal of the railway field worker, and not some other code (such as the version of the code that was stored in internal storage of the railway control apparatus at the time the code was generated). It is my opinion that a POSITA would not understand “from the terminal” or “from the user terminal” to be requiring a particular transmission device or particular way for returning the secret code/secret release code to the dispatcher/railway control apparatus, as SEPTA seems to propose.

337. My opinion is further supported by the other limitations in the claims. For example, in claim 20 and 30, the immediately preceding step states “receiving the secret release code via the network.” This step is the claimed step that actually described how the secret release code is received. The only limitation placed on “receiving the secret code” in this step is that it must be “via the network.” There is no limitation in this step that the code be received from any particular transmitter, such as the user terminal.

338. While the “receiving” step in claim 41 does state “receive the secret code from the user terminal via the network,” it is still my opinion that the “from the user terminal” is nothing

more than an indicator that the received “secret code” is the same secret code that was transmitted to the user terminal in a prior step in claim 40 (from which claim 41 depends). This is supported by the subsequent limitations in claim 41 which recite, *inter alia*, “verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device.” This limitation is clearly using “from the user terminal” to contrast the secret code that was received from the field with the secret code that was stored in the memory device. “From the user terminal” is *not* being used to identify a specific transmission device or specific way for the code that was received.

339. Accordingly, it is my opinion that the claims support my opinion that the terms “from the terminal” and “from the user terminal” do not require construction beyond Railware’s proposed construction for “user terminal” discussed above with respect to the ’835 patent.

b. The Specification of the ’835 Patent Supports Railware’s Proposal that No Construction Is Necessary.

340. The specification further supports my opinion that the terms “from the terminal” and “from the user terminal” do not require construction beyond Railware’s proposed construction for “user terminal” discussed above with respect to the ’835 patent.

341. As with the ’782 patent, discussed above, the ’835 patent describes numerous ways through exemplar embodiments in which the release or removal code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release or removal code first to the dispatcher (*e.g.*, through oral communication or otherwise), who then manually enters the release code into the user terminal of the dispatcher, so that the block can be

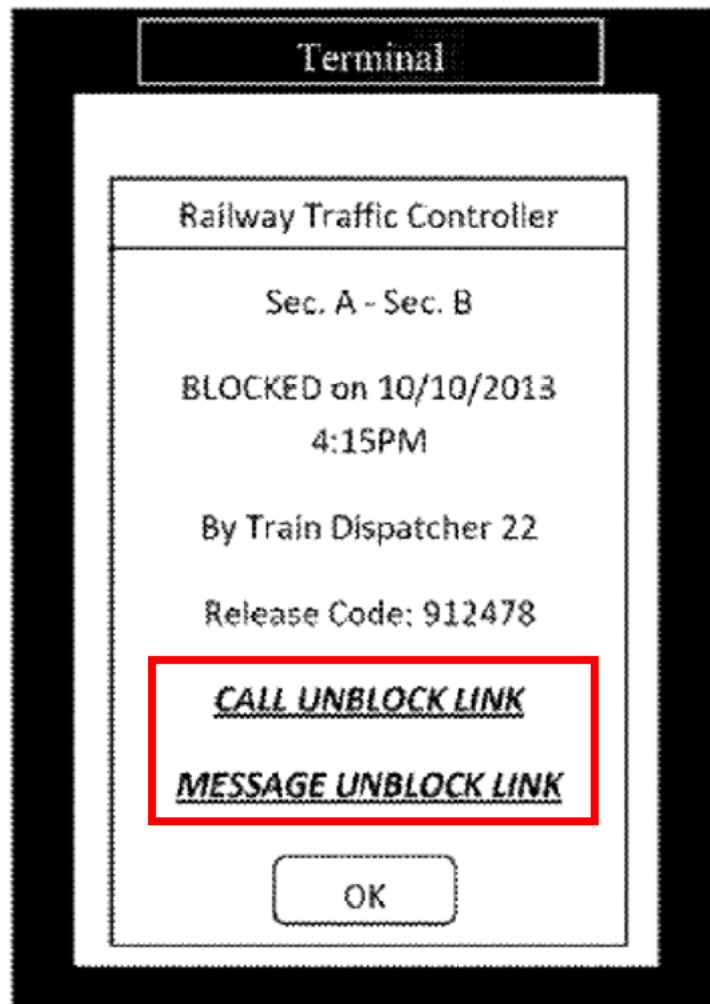
removed by the railway control apparatus. Specifically, the '835 patent provides that the “block removal user interface may be provided in any of various ways.” '835 patent at 3:19-20.

342. In some exemplar embodiments, the maintenance or railway field worker can interact directly with their own remote user terminal to lift a block. For example, in some exemplar embodiments, the maintenance or railway field worker may be able to directly release the block through a block removal user interface “provided within a mobile application or webpage through which the railway field worker can enter the removal code manually or orally.” *Id.* at 3:20-24.

343. Similarly, in some exemplar embodiments, the removal code may be “embedded in a link in a message transmitted by email or messaging to the electronic contact address of the railway field worker, and the railway field worker can simply cause the removal code to be entered by activating the link in the message received by the railway field worker.” *Id.* at 3:24-30.

344. Such an exemplar embodiment is shown, for example, in Figure 10 of the '835 patent, which shows “an example of a user interface display that may be provided on the field worker side or triggering block removal.” (*Id.* at 4:30-32):

FIGURE 10



345. In other exemplar embodiments, “the block removal user interface may be provided on the same user terminal on which the block placing part is disclosed.” *Id.* at 3:30-32.

346. Again, the '835 patent discloses a number of different exemplar embodiments in this configuration. For example, “a voice or speech interface part may be disposed on the system-side to process a voice message (such as received via a telephone call from terminal 103

of the railway field worker), extract the removal code from the voice message, and enter the block removal code.” *Id.* at 3:32-37.

347. As another example, the ’835 patent makes clear that the maintenance or railway field worker may simply call the dispatcher and provide the removal or release code to the dispatcher, who then enters the code into the dispatcher’s terminal to remove the block through the railway control apparatus. For example, “FIG. 8 shows the user interface of the railway traffic control [terminal] *apparatus* 105 as the railway traffic controller inputs the release code to remove the block on certain track sections” (*Id.* at 8:40-43):

FIGURE 8

The figure shows a user interface for a railway traffic control apparatus. On the left is a schematic diagram of a railway track with a central section highlighted. To the right of the diagram are several input fields and buttons. The fields include 'Authority: Train Dispatcher 22', 'Worker : Maintenance Worker 12', 'Block Limits: Section A - Section B', 'Placed At: 10/10/2013 4:15PM', and 'Release Code: 912478'. The 'Release Code' field is highlighted with a red border. Below these fields are three buttons: 'PLACE' (dashed border), 'REMOVE', and 'CANCEL'.

348. Further, the ’835 patent provides that “in a case where there are multiple workers assigned for a certain track section, there may be provided multiple unique release codes which would then all be required to be input into the train traffic control [terminal] *apparatus* 105 by

the train traffic controller in order to be able to remove blocks on certain track sections.” *Id.* at 8:58-64. Further, the ’835 patent makes clear that “[t]he user interface 101D is configured preferably for the ease of use for the railway traffic controller (*RTC*). As shown by way of examples in FIGS. 6-9 and 11, the user interface 101D displays information and tools needed to enable/disable blocks on rail sections.” *Id.* at 6:17-21. This description demonstrates that the user interface 101D, which is the dispatcher’s user interface, can control the removal of blocks, such as the ways discussed above, including with respect to Figure 8 above.

349. In each of the above exemplar embodiments where the dispatcher is involved in the removal of the block, it is not until the railway field worker seeks to remove the block that the dispatcher receives the code for the first time. As explained in the specification:

Once the secret code is received, the secret code may be input to the designated field (S1308) . . . [T]he railway traffic control [terminal] *apparatus* 105 checks that all information input into all fields is correct and that all fields are filled in. ***After*** this check is performed by the railway traffic control [terminal] *apparatus* 105, the remove button is enabled on the form (01312) and the railway traffic controller may remove the block on the corresponding track section.

Id. at 10:49-64 (emphasis added in bold italics). By using words like “once” and “after,” the specification makes clear that, in embodiments where the dispatcher is involved in the removal of the block, the dispatcher cannot remove the block until the dispatcher receives the code from the railway field worker.

350. In sum, the specification of the ’835 patent makes clear that the dispatcher does not have ready access to the removal or release code to lift the block until that code is provided by a maintenance or railway field worker. Further, the removal or release code can be returned to the railway control apparatus in any number of ways, including automatically by the railway field worker or manually by returning the code to the dispatcher, who then inputs the removal or

release code into the dispatcher's terminal to release the block. A POSITA would understand the terms "from the terminal" and "from the user terminal" in light of these various descriptions of how the code can be returned, and would not view the terms "from the terminal" and "from the user terminal" to limit the claims to any particular transmission device or particular way for returning the code to the dispatcher/railway control apparatus.

351. Thus, it is my opinion that "from the terminal" and "from the user terminal" require no construction beyond Railware's proposed construction for "user terminal" discussed above with respect to the '835 patent.

c. SEPTA's Proposed Construction Is Inconsistent with the Claims and the Specification of the '835 Patent and Improperly Reads Limitations into the Claims Beyond how a POSITA Would Understand the Claim Terms.

352. I understand that SEPTA has proposed that the terms "from the terminal" and "from the user terminal" both be construed to mean "transmitted from the user terminal (as previously defined)." As discussed above, I disagree that a POSITA would understand these terms to have the meaning that SEPTA proposes for a variety of reasons. Specifically, SEPTA's proposed construction is inconsistent with the claims and the specification and improperly reads limitations into the claims beyond how a POSITA would understand the claim terms.

353. Based on my knowledge and experience and review of the documents provided to me, it appears to me that SEPTA's construction is formed primarily to advance arguments it makes in support of its various non-infringement positions, rather than grounding its proposed construction in the perspective of a POSITA or in any intrinsic or extrinsic evidence.

354. As discussed in paragraphs 292 and 318 of this Declaration, I understand that SEPTA intends to argue that it does not infringe the Asserted Patents because "in the accused

[systems and methods], the railway field worker communicates the work zone key verbally to the CTC dispatcher over a separate radio network.” *See, e.g.*, Non-Infringement Contentions Chart B, at 87.

355. It is my view that SEPTA’s focus on limiting the terms “from the terminal” and “from the user terminal” to be construed to only cover configurations whereby the secret code/secret release code is only transmitted back to the railway control apparatus/railway traffic control apparatus directly from the user terminal of the railway field worker to which the code was transmitted, is a further attempt by SEPTA to buttress its non-infringement positions by creating an improper and unsupported limitation in the Asserted Patents (that does not exist), which would require, *inter alia*, any secret code/secret release code to only be transmitted directly from the device of the railway field worker to the railway control apparatus, thereby potentially excluding SEPTA’s radio-based return operation. But the specifications and claims do not support this construction, and SEPTA’s proposed construction is, again, problematic for a host of reasons.

356. First, SEPTA’s reading improperly adds a limitation into the claim language at issue by requiring that the “secret release code” from claims 20 and 30, and the “secret code” in claim 41, be ***transmitted*** from the user terminal of the railway field worker to the railway control apparatus/railway traffic control apparatus. This limitation is not in the claims at issue. The claims are, on their face, agnostic as to how the code is transmitted to the railway control apparatus, only specifying that the code must be “receiv[ed].”

357. Second, SEPTA’s proposed construction would render certain portions of the claim nonsensical if SEPTA’s proposed construction were inserted into the claims. For example, a claim element in claim 41 reads: “verify the secret code by comparing the secret code received

from the user terminal with the secret code stored in the memory device.” Should SEPTA’s proposed construction be adopted, and SEPTA’s construction be substituted in for the existing “received from the user terminal” language, the claim element would then read: “verify the secret code by comparing the secret code *received transmitted* from the user terminal with the secret code stored in the memory device.” This is a nonsense statement.

358. Third, SEPTA’s proposed construction is inconsistent with the specification because, as discussed above, the Asserted Patents, including the ’835 patent, describe numerous ways through exemplar embodiments in which the release or removal code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release or removal code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release or removal code first to the dispatcher (*e.g.*, through oral communication or otherwise), who then manually enters the release code into the user terminal of the dispatcher, so that the block can be released by the railway control apparatus. SEPTA’s proposed construction seemingly limits the claims to only the “automatic” embodiments.

359. Further, as discussed above, SEPTA’s proposed construction would read-out Railware’s own commercial embodiment, EEPS. In Railware’s commercial embodiment, the release code is provided by the field worker back to the dispatcher through a phone call, not necessarily through the mobile user device user interface, as SEPTA contends. This further indicates that SEPTA’s proposed construction is inconsistent with the Asserted Patents.

360. Based on this, it is my view that a POSITA would not understand claims 20, 30, and 41 to require that the secret release code/secret code can only be transmitted from the user

terminal of the railway field worker to the railway control apparatus/railway traffic control apparatus.

361. Thus, it is my opinion “from the terminal” and “from the user terminal” require no construction beyond Railware’s proposed construction for “user terminal” discussed above with respect to the ’835 patent, and that SEPTA’s proposed construction should be rejected.

2. “railway traffic controller” [’835 claims 2, 11; proposed by SEPTA]

362. It is my understanding that SEPTA has asked the Court to construe the term “railway traffic controller,” as this term is used in claims 2 and 11 of the ’835 patent. Railware proposes that the term does not need construction, or should be afforded its plain and ordinary meaning. The below chart illustrates this, as well as the Parties’ respective positions on the construction of these terms.

<u>Railware’s Proposed Construction</u>	<u>SEPTA’s Proposed Construction</u>
No construction necessary or plain and ordinary meaning.	train dispatcher

363. It is my opinion that the claim term “railway traffic controller” does not require construction. It is my opinion that a POSITA would readily understand the claim term “railway traffic controller” without further construction.

364. As an initial matter, the claim term itself is self-descriptive. A POSITA would readily understand this term in the context of the inventions described in claims 2 and 11 of the ’835 patent to indicate that the railway traffic control apparatus must contain a “railway traffic controller user interface.”

365. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. **The Claim Language of the '835 Patent Supports Railware's Proposal that No Construction Is Necessary.**

366. As with other purported “terms” that SEPTA has offered for construction, this “term” is not a term at all, but rather an (incomplete) phrase that derives much of its meaning from the rest of language in the claim element that it modifies. Claims 2 and 11 of the '835 patent uses the term “railway traffic controller user interface,” not “railway traffic controller” standing alone. The below, in green, illustrates the proposed language for construction. The below, in yellow, illustrates what I believe a POSITA would consider to be the full phrase at issue:

2. The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] *railway traffic controller (RTC)* *user interface* to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.

367. As is clear from the language of the claim, the term “railway traffic controller” is being used to describe the “user interface” discussed in the claims. A POSITA would appreciate this.

368. A POSITA would also readily understand that a “railway traffic controller” is the individual or entity that is controlling railway traffic. A POSITA would further appreciate that, based on the claim language at issue, the “railway traffic controller” is doing so by interfacing with the “user interface” discussed above. *See* '835 patent at claim 20.

b. The Specification of the '835 Patent Supports Railware's Proposal that No Construction Is Necessary.

369. It is my opinion that Railware's proposed construction is further supported by the specification of the '835 patent, which states that "[t]he user interface 101D is configured preferably for the ease of use for the railway traffic controller (*RTC*). As shown by way of examples in FIGS. 6-9 and 11, the user interface 101D displays information and tools needed to enable/disable blocks on rail sections." '835 patent at 6:17-21.

370. This is further supported through how contemporaneous dictionaries have defined terms such as "controller" as (i) "one that controls or has power or authority to control <air traffic>," Webster's Collegiate Dictionary, 11th Ed. (2012) at 272, and (ii) "a person [who] directs, regulates or restrains," Collins English Dictionary, 9th Ed. (2007) at 367.

371. In light of the above, SEPTA's proposed construction of "train dispatcher" is simply unnecessary, confusing, and adds new and unnecessary language and ambiguity into the claims at issue.

372. More, it would appear to me that focusing the construction of this term on "train dispatcher," as SEPTA proposes, rather than the user interface, is not consistent with how the terms are used in the claims.

373. As such, it is my opinion that SEPTA's proposed construction only adds surplusage, ambiguity, and confusion to the plain language of the claims.

374. Accordingly, it is my opinion that "railway traffic controller" does not require construction, and that SEPTA's proposed construction is improper and should be rejected.

3. “via the network” [’835 patents, claims 20, 30, 41; proposed by SEPTA]

375. It is my understanding that SEPTA has asked the Court to construe the term “via the network,” as this term is used in claims 20, 30, and 41 of the ’835 patent. Railware proposes that the terms do not need construction, or should be afforded their plain and ordinary meaning. The below chart illustrates this, as well as the Parties’ respective positions on the construction of these terms.

<u>Railware’s Proposed Construction</u>	<u>SEPTA’s Proposed Construction</u>
No construction necessary or plain and ordinary meaning.	via the same network used to transmit the secret release code

376. It is my opinion that the claim term “via the network” does not require construction. It is my opinion that a POSITA would readily understand the claim term “via the network” without further construction.

377. As an initial matter, the claim term is self-descriptive. A POSITA would readily understand this term in the context of the inventions described in claims 20, 30, and 41 of the ’835 patent to indicate that the railway traffic control apparatus must be able to send a secret code to the device of the railway field worker and the railway field worker must be able to return or provide that code through one or more networks in order for the block to be removed.

378. As detailed below, my opinion is supported by the intrinsic and extrinsic evidence.

a. The Claim Language of the ’835 Patent Support Railware’s Proposal that No Construction Is Necessary.

379. As with other purported “terms” that SEPTA has offered for construction, this “term” is not a term at all, but rather an (incomplete) phrase that derives much of its meaning

from the rest of language in the claim element that it modifies. Below is a reproduction of the full claim language at issue:

Claim 20

20. A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:

place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;

generate a secret release code associated with the blocked one or more sections of railway track;

transmit the secret release code to a user terminal via a network;

receive the secret release code via the network; and responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track.

Claim 30

30. A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, *the method comprising:*

placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;

generating a secret release code associated with the blocked one or more sections of railway track;

transmitting the secret release code to a user terminal via a network;

receiving the secret release code via the network; and responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track.

Claim 41

41. The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:

receive the secret code from the user terminal via the network;

verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;

receive an instruction to remove the block from the selected track sections, after verifying the secret code; and

responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks.

380. The language highlighted in green is the language that SEPTA proposes for construction. However, it is my view that, at a minimum, the language in yellow would also be considered by a POSITA in determining what the green language means.

381. In both cases, the highlighted language is self-explanatory.

382. Based on the above claim language, it is clear to me that a POSITA would understand “via the network” to indicate that that the railway traffic control apparatus must be able to send a secret code to the device of the railway field worker and the railway field worker must be able to return or provide that code through one or more networks in order for the block to be removed.

b. The Specification of the '835 Patent Supports Railware's Proposal that No Construction Is Necessary.

383. This understanding is consistent with the specification of the '835 patent, including Figures 1A and 1B, which illustrate exemplary embodiments of the inventions.

384. For example, both figures illustrate that the communication with a device of the railway field worker happens via a network.

FIGURE 1A

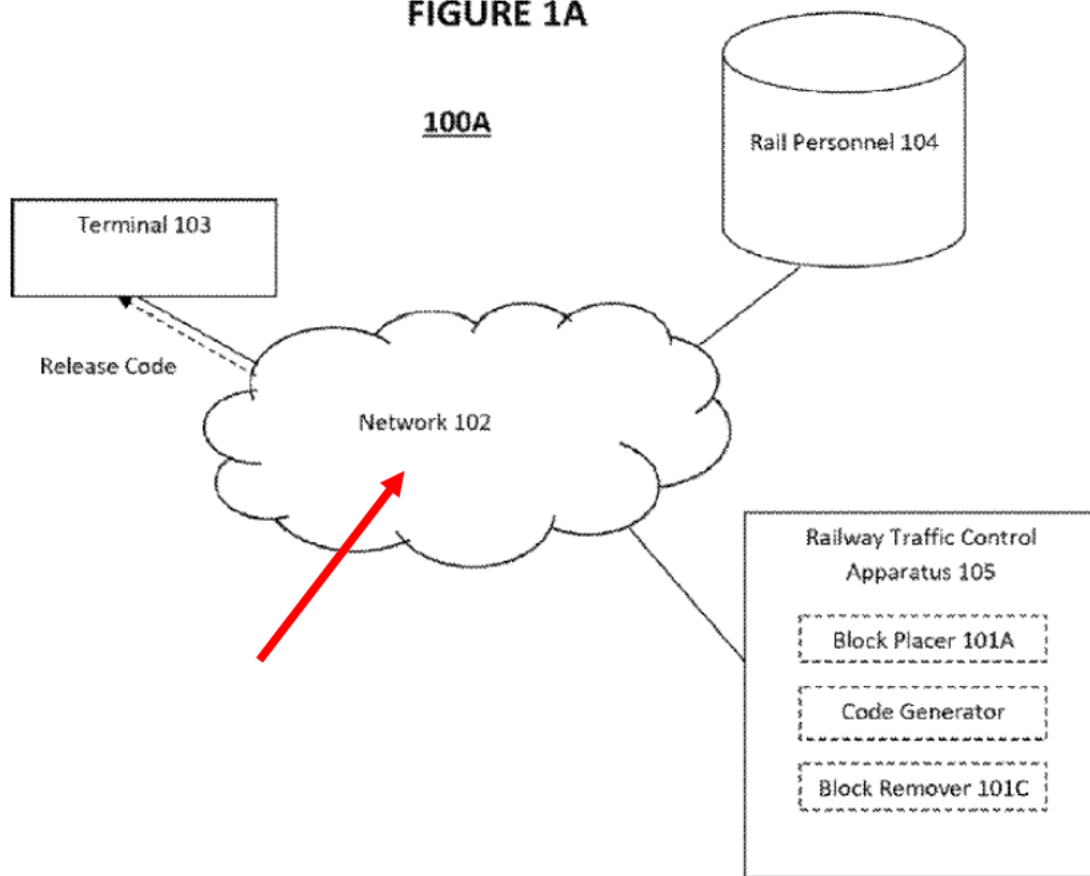
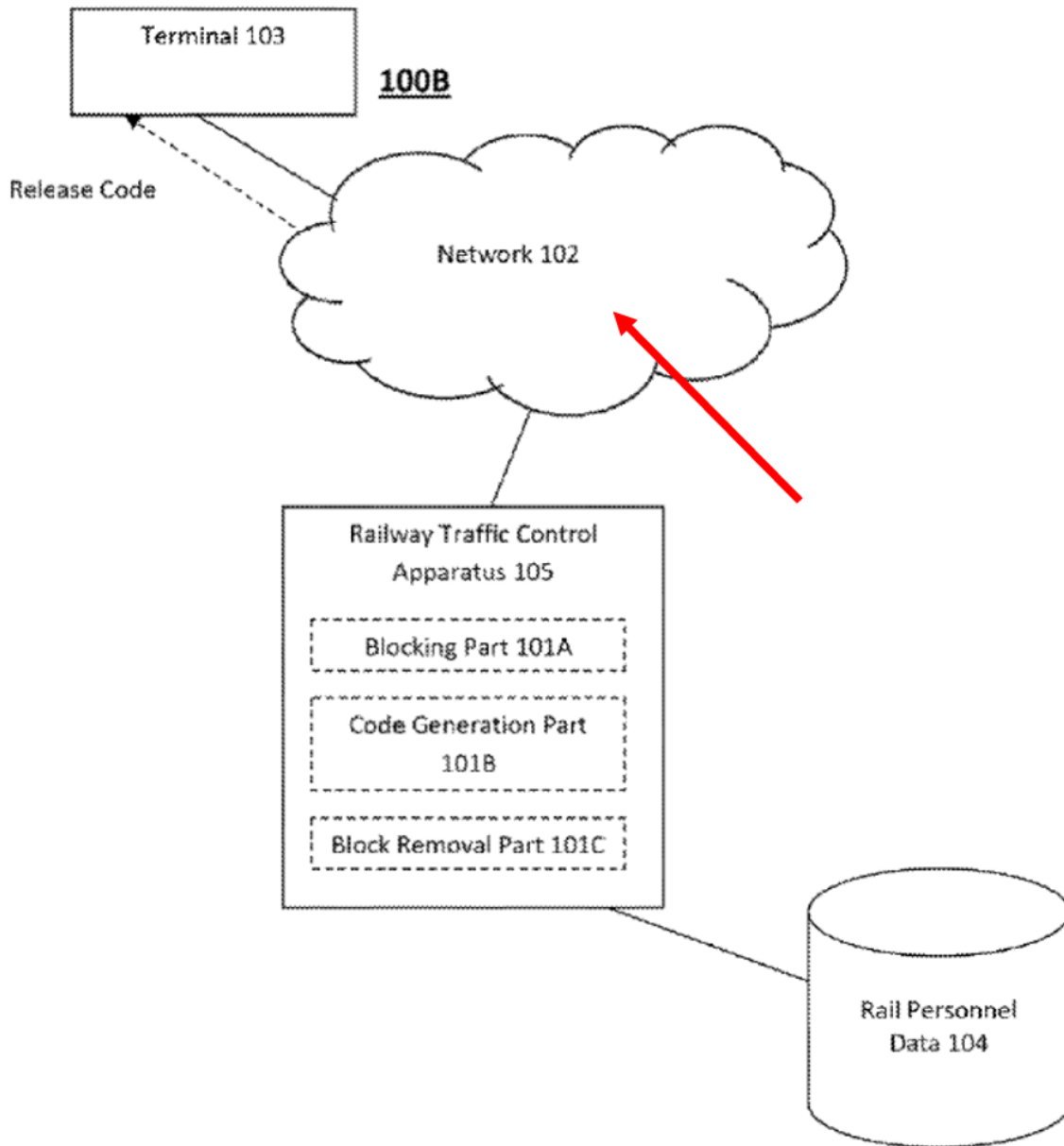


FIGURE 1B

385. Further, it is my view that a POSITA would appreciate that what comprises a “network” is broadly understood from the specification, and includes a number of combinations of various communications systems and hardware and software components. *See, e.g.*, ’835

patent at 5:4-22 (“The network 102 can be any data network, a local area network, a wide area network or any type of network such as an intranet, an extranet (for example, to provide controlled access to external users, for example through the Internet), a private or public cloud network, the Internet, etc., or a combination thereof. Further, other communications links (such as a virtual private network, a wireless link, etc.) may be used as well for the network 102.

In addition, the network 102 preferably uses TCP/IP (Transmission Control Protocol/Internet Protocol), but other protocols such as SNMP (Simple Network Management Protocol) and HTTP (Hypertext Transfer Protocol) can also be used.”); *see also id.* at 4:54-65 (“The drawings show examples of implementations of the subject matter of this patent disclosure in several computing environments. However, it should be understood that the subject matter of this disclosure can be utilized by any computing device including but not limited to PDAs (personal digital assistants), cell phones, personal, notebook and workstation computers, kiosks, other information terminals, [WIC (or another)] pager, etc. In addition, the subject matter of this disclosure might be provided as services in a modular fashion by other devices connected by a communication network.”)

386. As discussed in detail above (*see* paragraphs 341 to 351, which I incorporate here by reference), the specification of the ’835 patent describes numerous ways through exemplar embodiments in which the release code may be returned to the dispatcher or the railway control apparatus, including having the railway field worker automatically return the release code to the railway control apparatus (*e.g.*, through a text, embedded link, voice message, etc.) or having the railway field worker provide the release code first to the dispatcher, who then manually enters the release code into the user terminal of the dispatcher, so that the block can be removed by the railway control apparatus.

387. This further supports my opinion that a POSITA would appreciate that what comprises a “network” is broadly understood to include each of these communications systems and hardware and/or software components supporting them.

388. Furthermore, I have been informed that, in the context of patent drafting, the indefinite article “a” means “one or more” absent limiting language in the claims or the specification that would otherwise limit that definition. Based on my review of the claims and specification of the ’835 patent, I have found no language that could be construed as such a limitation. This further supports my opinion.

389. My opinion is further supported through how contemporaneous dictionaries have defined the term “network,” such as (i) “[a]n interconnected or interrelated chain, group, or system,” Merriam-Webster’s Collegiate Dictionary, 11th Ed. (2012) at 833, (ii) “[a] system of computers, peripherals, terminals, and databases connected by communications lines,” *id.*, (iii) “[a]n interconnected group or system,” Collins English Dictionary, 9th Ed. (2007) at 1094, (iv) “computing a system of interconnected computer systems, terminals, or other equipment allowing information to be exchanged,” *id.*, (v) “computing (of computers, terminals, etc.) to connect or be connected,” *id.*, (vi) “a number of interconnected computers, machines, or operations,” Concise Oxford English Dictionary, 11th Ed., Revised (2009) at 961.

c. **SEPTA’s Proposed Construction Is Inconsistent with the Claims and the Specification of the ’835 Patent and Improperly Reads Limitations into the Claims Beyond how a POSITA Would Understand the Claim Terms.**

390. I understand that SEPTA has proposed that the term “via the network” be construed as “via the same network used to transmit the secret release code.” As discussed above, I disagree that a POSITA would understand these terms to have the meaning that SEPTA

proposes for a variety of reasons. Specifically, SEPTA's proposed construction is inconsistent with the claims and the specification and improperly reads limitations into the claims beyond how a POSITA would understand the claim terms.

391. Based on my knowledge and experience and review of the documents provided to me, it appears to me that SEPTA's construction is formed primarily to advance arguments it makes in support of its various non-infringement positions, rather than grounding its proposed construction in the perspective of a POSITA or in any intrinsic or extrinsic evidence.

392. As discussed in paragraphs 292, 318 and 354 of this Declaration, I understand that SEPTA intends to argue that it does not infringe the Asserted Patents because "in the accused [systems and methods], the railway field worker communicates the work zone key verbally to the CTC dispatcher over a separate radio network." *See, e.g.,* Non-Infringement Contentions Chart B, at 87.

393. It is my opinion that SEPTA's focus on limiting the term "via the network" to only describe configurations whereby the railway traffic control apparatus receives a secret code from the device of the railway field worker *only through the same network* that was used to transmit the secret code to the device of the railway field worker is a further attempt by SEPTA to buttress this non-infringement position by creating an improper and unsupported limitation in the Asserted Patents (that does not exist), which would potentially exclude SEPTA's radio-based return operation. But the Asserted Patents do not support this construction, and SEPTA's proposed construction is, again, problematic for a host of reasons.

394. First, SEPTA's proposed construction improperly adds a limitation into the claim language at issue by requiring that the railway traffic control apparatus must be able to receive a secret code from the device of the railway field worker through the *same network* that was used

to transmit the secret code to the device of the railway field worker. This limitation is not in the claims at issue. The claims are, on their face, agnostic as to whether the same, or a different, network is utilized to transmit the secret code back to the railway traffic control apparatus.

395. Second, the intrinsic evidence cited by SEPTA on this point, much of which I rely on in my discussion above, does not provide any support for SEPTA's proposed construction. Rather, the intrinsic evidence, in this case the specification of the '835 patent, runs directly contrary to SEPTA's proposed construction.

396. This is because the specification is clear that, for example, "[t]he network 102 can be any data network, a local area network, a wide area network or any type of network such as an intranet, an extranet (for example, to provide controlled access to external users, for example through the Internet), a private or public cloud network, the Internet, etc., *or a combination thereof*." '835 patent at 5:4-22 (emphasis added). Accordingly, the specification contemplates the potential use of multiple networks in the inventions described, rather than a single network as SEPTA proposes.

397. Further, as discussed above, SEPTA's proposed construction would read-out Railware's own commercial embodiment, EEPS. In Railware's commercial embodiment, the release code is provided by the field worker back to the dispatcher through a phone call, not necessarily through the mobile user device user interface, as SEPTA contends. This further indicates that SEPTA's proposed construction is inconsistent with the Asserted Patents.

398. A POSITA would therefore understand from the specification that the "same network" need not be utilized for both transmission and return of the secret code.

399. Accordingly, it is my opinion that "via the network" does not require construction, and that SEPTA's proposed construction should be rejected.

* * * *

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge.

Respectfully submitted,

Dated: March 14, 2025

A handwritten signature in black ink, appearing to read 'Mehdi Ahmadian', is written above a horizontal line.

Mehdi Ahmadian, Ph.D.

EXHIBIT 1

MEHDI AHMADIAN

J. Bernard Jones Chair and Director
Fellow, ASME, SAE International, ISCM, IIAV; Associate Fellow, AIAA

Center for Vehicle Systems & Safety
College of Engineering, MC – 0901
Virginia Polytechnic Institute and State University
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Education

- Ph.D. Mechanical Engineering, State University of New York at Buffalo, 1984
- MBA Business Administration, Pennsylvania State University – Behrend College, 1994
- M.S. Mechanical Engineering, State University of New York at Buffalo, 1982
- B.S. Mechanical Engineering, State University of New York at Buffalo, 1980

Qualifications

Dr. Ahmadian's expertise includes product liability and patent litigations involving vehicular systems for automobiles, heavy trucks, and railroad equipment. He has been involved in conceptualization, design, engineering, research, and testing of various components related to active safety systems for ground vehicles.

For nearly three decades, as an independent consultant, Dr. Ahmadian has served as an expert witness and case consultant for a broad spectrum of cases. His legal consulting has included case review, design analysis, vehicle inspection, claim construction, inter partes reviews (IPR), discovery report preparation, deposition, and courtroom testimony. Additionally, he has conducted numerous Professional Development Seminars (short courses) for the Society of Automotive Engineers (SAE International) and his clients on topics directly related to vehicle dynamics, including tires, steering systems, brake systems, axle suspensions, and active safety systems. The seminars are attended by practicing engineers.

Dr. Ahmadian is J. Bernard Jones Chair of Mechanical Engineering at Virginia Tech, where he also holds the position of Director of the Center for Vehicle Systems and Safety (CVeSS), and the Railway Technologies Laboratory (RTL). He is the founding director of CVeSS, RTL, Virginia Institute for Performance Engineering and Research (VIPER), and the Advanced Vehicle Dynamics Laboratory (AVDL). Before joining Virginia Tech in 1995, Dr. Ahmadian worked in the transportation industry for eight years, including serving as the Lead Design Engineer for steerable locomotive trucks (bogies) at General Electric Transportation System from 1993 to 1995. He also held various engineering and management positions at Lord Corporation from 1987 to 1993. Dr. Ahmadian has co-authored eight books, four book chapters, more than 175 archival journal papers, more than 230 refereed conference publications, and more than 155 un-refereed conference publications. He has made more than 400 technical presentations, including numerous major keynote and plenary lectures and invited presentations. He holds 12 U.S. and international patents, with an additional patent application pending. He has served as Editor-in-Chief of the *Journal of Vibration and Control* (2013 – 2023), Editor of the *International Journal of Vehicle System Dynamics* (2008 – 2022), Editor-in-Chief of *Shock and Vibration* journal (2011 – 2016), Editor-in-Chief of *Advances in Automobile Engineering* (2010 – 2014). He has also served on the editorial board of numerous journals including Associate Editor for the *ASME Journal of Vibration and Acoustics* (1989 – 1996), the *AIAA Journal* (2000 – 2008), and *Shock and Vibration* (2003 – 2011). Dr. Ahmadian is a Fellow of the American Society of Mechanical Engineers (ASME), Fellow of the SAE International, Fellow of the International Society for Condition Monitoring (ISCM), Fellow of the International Institute of Acoustics and Vibration (IIAV), and Associate Fellow of the American Institute for Aeronautics and Astronautics (AIAA).

His most recent professional awards include the 2024 SAE Medal of Honor (the *highest* recognition of life-time achievement bestowed on *one* SAE member per year), the 2023 Virginia Tech Alumni Award for Research Excellence, regarded as the most prestigious Virginia Tech award for significant life-long research contributions. He is also the recipient of the 2019 SAE Magnus Hendrickson Innovation Award, the seminal SAE International award in vehicle dynamics and suspension technologies; the SAE International 2019 Top Contributor Award; the 2015 SAE International Lloyd L. Withrow Distinguished Speaker Award; the 2014 SAE International L. Ray Buckendale Award (the ultimate recognition in vehicle

engineering) with a plenary lecture on “Integrating Electromechanical Systems in Commercial Vehicles for Improved Handling, Stability, and Comfort”; the 2013 COMVEC Best Presentation Award; the 2013 Simulation Multi-Conference Best Paper Award; and the 2008 SAE International Forest R. McFarland Award. Dr. Ahmadian is an active member of the SAE International and ASME and has held various volunteer leadership positions within both professional societies during the past two decades. Some of his most recent professional volunteer positions include Member of SAE International Executive Nominating Committee (ENC); Chair of the SAE International Fellows Selection Committee, and the longest-serving member of the SAE International Commercial Vehicle Engineering Congress (COMVEC) Executive Council.

Experience

Virginia Polytechnic Institute and State University (Virginia Tech):

J. Bernard Jones Chair: April 2020 – present

Dan Pletta Professor: March 2014 – April 2020

Professor: August 2001 – March 2014

Associate Professor: August 1998 – August 2001

Assistant Professor: May 1995 – August 1998

Founding Director, Advanced Vehicle Dynamics Laboratory: August 1995 – January 2005

Founding Director, Center for Vehicle Systems and Safety: January 2005 – present

Founding Director, Railway Technologies Laboratory: August 2004 – present

Founding Director, Virginia Institute for Performance Engineering and Research: January 2003 – 2006

Army Research Laboratory and Aberdeen Test Center:

Visiting Scientist: August 2002 – July 2003

General Electric Transportation Systems

Project Manager & Senior Mechanical Systems Engineer: Feb. 1993 – May 1995

Lord Corporation

Staff Engineer and Section Manager: March 1991 – February 1993

Senior Engineering Specialist: February 1989 – March 1991

Engineering Specialist: August 1987 – February 1989

Clemson University, Department of Mechanical Engineering

Assistant Professor: August 1984 – August 1987

Air Force Wright Aeronautical Laboratories

Summer Faculty Research Fellow: May 1986 – August 1986

State University of New York at Buffalo

Graduate Research Assistant and Graduate Teaching Assistant: August 1980 – August 1984

Awards

SAE Medal of Honor	The <u>highest</u> recognition of life-time achievement bestowed on <u>one</u> SAE member per year
Alumni Award for Research Excellence	Regarded as the most prestigious Virginia Tech award for significant life-long research contributions, 2023
Magnus Hendrickson Innovation Award	Recipient of the Magnus Hendrickson Innovation Award, the seminal SAE International Award in Vehicle Dynamics and Suspension Technologies, 2019
SAE International 2019 Top Contributor of the Year Award	Awarded annually by the SAE International to the top 35 contributors from more than 250,000 members in 2019 (the inaugural class)
Lloyd L. Withrow Award	Recipient of the SAE International Lloyd L. Withrow Distinguished Speaker Award, 2015

L. Ray Buckendale Award	Recipient of the 61 st SAE International L. Ray Buckendale Award; The highest technical distinction of the SAE International Commercial Engineering Congress and Exhibition Congress (COMVEC); delivered a plenary lecture, entitled "Integrating Electromechanical Systems in Commercial Vehicles for Improved Handling, Stability, and Comfort," at 2014 COMVEC, Rosemont, IL, October 7 – 9, 2014
Best Presentation Award	SAE International Commercial Engineering Congress and Exhibition (COMVEC), Rosemont, IL, October 1 – 3, 2013
Best Paper Award	Simulation Multi-Conference, Toronto, Ontario, July 7 – 10, 2013
Forest R. McFarland Award	Recipient of the SAE International Forest R. McFarland Award. Recognizes individuals for their outstanding contributions toward planning, development, and dissemination of technical meetings, conferences, and professional development programs, 2008
Manager's Award	Recipient of the GE Transportation Systems Manager's Award for exceptional leadership of a business-critical project, 1995
General Manager's Award	Recipient of the GE Transportation Systems General Manager's Award, the highest distinction awarded to one technical contributor annually for exceptional contributions to a critical project that advances technology and increases market share, 1994
Gustav H. and Grete Zimmer Memorial Scholarship	University of Buffalo, Mechanical Engineering Department, awarded to distinguished juniors and seniors, 1978 – 1980

Editorship

Editor-in-Chief	<i>Journal of Vibration and Control</i> , January 2014 – December 2023
Editor	International Journal of <i>Vehicle System Dynamics</i> , January 2008 – December 2022
Editor-in-Chief	<i>Shock and Vibration</i> , October 2011 – December 2016
Editor-in-Chief	<i>Advances in Automobile Engineering</i> , May 2012 – August 2014
Senior Editor	<i>Journal of Vibration and Control</i> , January 2014 – August 2014
Editor	<i>Advances in Mechanical Engineering</i> , January 2008 – August 2014
Editor	<i>Smart Materials Research</i> , May 2010 – August 2014
Editor	<i>Mechanical Engineering</i> , October 2010 – March 2014
Associate Editor	<i>Shock and Vibration</i> , March 2003 – October 2011
Associate Editor	<i>AIAA Journal</i> , December 2000 – 2008
Associate Editor	<i>ASME Journal of Vibration and Acoustics</i> , 1989 – 1996
Editorial Board	<i>Advances in Theoretical and Applied Mechanics</i> , February 2012 – present
Editorial Board	<i>Nonlinear Analysis and Differential Equations</i> , January 2013 – present
Editorial Board	<i>Journal of Theoretical and Applied Vibration and Acoustics</i> , April 2018 – present

Professional Society Leadership

COMVEC Executive Council	SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), 2006 – present
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Standards Executive Committee	SAE International Standards Executive Council, 2020 – present
European Research Council Member	Member of the international committee for evaluation of high-value, multiyear proposals, 2018 – present
IAVSD Board Member	International Association of Vehicle System Design (IAVSD), Elected Board Member, 2017 – present
IAVSD Vice Chair	International Association of Vehicle System Dynamics (IAVSD), Elected Officer, 2017 – present
COMVEC Technical Taskforce Chair	Chair of taskforce committee for significantly improving technical content of the SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), 2023 – present
IFTToMM TC Member	International Federation for the Promotion of Mechanism and Machine Science (IFTToMM) Technical Committee for Transportation Machinery, 2020 – present
National Academy of Engineers	ECP Brake Committee, 2016 – 2017
National Academy of Engineers	U.S. Transportation R&D Planning and Management Committee, 2015 – 2016
National Academy of Engineers	FRA R&D Strategic Plan Review Committee, 2015 – 2016
Executive Nominating Committee	SAE International, January 2016 – 2020
SAE Fellow Selection Committee	SAE International, 2016 – 2018 (Chair of Committee, 2017 – 2018)
SAE Membership Board	SAE International, 2012 – 2017
COMVEC Activity Committee	SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), 2005 – present
ASME RTD Chair	ASME Rail Transportation Division (RTD) Chair, April – December 2022
ASME RTD Executive Committee	ASME Rail Transportation Division (RTD), 2017 – 2023
ASME RTD Secretary	ASME Rail Transportation Division (RTD), 2019 – 2023
General Committee	ASME Rail Transportation Division (RTD), 1999 – 2023
Total Quality Response Team (TQRT)	SAE International, 2011 – 2018
Accreditation Board for Engineering and Technology (ABET)	Visitor, January 2006 – December 2013
IIUM Program Reviewer University, Malaysia	IIUM University, Malaysia, Program Reviewer, Automotive Engineering, 2008 – 2018
Truck and Bus Human Factors Committee	SAE International, 2002 – 2010
Transportation Committee	ASME Dynamic Systems and Control Division, 1998 – 2020

Vehicle Design Committee	ASME Design Engineering Division, 2002 – 2020
Dynamics of Structures and Systems	ASME Applied Mechanics Division, 1991 – 1999
SAE International Chassis and Suspension Committee Chair	SAE International, Chair (2005 – 2014), Vice Chair, (2004 – 2005)
ASME Virginia Section Chair	American Society of Mechanical Engineers (ASME), Chair (1988 – 2002), Vice Chair (1986 – 1988)

Technical Conference Leadership

Organizer & Moderator	Smart Engineering Executive Panel, SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), September 19 – 21, 2023
Conference Co-Chair	The 2023 International Association of Vehicle System Dynamics (IAVSD) Bi-Annual Conference, Ottawa, Canada, August 21 – 25, 2023
Scientific Committee Co-Chair	The 2023 International Association of Vehicle System Dynamics (IAVSD) Bi-Annual Conference, Ottawa, Canada, August 21 – 25, 2023
IFTToMM TC Member	Member of Technical Committee for Transportation Machinery, the 16 th International Federation for the Promotion of Mechanism and Machine Science (IFTToMM) World Congress, Tokyo, Japan, November 5 – 10, 2023
Conference Chair	ASME Joint Rail Conference, April 11 – 13, 2023, Baltimore, MD
Symposium Chair	2nd RailTEAM Symposium on Railroad Infrastructure Diagnosis & Prognosis, Roanoke, VA, May 23 – 24, 2022
Chair	Product Development Track - Vehicles of the Future - Challenges in Requirements, Development, and Testing, SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), Chicago, IL, 2021
COMVEC Technical Paper Chair and Guest Editor	SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), Chicago, IL, 2020, and Special issue of the SAE International Journal of Commercial Vehicles
5th International Conference on Dynamics, Vibration and Control	Co-Chair, Shijiazhuang, China, 2018
COMVEC Technical Program Chair	SAE International Commercial Vehicle Engineering Congress & Exhibition (COMVEC), Chicago, IL, 2014 – 2015 and 2009 – 2010
COMVEC Technical Program Vice-chair	Activity Committee, SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, 2013 – 2014, and 2007 – 2008
European Conference of Mechanical Engineering Scientific Committee	ECME'13, Paris, France, 2013

Truck Handling, Dynamics, and Control Symposium Organizer	SAE International, Greenville, SC, 2012; Greenville, SC, 2005, and Baltimore, MD, 2003
American Control Conference Publicity Chair	American Control Conference, San Francisco, CA, 2011
Vibration and Control of Smart Structures Symposium Organizer	American Society of Mechanical Engineers (ASME), International Design Engineering Technical Conference & Computer and Information in Engineering Conference, Washington, D.C., 2011
The 14 th , 15 th , and 16 th SPIE International Conference Chair	Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring, San Diego, CA, 2007, 2008, and 2009
Advanced Suspension Systems Symposium Chair	Advanced Suspension Systems, Detroit, MI, 2008
Commercial Vehicle Chassis and Suspensions Symposium Organizer	Commercial Vehicle Engineering Congress & Exhibition, Chicago, Illinois, November 2005, 2006, and 2007
Active and Passive Structures and Integrated Systems Conference Vice-chair	The 13th SPIE International Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring San Diego, CA, 2006
Automotive Dynamics Stability and Controls Conference	SAE International, Organizing Committee, Detroit, MI, 2006
Damping and Isolation Conference Vice-chair	The 12th SPIE International Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring, San Diego, CA, 2005
International Conference on Mechanical Engineering and Mechanics	Organizing Committee, Nanjing University of Science and Technology, China, 2005
Vehicle Design Session Organizer	American Society of Mechanical Engineers (ASME), International Mechanical Engineering Conference and Exposition (IMECE), Design Engineering Division, Orlando, FL, 2005
Smart Structures and Materials Organizing Committee	The 9 th , 10 th , and 11 th Annual International Symposium on Smart Structures and Materials, San Diego, CA, 2002, 2003, and 2004
Active Vibration Control and Actuation using Smart Materials Symposium Organizer	American Society of Mechanical Engineers (ASME), International Mechanical Engineering Congress and Exposition, Washington, D.C., 2003
Transportation Noise and Vibrations Symposium Organizer	The 17 th biennial Conference on Mechanical Vibration and Noise, Las Vegas, Nevada, 1999
Advanced Automotive Technologies Symposium Organizer	American Society of Mechanical Engineers (ASME), Winter Annual Meeting, New Orleans, Louisiana, 1994

Professional Society Membership

American Society of Mechanical Engineers (ASME)	Member (1984 – 1996), Fellow (1996 – present)
SAE International	Member (2001 – 2012), Fellow (2012 – present)
International Society for Condition Monitoring (ISCM)	Fellow, 2021 – present
International Institute of Acoustics and Vibration (IIAV)	Fellow, 2021 – present
American Institute of Aeronautics and Astronauts (AIAA)	Associate Fellow, 1984 – present
American Railway Engineering and Maintenance-of-Way Association (AREMA)	Member, 2011 – present
American Society of Education for Engineers (ASEE)	Member, 1984 – 2001
Tau Beta Pi National Engineering Honorary Society	Member, 1979 – present

Patents

1. Kinetic Energy-Harvesting Device for Powering and Charging Railway and Other Applications, U.S. Patent US2022/0337124 A1, September 10, 2024.
2. Dual-action rotary dynamic load stabilization pneumatic valve system, U.S. Patent 9,975,392, May 22, 2018.
3. A Compact Lightweight Double-piston Magnetorheological (MR) Damper with large adjustable dynamics force, Chinese Patent # ZL 201110420869.8, December 25, 2013.
4. A Compact Lightweight Double-piston Magnetorheological (MR) Damper, Chinese Patent # ZL 201110418073.9, January 9, 2014.
5. Doppler Sensor for the Derivation of Torsional Slip, Friction, and Related Parameters, U.S. Patent 8,294,883, October 23, 2012.
6. Doppler Sensor for the Derivation of Torsional Slip, Friction and Related Parameters, U.S. Patent 7,705,972, April 27, 2010.
7. No Jerk Semiactive Suspension System, U.S. Patent 6,115,658, September 5, 2000.
8. No Jerk Semi-Active Skyhook Control Methods and Apparatus, Canadian Patent Application, No. 09/225,147, December 17, 1999.
9. Self-Steering Locomotive Truck, U.S. Patent 6,006,674, December 28, 1999.
10. Self-Steering Locomotive Truck, U.S. Patent 5,746,135, May 5, 1998.
11. Self-Steering Locomotive Truck, U.S. Patent 5,613,444, March 25, 1997.
12. Electromagnetically Operated Pneumatic Valve Assembly for an Electrical Contactor Actuator, U.S. Patent 5,409,036, April 25, 1995.

Major Keynote Lectures and Plenary Addresses

1. The 8th International Conference on Condition Monitoring in Non-Stationary Operations (CMMNO 2024), Wenzhou, China, May 11 – 14, 2024.
2. Intelligent Transportation: From Model T to Autonomous Vehicles, University of Toledo's 2023 Theodore "Ted" Keith Annual Distinguished Lecture (one individual selected annually by a university committee in recognition of the nominees' life-long technical leadership and achievements), October 27, 2024.
3. The 2023 International Association of Vehicle System Dynamics (IAVSD) Bi-Annual Conference, "Dynamics performance of long combination vehicles with active control systems," Ottawa, Canada, August 21 – 25, 2023.
4. Iranian Society of Acoustics and Vibration (ISAV), "Low-Profile Magnetorheological Fluid Mounts," Tehran, Iran, December 8 – 9, 2021. (Virtual)
5. The 7th International Conference on Condition Monitoring and Asset Management, Plenary Lecture, "LiDAR System Applications for Improving Condition Monitoring and Asset Management of Railways," London, England, September 6 – 10, 2021. (Virtual)
6. International Conference on Rail Transportation (ICRT2021) "Achieving Improved Understanding of Wheel-Rail Interface Dynamics Through Roller Rig Testing," Chengdu, China, July 5 – 6, 2021. (Virtual)
7. The 9th ECCOMAS Thematic Conference on Smart Structures and Materials, Plenary Lecture, "Advancing Vehicle Safety Through Smart Systems," SMART 2019, Paris, France, July 8 – 12, 2019.
8. Ahmadian, M., "Railroad Track Monitoring Technologies," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
9. The 2017 International Association of Vehicle System Design (IAVSD) Conference, State of the Art Lecture, "Magneto-Rheological Semiactive Suspensions for Improving Ground Vehicle's Ride Comfort, Stability, and Handling," Rockhampton, Queensland, Australia, August 14 – 18, 2017.
10. The 2016 Annual North Carolina Trucking Association Meeting (NCTA), "Trucking Ahead Toward Higher Productivity and Better Safety: A review of current and future technologies," Ashville, NC, October 11 – 12, 2016.
11. The 2014 SAE International Commercial Vehicle Engineering Congress (COMVEC), "Integrating Electromechanical Systems in Commercial Vehicles for Improved Handling, Stability, and Comfort," L. Ray Buckendale Lecture, Rosemont, IL, October 7 – 9, 2014.
12. The 2014 SAE International Commercial Vehicle Engineering Congress (COMVEC), "Effective Methods for Controlling Noise and Vibrations in Commercial Trucks: Passive and Semiactive Approaches," Rosemont, IL, October 1 – 3, 2013.
13. The 2012 International Conference on Advanced Vehicle Technologies and Integration, "The Magic of Magneto Rheological Fluids: Past, Present, and Future," Changchun, China, July 16-19, 2012.
14. SAE International Heavy Truck Handling, Dynamics, and Control Symposium, "Heavy Truck Handling, Dynamics and Control: Past, present, and future," Greenville, SC, May 15 – 17, 2012.
15. The 2nd International Conference on Mechatronics, "Non-dimensional Analysis of Semiactive Magneto-Rheological Suspensions for Optimizing Vehicle Ride, Handling, and Stability," Kuala Lumpur, Malaysia, May 10 – 12, 2005.
16. The International Conference on Mechanical Engineering and Mechanics (ICMEM2005), "The Challenges of Correlating Subjective and Objective Ride in Ground Vehicles," Nanjing University of Science and Technology, China, October 26 – 28, 2005.

Books and Edited Volumes

1. Huang, W. and Ahmadian, M. (Ed.) Advances in Dynamics of Vehicles on Roads and Tracks III, Proceedings of the 28th Symposium of the International Association of Vehicle System Dynamics, IAVSD 2023, August 21–25, 2023, Ottawa, Canada - Volume 1: Rail Vehicles, October 2024.
2. Huang, W. and Ahmadian, M. (Ed.) Advances in Dynamics of Vehicles on Roads and Tracks III, Proceedings of the 28th Symposium of the International Association of Vehicle System Dynamics, IAVSD 2023, August 21–25, 2023, Ottawa, Canada - Volume 2: Road Vehicles, October 2024.
3. Ahmadian, M. (Ed.), Active and Passive Structures and Integrated Systems, Proceedings of SPIE, Volume 7288, May 2009.
4. Ahmadian, M. (Ed.), Active and Passive Structures and Integrated Systems, Proceedings of SPIE, Volume 6928, May 2008.
5. Ahmadian, M. (Ed.), Advanced Automotive Technologies 1993, DSC-52, American Society of Mechanical Engineers, New Orleans, Louisiana, November 1993.
6. Ahmadian, M. (Ed.), *Shock and Vibration*, Guest Editor for Special Issues on Gun Dynamics, IOS Press, Amsterdam, the Netherlands, December 2001.
7. Ahmadian, M. (Ed.), *Shock and Vibration*, Guest Editor for Special Issues on Gun Dynamics, IOS Press, Amsterdam, the Netherlands, February 2002.
8. Ahmadian, M. (Co-ed.), Co-edited with W. W. Clark and A. Lumsdaine, Damping and Isolation, *SPIE International Symposium on Smart Structures and Materials*, March 2006.

Book Chapters

1. Meirovitch, L., and Ahmadian, M., "Vibration," Mark's Standard Handbook for Mechanical Engineers, 12th Edition, Section 3.4, 2017.
2. Hawthorne V. T., Hawthorne, K. L., and Ahmadian, M., "Railway Engineering," Mark's Standard Handbook for Mechanical Engineers, 12th Edition, Section 11.2, 2017.
3. Sardar, H. and Ahmadian, M., "Effect of System Nonlinearities on the Modified Model Referenced Adaptive Control Scheme," *Structronic Systems: Smart Structures, Devices and Systems*, World Scientific Publication Company, Vol. 2, pp. 294 – 315, 1997.
4. Ahmadian, M., "Active Control of Vehicle Vibrations," *Encyclopedia of Vibration*, Academic Press, London, 2001, October 2001.

Journal Publications

1. Chen, Y., Li, L., and Ahmadian, M., "Rollover Analysis and Prevention for Commercial Vehicles: Literature Survey," *Vehicle System Dynamics*, Submitted November 2024, in review.
2. Chen, Y., Zhang, Z., Neighborgall, C., and Ahmadian, M., "Effect of Drum and Disc Brakes on Roll Stability of Double-trailer Trucks During Braking-in-turn Maneuvers," *Vehicle System Dynamics*, January 2024. (<https://doi.org/10.1080/00423114.2025.2460493>)
3. Bollineni, R. K., Ahmadian, M., Tonks, M., and Mirzaeifar, M., "Microstructural material design of pearlitic steel lamella for desired mechanical properties," *Materials Today Communication*, Vol. 41, December 2024, 110691. <https://doi.org/10.1016/j.mtcomm.2024.110691>
4. Chen, Y., Neighborgall, C., Zheng, X., and Ahmadian, M. (2024), "Field Testing and Performance Evaluation of Roll Stability Control System of Double-Trailer Trucks," *Advances in Dynamics of Vehicles on Roads and Tracks III*, IAVSD 2023, Lecture Notes in Mechanical Engineering, Springer, Volume 2: Road Vehicles, October 2024, pp. 209 – 216. (https://doi.org/10.1007/978-3-031-66968-2_21)

5. Radmehr, A., Mirzaei, M., Larson, I., Holton, C., and Ahmadian, M., "Railroad Track Gage Widening Assessment Using On-board Doppler LiDAR Velocity Measurements and Unsupervised Machine Learning Technique," Advances in Dynamics of Vehicles on Roads and Tracks III, IAVSD 2023, Lecture Notes in Mechanical Engineering, Springer, Volume 1: Rail Vehicles, October 2024, pp. 97 – 106. https://doi.org/10.1007/978-3-031-66971-2_11
6. Mirzaei, M., Radmehr, A., Holton, C., and Ahmadian, M., "In-Motion, Non-Contact Detection of Ties and Ballasts on Railroad Tracks," Applied Science, September 2024, Vol. 14, Issue 19, pp. 8804 – 8823. <https://doi.org/10.3390/app14198804>
7. Kasch, J. and Ahmadian, M., "Design and Operational Assessment of a Railroad Track Robot for Railcar Undercarriage Condition Inspection," Designs, July 2024, Vol. 8, Issue 4, pp. 70 – 100. <https://doi.org/10.3390/designs8040070>
8. Kumar, N., Radmehr, A., and Ahmadian, M., "Experimental Evaluation of Effect of Leaves on Railroad Tracks in Loss of Braking," Machines, April 2024, Vol. 12, No. 5, pp. 301 – 318. <https://doi.org/10.3390/machines12050301>
9. Shaju, A., Southward, S. C., and Ahmadian, M., "Enhancing Autonomous Vehicle Navigation with a Clothoid-Based Lateral Controller," Applied Sciences, Volume 14, Issue 5, pp. 1817 – 183, February 2024. (<https://doi.org/10.3390/app14051817>)
10. Chen, Y., S. M. H. Mirzaei, Holton, C., and Ahmadian, M., "Development of An Optical Sensing System for the Detection of Lubricity Conditions on the Rail Gage Face," International Journal of Rail Transportation, Vol. 13, No. 1, pp. 103 – 119, February 2024. (<https://doi.org/10.1080/23248378.2024.2309618>)
11. Ahmadian, M., Chen, Y., and Zhang, Z., "Emergency collision avoidance maneuvers of multi-trailer articulated heavy vehicles," Vehicle System Dynamics, Vol. 62, Issue 11, pp. 2837 – 2860, January 2024. (<https://doi.org/10.1080/00423114.2024.2305292>)
12. Neighborgall, C., Chen, Y., and Ahmadian, M., "Tyre lateral slip effect on off-tracking of a long combination vehicle," Vehicle System Dynamics, Vol. 62, Issue 11, January 2024, pp. 2765 – 2784. (<https://doi.org/10.1080/00423114.2024.2304052>)
13. Shaju, A., Southward, S. C., and Ahmadian, M., "PID-Based Longitudinal Control of Platooning Trucks," Machines, Vol. 11, Issue 12, December 2023, pp. 1069 – 1080. (<https://doi.org/10.3390/machines11121069>)
14. Zheng, X., Chen, Y., and Ahmadian, M., "Interconnected Roll Stability Control System for Semitrucks with Double Trailers," SAE Technical Paper No. 2023-01-0906, 2023. (<https://doi.org/10.4271/2023-01-0906>)
15. Ali, G., McLaughlin, S., and Ahmadian, M., "The Surface Accelerations Reference— A Large-Scale, Interactive Catalog of Passenger Vehicle Accelerations," IEEE Transactions on Intelligent Transportation Systems, Vol. 24, Issue 9, September 2023, pp. 9031 – 9040. (<https://doi.org/10.1109/TITS.2023.3267844>)
16. Zhang, Z., Chen, Y., and Ahmadian, M., "Dimensionless Analysis of Rearward Amplification of Trucks with Single and Double Trailers: A Frequency Analysis," SAE International Journal of Commercial Vehicle, Volume 16, No. 3, 2023, pp. 245 – 2021. (<https://doi.org/10.4271/02-16-03-0015>)
17. Huang, M., Ahmadian, M., Rahimi, A., and Steinginga, L., "Dynamics performance of long combination vehicles with active control systems," Vehicle System Dynamics, Vol. 61, No. 7, May 2023, pp. 1829 - 1878. (<https://doi.org/10.1080/00423114.2023.2194545>)
18. Chen, Y., Zhang, Z., and Ahmadian, M., "When is it too Late to Brake?" Vehicle System Dynamics, Vol. 61, No. 11, 2023, pp. 2888 – 2911. (<https://doi.org/10.1080/00423114.2022.2144386>)

19. Pan, Y., Radmehr, A., and Ahmadian, M., "Experimental evaluation of the amount and repeated applications of top of rail friction modifiers on wear and adhesion," *International Journal of Rail Transportation*, Vol. 11, No. 6, 2023, pp. 855 – 871. (<https://doi.org/10.1080/23248378.2022.2119438>)
20. Pan, Y., Zuo, L., and Ahmadian, M., "A Half-wave Electromagnetic Energy-Harvesting Tie towards Safe and Intelligent Rail Transportation," *Applied Energy*, Volume 313, May 2022, 118844. (<https://doi.org/10.1016/j.apenergy.2022.118844>)
21. Hosseini, S-M, Hosseinian Ahangarnejad, A., Radmehr, A., and Ahmadian, M., "A Statistical Evaluation of Multiple Regression Models for Contact Dynamics in Rail Vehicles Using Roller Rig Data," *International Journal of Rail Transportation*, pp. 717 – 729, January 2022. (<https://doi.org/10.1080/23248378.2021.2021829>)
22. Zhang, Z., Sun, N., Chen, Y., and Ahmadian, M., "Detailed Modeling of Pneumatic Braking in Long Combination Vehicles," *SAE International Journal of Commercial Vehicle*, Volume 14, No. 3, October 2021, pp. 245 – 2021. (<https://doi.org/10.4271/02-14-03-0020>)
23. Chen, Y., Zheng, X., Zhang, Z., and Ahmadian, M., "Effect of Off-centered Loading on Roll Stability of Multi-trailer Trucks," *International Journal of Vehicle Performance*, Volume 8, No. 2/3, March 2022, pp. 271 – 295. (<https://doi.org/10.1504/IJVP.2022.122046>)
24. Ali, G., McLaughlin, S., and Ahmadian, M., "Quantifying the Effect of Roadway, Driver, Vehicle, and Location Characteristics on the Frequency of Longitudinal and Lateral Accelerations," *Accident Analysis and Prevention*, Volume 161, October 2021. (<https://doi.org/10.1016/j.aap.2021.106356>)
25. Ahmadian, M., Southern, B. M., "Isolation Properties of Low-Profile Magnetorheological Fluid Mounts," *Fluids*, Volume 6, Issue 4, April 2021. (<https://doi.org/10.3390/fluids6040164>)
26. Chen, Y., Zhang, Z., and Ahmadian, M., "Comparative Analysis of Emergency Evasive Steering for Long Combination Vehicles," *SAE International Journal of Commercial Vehicle*, Vol. 13, No. 3, October 2020, pp. 323 – 250. (<https://doi.org/10.4271/02-13-03-0018>)
27. Chen, Y., Zheng, X., Peterson, A. W., and Ahmadian, M., "Simulation Evaluation on the Rollover Propensity of Multi-Trailer Trucks at Roundabouts," *SAE International Technical Paper 2020-01-5005*, 2020. (<https://doi.org/10.4271/2020-01-5005>)
28. Ahangarnejad, A. H., Radmehr, A., and Ahmadian, M., "A Review of Vehicle Active Safety Control Methods: From Antilock brakes to Semi-Autonomy," *Journal of Vibration and Control*, Volume 27, Issues 15-16, August 2020. (<https://doi.org/10.1177/1077546320948656>)
29. Ferestade, I., Ahmadian, M., Molatefi, H., Moaveni, B., Bokaeian, V., "Integrated Sliding Mode and Direct Torque Controls for Improving Transient Traction in High-speed Trains," *Journal of Vibration and Control*, June 2020. (<https://doi.org/10.1177/1077546320932027>)
30. Chen, Y., and Ahmadian, M., "Countering the Destabilizing Effects of Shifted Loads through Pneumatic Suspension Design," *SAE International Journal of Vehicle System Dynamics, Stability, and NVH*, Vol. 4, No. 1, January 2020, pp. 5 – 17. (<https://doi.org/10.4271/10-04-01-0001>)
31. Chen, Y., Peterson, A. W., and Ahmadian, M., "Achieving anti-roll bar effect through air management in commercial vehicle pneumatic suspensions," *Vehicle system dynamics*, Vol. 57, No. 12, December 2019, pp. 1775-1794. (<https://dx.doi.org/10.1080/00423114.2018.1552005>)
32. Hosseinian, A. H., Melzi, S., and Ahmadian, M., "Integrated Vehicle Dynamics System through Coordinating Active Aerodynamics Control, Active Rear Steering, Torque Vectoring, and Hydraulically Interconnected Suspension," *International Journal of Automotive Technology*, Vol. 20, No. 5, August 2019, pp. 903 – 915. (<https://doi.org/10.1007/s12239-019-0084-x>)
33. Ahangarnejad, A. H., Melzi, S., Ahmadian, M., "Numerical Comparison of Two Methods for Integration of Active Rear Steering, Torque Vectoring and Hydraulically Interconnected

- Suspension,” International Journal of Vehicle Systems Modelling and Testing, Vol. 13, No. 2, March 2019, pp. 125 – 148. (<https://dx.doi.org/10.1504/IJVSMT.2018.098338>)
34. Chen, Y., Zhang, C., Peterson, A. W., and Ahmadian, M., “A Simulation-based Comparative Study on Lateral Characteristics of Trucks with Double and Triple Trailers,” International Journal of Vehicle Safety, Vol. 11, No. 2, 2019, pp. 136 – 157. (<https://dx.doi.org/10.1504/IJVS.2019.101857>)
 35. Ghodrati, M., Ahmadian, M., Mirzaeifar R., “Modeling of Rolling Contact Fatigue in Rails at the Microstructural Level,” Wear, No. 406, July 2018, pp. 205 – 217. <https://doi.org/10.1016/j.wear.2018.04.016>
 36. Chen, Y., Hou, Y., Peterson, A. W., and Ahmadian, M., “Failure Mode and Effects Analysis of Dual Leveling Valve Airspring Suspensions on Truck Dynamics,” Vehicle System Dynamics, Vol. 57, No. 4, 2109, pp. 617 – 635. <https://doi.org/10.1080/00423114.2018.1480787>
 37. Taheri, M. A., Peterson, Munoz, J. E., and Ahmadian, M., "Railway Track Irregularity and Curvature Estimation Using Doppler LIDAR Fiber Optics," Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit, Vol 232, Issue 1, January 2018, pp. 63 – 72. <https://doi.org/10.1177/0954409716660738>
 38. Hosseini-pour, M., Naderi-Soorki, M., and Ahmadian, M., “On Effective Electromagnetic Shielding of Modern Pulse Width Modulating Adjustable Speed Drives,” IEEE Transaction on Electromagnetic Compatibility, Vol. 60, Issue 4, October 2017, pp. 875 – 884. (DOI: <https://doi.org/10.1109/TEM.2017.2738840>)
 39. Ahmadian, M., “Magneto-rheological suspensions for improving ground vehicle’s ride comfort, stability, and handling,” Vehicle System Dynamics, Vol. 55, Issue 10, August 2017, pp. 1618 – 1642. (<https://doi.org/10.1080/00423114.2017.1323106>)
 40. Mousaviraad, M., Conger, M., Bhushan, S., Stern, F., Peterson, A. W., Ahmadian, M., "Coupled computational fluid and multi-body dynamics suspension boat modeling," Journal of Vibration and Control, August 2017. (<https://doi.org/10.1177/1077546317722897>)
 41. Albakri, M., Tarazaga, P., Ahmadian, M., Otter, D., “Impedance-based Structural Health Monitoring for Insulated Rail ASME Joints,” Association of American Railroads (AAR) Technology Digest, TD-17-032, pp. 1 – 4. November 2017.
 42. Li, Z.; Zhang, X., Guo, K., Ahmadian, M., and Liu, Y., "A novel squeeze mode based magnetorheological valve: design, test, and evaluation," Smart Materials and Structure, Vol. 25, 127003, November 2016. (<https://doi.org/10.1088/0964-1726/25/12/127003>).
 43. Ahmadian, M., Taheri, M. A., Munoz, J. E., Holton, C., Davis, D., “Track Geometry Inspection using Prototype LIDAR System,” Railway Track and Structure, July 2016, pp. 14 – 18.
 44. Yang, L., Ma, B., Ahmadian, M., Li, H., Vick, B., “Pressure Distribution of a Multidisc Clutch Suffering Frictionally Induced Thermal Load,” Tribology Transaction, Vol. 59, No. 6, June 2016, pp. 983 – 992.
 45. Hou, Y., Chen, Y., and Ahmadian, M., "A Simulation-Based Study on the Improvement of Semi-Truck Roll Stability in Roundabouts," SAE International Technical Paper 2016-01-8038, 2016. (<https://doi.org/10.4271/2016-01-8038>)
 46. Taheri, M. and Ahmadian, M., “Machine Learning from Computer Simulations with Applications in Rail Vehicle Dynamics,” Vehicle System Dynamics, Vol. 54, Issue, 5., March 2016, pp. 653 – 666. (<https://doi.org/10.1080/00423114.2016.1150497>)
 47. Meymand, S. Z., Keylin, A., and Ahmadian, M., “A survey of Wheel-rail Contact Models for Rail Vehicles,” Vehicle System Dynamics, Vol. 54, Issue 3, March 2016, pp. 386 – 428. (<https://dx.doi.org/10.1080/00423114.2015.1137956>)

48. Zhang, H., Zhang, X., Ahmadian, M., Zhang, N., and Wang, J., "Editorial: Recent Developments in Active and Semi-active Suspension System Design for Vehicular Applications," *International Journal of Vehicle Design*, Vol. 68, No 1/2/3, June 2015, pp. 1 – 4.
49. Yang, L., Ma, B., Ahmadian, M., Li, H., and Vick, B., "Pressure Distribution of a Multidisc Clutch Suffering Frictionally Induced Thermal Load," *Tribology Transaction*, Vol. 59, Issue 6, June 2016, pp. 983 – 992. (<https://dx.doi.org/10.1080/10402004.2015.1126877>)
50. Yang, L., Li, H., Ahmadian, M., and Ma, B., "Analysis of the Influence of Engine Torque Excitation on Clutch Judder," *Journal of Vibration and Control*, Vol. 23, issue 4, June 2015, pp. 645 – 655. (<https://doi.org/10.1177/1077546315582291>)
51. Chen, Y., Ahmadian, M., and Peterson, A., "Pneumatically Balanced Heavy Truck Air Suspensions for Improved Roll Stability," SAE International Technical Paper 2015-01-2749, 2015. (<https://doi.org/10.4271/2015-01-2749>)
52. Ahmadian, M., "Integrating Electromechanical Systems in Commercial Vehicles for Improved Handling, Stability, and Comfort," SAE International, *Journal of Commercial Vehicle*, Vol. 7, No. 2, October 2014, pp. 535 – 587. (<https://doi.org/10.4271/2014-01-2408>)
53. Taheri, S., Sandu, C., Ahmadian, M., Furukawa, T., Ferris, J., and Batur, C., "Technical note: NSF I/UCRC Centre for Tire Research (CenTiRe): an overview," *International Journal of Vehicle Design*, Vol. 65, No 2-3, September 2014, pp. 286-291.
54. Wang, Q., Ahmadian, M., and Chen, Z., "A Novel Double-Piston Magnetorheological Damper for Space Truss Structures Vibration Suppression," *Shock and Vibration*, Vol. 2014, Article ID 864765, doi 10.1155/2014/864765, July 22, 2014, 11 pages (<https://dx.doi.org/10.1155/2014/864765>).
55. Xu, Y. and Ahmadian, M., "Improving Vehicle Lateral Stability based on Variable Stiffness and Damping Suspension System via MR Damper," *IEEE Transactions on Vehicular Technology*, Vol. 63, No. 3, March 2014, pp. 1071 – 1078.
56. Shen, Y. and Ahmadian, M., "Nonlinear Dynamical Analysis on Four Semi-active Dynamic Vibration Absorbers with Time Delay," *Shock and Vibration*, Vol. 20, No. 4, 2013, pp. 649-663.
57. Xu, Y. and Ahmadian, M., "Improving the capacity of tire normal force via variable stiffness and damping suspension system," *Journal of Terramechanics*, 2013, Vol. 50 No. 2, pp. 121 – 132. (<https://doi.org/10.1016/j.jterra.2013.03.003>)
58. Zang, X., Ahmadian, M., and Guo, K. H., "On the Benefits of Semi-active Suspension with Inverters," *Shock and Vibration*, Vol. 19, No. 3, 2012, pp. 257-272.
59. Templeton, B.A., Ahmadian, M., and Southward, S., "Probabilistic Control Using H2 Control Design and Polynomial Chaos" Experimental Design, Analysis, and Results," *Probabilistic Engineering Mechanics*, Vol. 30, 2012, pp. 9-19.
60. Ahmadian, M., "An Exciting Future awaits us in Automotive Engineering Technologies," *Advances in Automotive Engineering*, January 2012. (<https://doi.org/10.4172/2167-7670.1000e105>)
61. Farjoud, A., Ahmadian, M., Craft, M., and Burke, W., "Nonlinear Modeling and Experimental Characterization of Hydraulic Dampers: Effects of Shim Stack on Orifice Parameters on Damper Performance," *Nonlinear Dynamics*, Vol. 67, 2012, pp. 1437 – 1456.
62. Soltan, R. and Ahmadian, M., "Extended Viterbi Algorithm for Hidden Markov Process: A Transient/Steady Probabilities Approach," *International Mathematical Forum*, Vol. 7, 2012, no. 58, pp. 2871 – 2883.
63. Farjoud, A., Mahmoodi, N., Ahmadian, M., "Nonlinear Model of Squeeze Flow of Fluids with Yield Stress Using Perturbation Techniques," *Modern Physics Letters B*, Vol. 26, No. 7, 2012, pp. 1150040-1 - 1150040-17.

64. Farjoud, A., Craft, M., Burke, W., and Ahmadian, M., "Experimental investigation of MR squeeze mounts," *Journal of Intelligent Material Systems and Structures*, Vol. 22, No. 15, 2011, pp. 1645-1652.
65. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Optimal Direct Yaw Controller Design for Vehicle Systems with Human Driver," *SAE International Journal of Commercial Vehicles*, Vol. 4, No. 1, 2011, pp. 13-21.
66. Tamaddoni, S. H., Alavi, H., Taheri, S., and Ahmadian, M., "Vehicle System Simulator: Development and Validation," *SAE International Journal of Commercial Vehicles*, Vol. 4, No. 1, 2011, pp. 67 – 83.
67. Zhang, X., Ahmadian, M., and Guo, K. H., "Dynamic Testing and Modeling of an MR Squeeze Mount," *Journal of Intelligent Material Systems and Structures*, Vol. 22, No. 15, 2011, pp. 1715-1726.
68. Farjoud, A., Mahmoodi, N., Zhang, X., Craft, M., and Ahmadian, M., "Nonlinear modeling and testing of Magneto-Rheological (MR) fluids in low shear rate squeezing flows," *Smart Materials and Structures*, Vol. 20, No. 8, 2011.
69. Tamaddoni, S.H., Taheri, S., Ahmadian, M., "Optimal Preview Game Theory Approach to Vehicle Stability Controller Design," *Vehicle System Dynamics*, Vol. 49, No. 12, 2011, pp. 1967-1979.
70. Tamaddoni S.H., Taheri, S., and Ahmadian, M., "Linear Quadratic Game Theory Approach to Optimal Preview Control of Vehicle Lateral Motion," *Journal of SAE International*, Vol. 4, No. 1, 2011, pp. 740 – 748.
71. Ahmadian, M. and Blanchard, E., "Advanced Suspension Systems and Dynamics for Future Road Vehicles," *Vehicle System Dynamics*, Vol. 49, No. 1-3, 2011, pp. 219 – 235.
72. Cao, D., Song, X., and Ahmadian, M., "Editor's Perspectives: Road Vehicle Suspension Design, Dynamics, and Control," *Vehicle System Dynamics*, Vol. 49, No. 1-2, 2011, pp. 3-28.
73. Templeton, B., Cox, D., Kenny, S., Ahmadian, M., and Southward, S., "On Controlling an Uncertain System with Polynomial Chaos and H Control Design," *Journal of Dynamic Systems, Measurement, and Control*, Vol. 132, No. 6.
74. Zhang, X., A. Farjoud, M. Ahmadian, K. Guo, M. Craft, "Dynamic Testing and Modeling of an MR Squeeze Mount," *Journal of Intelligent Material Systems and Structures*, Vol. 22, No. 15, October 2011, pp. 1717 – 1728.
75. Mahmoodi, S. N., Craft, M. J., Southward, S. C., and Ahmadian, M., "Active Vibration Control Using Optimized Modified Acceleration Feedback with Adaptive Line Enhancer for Frequency Tracking," *Journal of Sound and Vibration*, Vol. 330, January 2011, 1300 – 1311.
76. Blanchard, E. and Ahmadian, M., "Non-dimensionalized closed-form parametric analysis of semi-active vehicle suspensions using a quarter-car model," *Journal of Vehicle System Dynamics*, Vol. 49, No. 1, January 2011, pp. 219 – 236.
77. Tamaddoni, S. H., Taheri, S., Ahmadian, M., "Optimal Vehicle Stability Controller Based on Nash Strategy for Differential LQ Games," *International Journal of Vehicle Autonomous Systems*, Vol. 8, No. 2/3/4, 2010, pp. 171-189.
78. Rastgaar, A. M., Ahmadian, M., and Southward, S., "Vibration Cancellation in a Plate using Orthogonal Eigenstructure Control," *ASME Journal of Applied Mechanics*, Vol. 77, No. 6, November 2010, pp. 1007 – 1013.
79. Song, X., and Ahmadian, M., "Characterization of Semiactive Control System Dynamics with Magneto-Rheological Suspensions," *Journal of Vibration and Control*, Vol. 16, No. 10, September 2010, pp. 1439 – 1463.
80. Boggs, C. Ahmadian, M., and Southward, S., "Efficient Empirical Modeling of a High-Performance Shock Absorber for Vehicle Dynamics Studies," *Vehicle System Dynamics*, Vol. 48, No. 4, June 2010.

81. Mahmoodi, S. N., and Ahmadian, M., "Modified Acceleration Feedback for Active Vibration Control of Aerospace Structures," *Smart Materials and Structures*, Vol. 19, No. 6, June 2010.
82. Mahmoodi, S. N., Ahmadian M., and Inman, D. J., "Adaptive Modified Positive Position Feedback for Active Vibration Control of Structures," *Journal of Intelligent Material Systems and Structures*, Vol. 21, No. 6, February 2010, doi: 10.1177/1045389X10361631, pp. 57 – 64.
83. Rastgaar A. M., Ahmadian M., and Southward S. C., "Experimental Application of Orthogonal Eigenstructure Control for Structural Vibration Cancellation," *Journal of Sound and Vibration*, Vol. 329, No. 39, April 2010, pp. 3873 – 3887.
84. Mahmoodi, S. N., Ahmadian, M., and Inman, D. J., "Vibration Control of Microcantilever Using Adaptive Modified Positive Position Feedback," *Journal of Intelligent Materials and Smart Structures*, Vol. 21, No. 6, 2010, pp. 571–580.
85. Mahmoodi, S. N., Jalili, N., and Ahmadian, M., "Subharmonic Resonance Analysis of Nonlinear Flexural Vibrations of Piezoelectrically Actuated Microcantilevers," *Nonlinear Dynamics*, Vol. 59, No. 3, January 2010, pp. 397 – 409.
86. Tamaddoni, S. H., Taheri, S., and Ahmadian, M., "Optimal Vehicle Stability Controller Based on Nash Strategy for Differential LQ Games," *International Journal of Vehicle Autonomous Systems*, Vol. 8, No. 2/3/4, 2010, pp. 171-189
87. Rastgaar, M., Ahmadian, M., and Southward, S. C., "Orthogonal Eigenstructure Control for Vibration Suppression," *ASME Journal of Vibrations and Acoustics*, Vol. 132, No. 1, February 2010, pp. 1 – 10.
88. Farjoud, A., R. Cavey, M. Ahmadian, and M. Craft, "Magneto-rheological fluid behavior in squeeze mode," *Journal of Smart Materials and Structures*, Vol. 18, No. 9, 2009,): pp. 8.
89. Farjoud, A., Cavey, R., Ahmadian, M., and Namuduri, C., "Non-dimensional Modeling and Experimental Evaluation of an MR Squeeze Mode Rheometer," *Journal of Physics: Conference Series*, Vol. 149, No. 1, 2009.
90. Ihsan, S. I., Faris, W. F., and Ahmadian, M., "Transient and Steady State Dynamic Analysis of Passive and Semiactive Suspension Systems Using Half Car Model," *International Journal of Modeling, Identification and Control*, Vol. 6, No. 1, 2009, pp. 62-71.
91. Farjoud, A., Cavey, R., Ahmadian, M., and Craft, M., "Magneto-rheological fluid behavior in squeeze mode," *Journal of Smart Materials and Structures*, Vol. 18, No. 9, September 2009 pp. 1 – 8.
92. Mahmoodi, S. N. and Ahmadian, M., "Active Vibration Control with Modified Positive Position Feedback," *ASME Journal of Dynamics System, Measurements, and Control*, Vol. 131, No. 4, July 2009, pp. 1002 – 1010.
93. Rastgaar, M., Ahmadian, M., and Southward, S. C., "Orthogonal Eigenstructure Control using Non-Collocated Actuators and Sensors," *Journal of Vibration and Control*, Vol. 15, No. 7, 2009, pp. 1019 – 1047.
94. Ihsan, S. I., Ahmadian, M., Faris, W. F., and E. D. Blanchard, "Ride performance analysis of half-car model for Semi-active system using RMS as performance criteria," *Shock and Vibration*, Vol. 16, No. 6, December 2009, pp. 593 – 605.
95. Rastgaar M., Ahmadian M., and Southward S. C., "A Review on Eigenstructure Assignment Methods and Orthogonal Eigenstructure Control of Structural Vibrations," *Shock and Vibration*, Vol. 16, November 2009, pp. 555 – 564.
96. Faris, W. F., Ihsan, S. I., and Ahmadian, M., "A Comparative Ride Performance and Dynamic Analysis of Passive and Semiactive Suspension Systems Based on Different Vehicle Models," *International Journal of Vehicle Noise and Vibrations*, Volume 5, Nos. 1/2, October 2009, pp. 116 – 140.

97. Vahdati, N. and Ahmadian, M., "Hybrid Secondary Suspension Systems," *Shock and Vibration*, Vol. 16, No. 5, October 2009, pp. 467 – 480.
98. Rastgaar Aagaah M., Ahmadian M., and Southward S. C., "Orthogonal Eigenstructure Control with Non-collocated Actuators and Sensors," *Journal of Vibration and Control*, Vol. 15, No. 7, July 2009, 1019 – 1047.
99. Boggs, C. M., Ahmadian, M., and Southward, S. C., "Application of System Identification for Efficient Suspension Turning in High-Performance Vehicles: Quarter – Car Study," *SAE International Journal of Passenger Cars – Mechanical Systems*, Volume 1, Issue 1, April 2009, pp. 1298 – 1310.
100. Ahmadian, M. and Sandu, C., "An Experimental Evaluation of Magneto Rheological Front Fork Suspensions for Motorcycle Applications," *International Journal of Vehicle System Modeling and Testing*, Vol. 3, No. 4, 2008, pp. 296-311.
101. Ihsan, S. I., Faris, W. F., and Ahmadian, M., "Analysis of Control Policies and Dynamic Response of a Q- car 2-DOF semi-active system," *Journal of Shock and Vibration*, Vol. 15, No. 5, 2008, pp. 573-582.
102. Boggs, C. M. and Ahmadian, M., "Efficient Empirical Modeling of a High-Performance Shock Absorber for Vehicle Dynamics Studies," *SAE International Transactions, Journal of Passenger Cars: Mechanical Systems*, August 2008, pp. 885 – 896.
103. Sandu, C., Sandu, A., Chan, B. J., and Ahmadian, M., "A Response Spectral Decomposition Approach for the Control of Nonlinear Mechanical Systems," *International Journal of Heavy Vehicle Systems*, Volume 15, Issue 1, January 2008, pp. 27 – 52.
104. Koo, J. H. and Ahmadian, M., "Qualitative Analysis of Magneto-rheological Tuned Vibration Absorbers: Experimental Approach," *Journal of Intelligent Material Systems and Structures*, Vol. 18, No. 12, December 2007, pp. 1137 – 1142.
105. Song, X., Ahmadian, M., and Southward, S.C., "Analysis and Strategy for Superharmonics with Semiactive Magneto-Rheological Suspension Systems," *ASME Journal of Dynamic Systems, Measurement and Control*, Vol. 129, No. 4, November 2007, pp. 795 – 803.
106. Ahmadian, M. and J. A. Norris, "Experimental Analysis of Magneto Rheological dampers when subjected to Impact and shock loading," *Communications in Nonlinear Science and Numerical Simulation*, Volume 13, Issue 9, November 2007, pp. 1978 – 1985.
107. Ihsan, S. I., Faris, W. F., and Ahmadian, M., "Dynamics and Control Policies Analysis of Semiactive Suspension Systems Using a Full-car Model," *Int. J. Vehicle Noise and Vibration*, Vol. 3, No. 4, November 2007, pp. 370 – 405.
108. Boggs, C. M. and Ahmadian, M., "Field study to evaluate driver fatigue on air-inflated truck seat cushions," *International Journal of Heavy Vehicle Systems*, Volume 14, Issue 3, September 2007, pp. 227 – 253.
109. Song, X., Ahmadian, M., and Southward, S.C., "Parametric Study of Nonlinear Adaptive Control Algorithm with Magneto-rheological Suspension Systems," *Communications in Nonlinear Science and Numerical Simulation*, Vol. 12, No. 4, July 2007, pp. 584 – 607.
110. M. Setareh, J. K. Ritchey, T. M. Murray, J. H. Koo, and M. Ahmadian, "Semiactive Tuned Mass Damper for Floor Vibration Control," *Journal of Structural Engineering*, Vol. 133, No. 2, March 2007, pp. 242 – 250.
111. Elahinia, M. H. and Ahmadian, M., "Application of the Extended Kalman Filter to Control of a Shape Memory Alloy Arm," *Journal of Smart Materials and Structures*, Vol. 15, Number 5, October 2006, pp. 1370 – 1384.
112. Song, X., Ahmadian, M., Southward, S.C., and Miller, L., "Parametric Study of Nonlinear Adaptive Control Algorithm with Magneto-Rheological Suspension Systems," *Communications in Nonlinear Science and Numerical Simulation*, Vol. 12, Number 4, July 2006, pp. 584 – 607.

113. Sandu, A., Sandu, C., and Ahmadian, M., "Modeling Multibody Dynamic Systems with Uncertainties. Part I: Theoretical and Computational Aspects," *Multibody System Dynamics*, Vol. 15, Number 4, May 2006, pp. 369 – 391.
114. Goncalves F. D., Koo, J. H., and Ahmadian, M., "A Review of the State of the Art in Magnetorheological Fluid Technologies-Part I: MR Fluids and MR Fluid Models, *Shock and Vibration Digest*, Vol. 38, Number 3, May 2006, pp. 203 – 220.
115. Sandu, A., Sandu, C., and Ahmadian, M., "Modeling Multibody Dynamic Systems with Uncertainties. Part II: Numerical Applications," *Multibody System Dynamics*, Vol. 15, Number 3, April 2006, pp. 241 – 262.
116. Koo, J. H., Goncalves, F., and Ahmadian, M., "A comprehensive analysis of the response time of MR dampers," *Smart Materials and Structures*, Vol. 15, Number 2, April 2006, pp. 351 – 358.
117. Koo, J. H., and Ahmadian, M., "Experimental Robustness Analysis of Magneto-Rheological Tuned Vibration Absorbers Subject to Mass Off-tuning," *ASME Journal of Vibration and Acoustics*, Transactions of the ASME, Vol. 128, February 2006, pp. 126 – 131.
118. Ahmadian, M. and Vahdati, N., "Transient Dynamics of Semiactive Suspensions with Hybrid Control," *Journal of Intelligent Material Systems and Structures*, Vol. 17, Number 2, February 2006, pp. 145 – 153.
119. Goncalves F. D., Ahmadian, M., and Carlson, J. D., "Investigating the MR effect at high flow velocities," *Smart Materials and Structures*, Vol. 15, Number 1, February 2006, pp. 75 – 85.
120. Elahinia, M. H. and Ahmadian, M., "An Enhanced SMA Phenomenological Model. Part I. The Shortcomings of the Existing Models," *Journal of Smart Materials and Structures*, Vol. 14, Number 6, December 2005, pp. 1297 – 1308.
121. Elahinia, M. H. and Ahmadian, M., "An Enhanced SMA Phenomenological Model. Part II. The Experimental Study," *Journal of Smart Materials and Structures*, Vol. 14, Number 6, December 2005, pp. 1309 – 1319.
122. Song, X., Ahmadian, M., Southward, S. C., and Miller, L., "An Adaptive Semiactive Control Algorithm for Magneto-Rheological Suspension Systems," *ASME Journal of Vibration and Acoustics*, Vol. 127, No. 5, October 2005, pp. 493 – 502.
123. Elahinia, M. H., Ashrafiuon, H., and Ahmadian, M., "A Temperature – Based Controller for a Shape Memory Alloy Actuator," *ASME Journal of Vibration and Acoustics*, Vol. 127, No. 3, June 2005, pp. 285 – 291.
124. Ahn, Y. K., Kim, Y. C., Yang, B. S., and Ahmadian, M., "Optimal Design of Engine Mount Using an Enhanced Genetic Algorithm with Simplex Method," *Vehicle Systems Dynamics*, Vol. 43, No 1, February 2005, pp. 57 – 81. (Released June 2005)
125. Song, X., Ahmadian, M., and Southward, S. C., "Modeling Magneto-Rheological Dampers with Application of Nonparametric Approach," *Journal of Intelligent Material Systems and Structures*, Vol. 16, No. 5, May 2005, pp. 421 – 432.
126. Ahmadian, M., "Semiactive Fuzzy Logic Control for Heavy Truck Primary Suspensions: Is it Effective?" *SAE International Journal of Commercial Vehicles*, Volume 114, No. 2, April 2005, pp. 157 – 165.
127. Elahinia, M., Koo, J. H., and Ahmadian, M., "Improving Robustness of Tuned Vibration Absorbers using Shape Memory Alloys" *Shock and Vibration*, accepted for publication, March 2005, Vol. 12, No. 5, pp. 349 – 361.
128. Elahinia, M. H., Koo, J., Ahmadian, M., and Woolsey, C., "Backstepping Control of an SMA-Actuated Robotic Arm," *Journal of Vibration and Control*, March 2005, Vol. 11, No. 3, pp. 407 – 429.

129. Ahn, Y. K., Yang, B. S., Ahmadian, M., and Morishita, S., "A Small-Sized Variable – Damping Mount Using Magneto-Rheological Fluid," *Journal of Intelligent Material Systems and Structures*, Vol. 16, No. 2, February 2005, pp. 127 – 133.
130. Ahn, Y. K., Ha, J. Y., Kim, Y. H. and Yang, B. S., Ahmadian, M., and Morishita, S., "Dynamic Properties of Squeeze Type Mount Using MR Fluid," *Journal of Multi-Body Dynamics*, Part K, Vol. 219, No. 1, January 2005, pp. 27 – 34.
131. Goncalves, F. D., Ahmadian, M., and Carlson, J. D., "Behavior of MR fluids at high velocities and high shear rates," *International Journal of Modern Physics B*, Vol. 19, Nos. 7 – 9, pp. 1395–1401, 2005.
132. Ahmadian, M., Song, X., and Southward, S.C., "No-jerk Skyhook Control Methods for Semiactive Suspension," *ASME Journal of Vibration and Acoustics*, Vol. 126, No. 4, October 2004, pp. 580 – 584.
133. Elahinia, M. H. and Ahmadian, M., "Application of Time – Domain Identification Techniques for Evaluating Heavy Truck Dynamics," *SAE International Journal of Commercial Vehicles*, September 2004, pp. 118 – 129.
134. Elahinia, M. H. Ahmadian, M. and Ashrafiuon, H., "Design of a Kalman filter for rotary shape memory alloy actuators," *Journal of Smart Materials and Structures*, Vol. 13, Number 4, August 2004, pp. 691 – 697.
135. Elahinia, M., Seigler, T. M., Leo, D. J., and Ahmadian, M., "Nonlinear Stress-based Control of a Rotary SMA-Actuated Manipulator," *Journal of Intelligent Materials Systems and Structures*, Vol. 15, No. 6, June 2004, pp. 495 – 508.
136. Koo, J. H., Ahmadian, M., Setareh, M., and Murray, T., "In Search of Suitable Control Methods for Semi-active Tuned Vibration Absorbers," *Journal of Vibration and Control*, Vol. 10, No. 2, February 2004, pp. 163 – 174.
137. Vahdati, N. and Ahmadian, M., "Variable Volumetric Stiffness Fluid Mount Design," *Shock and Vibration*, Vol. 11, Number 1, January 2004, pp. 21 – 32.
138. Seigler, T., M. and Ahmadian, M., "Evaluation of an Alternative Seating Technology for Truck Seats," *International Journal of Heavy Vehicle Systems*, Volume 10, No. 3, August 2003, pp. 188 – 208.
139. Vahdati, N. and Ahmadian, M., "Variable Volumetric Stiffness Fluid Mount Design," *Shock and Vibration*, Vol. 11, No. 1, February 2003, pp. 21 – 32.
140. Seigler, T., M., Ahmadian, M., and Boggs, C. M., "Validation of an Indenter System for Evaluating Truck Seat Cushions," *Journal of Automobile Engineering*, Vol. 217, No. 5, May 2003, pp. 343 – 348.
141. Ahmadian, M., Appleton, R., and Norris, J. A., "Designing Magneto-Rheological Recoil Dampers in a Fire-out-of-Battery Recoil System," *IEEE Transactions on Magnetics*, Vol. 39, No. 1, January 2003, pp. 480 – 485.
142. Seigler, M. Ahmadian, M. and Boggs, C. "SAE International Validation of an Indenter System for Evaluating Truck Seat Cushions," *Journal of Automobile Engineering*, Vol. 217, 2003
143. Goncalves, F. D., and Ahmadian, M., "A Hybrid Control Policy for Semiactive Vehicle Suspensions," *Shock and Vibration*, Vol. 10, No. 1, January 2003, pp. 59 – 69.
144. Ahmadian, M., and Simon, D. E., "An Analytical and Experimental Evaluation of Magneto-Rheological Suspensions for Heavy Trucks," *International Journal of Vehicle System Dynamics*, Vol. 37, No. IAVSD Suppl. 37, 2003, pp. 38 – 49.
145. Ahmadian, M., Seigler, T. M., Clapper, D., and Sprouse, A., "A Comparative Analysis of Air-inflated and Foam Seat Cushions for Truck Seats," *SAE International Journal of Commercial Vehicles*, SP – 1730, November 2002.

146. Ahmadian, M., Appleton, R., and Norris, J. A., "An Analytical Study of Fire out of Battery using Magneto-Rheological Dampers," *Shock and Vibration*, Vol. 9, No. 3, June 2002, pp. 129 – 142.
147. Tuzcu, I. and Ahmadian, M., "Delay-Independent Stability of Uncertain Control Systems," *ASME Journal of Vibration and Acoustics*, Vol. 124, No. 2, April 2002, pp. 277 – 283.
148. Simon, D. E., and Ahmadian, M., "An Alternative Semiactive Control Method for Sport Utility Vehicles," *Journal of Automobile Engineering*, Vol. 216, Part D, April 2002, pp. 125 – 139.
149. Koo, J. H. and Ahmadian, M., "A Qualitative Analysis of Groundhook Tuned Vibration Absorbers for Controlling Structural Vibrations," *Journal of Multi-body Dynamics*, Vol. 216, Part K., February 2002, pp. 351 – 359.
150. Ahmadian, M., and Huang, W., "A Qualitative Analysis of the Dynamics of Self-Steering Locomotive Trucks," *International Journal of Vehicle System Dynamics*, Vol. 37, No 2, February 2002, pp. 85 – 127.
151. Inman, D. J., Ahmadian, M., and Claus, R. O., "Simultaneous Active Damping and Health Monitoring of Aircraft Panels," *Journal of Smart Material Systems and Structures*, Vol. 12, No. 11, November 2001, pp. 775 – 783.
152. Simon, D. E. and Ahmadian, M., "Vehicle Evaluation of the Performance of Magneto-Rheological Dampers for Heavy Truck Suspensions," *ASME Journal of Vibration and Acoustics*, Vol. 123, No. 3, July 2001, pp. 365 – 375.
153. Ahmadian, M. and Poynor, J. C., "An Evaluation of Magneto-Rheological Dampers for Controlling Gun Recoil Dynamics," *Shock and Vibration*, Vol. 8, Nos. 3 and 4, December 2001, pp. 141 – 146.
154. Ahmadian, M., Jeric, K. A., and Inman, D. J., "An Experimental Evaluation of Smart Damping Materials for Reducing Structural Noise and Vibrations," *ASME Journal of Vibration and Acoustics*, Vol. 123, October 2001, pp. 533 – 535.
155. Ahmadian, M. and Jeric, K. A., "On the Application of Electrically Shunted Piezoceramics for Increasing Acoustic Transmission Loss in Structures," *Journal of Sound and Vibration*, Vol. 243, No. 2, May 2001, pp. 347 – 359.
156. Ahmadian, M., Reichert, B.A. and Song, X., "System Non-linearities Induced by Skyhook Dampers," *Shock and Vibration*, Vol. 8, No. 2, March 2001, pp. 95 – 104.
157. Ahmadian, M. and DeGuilio, A. P., "Recent Advances in the use of Piezoceramics for Vibration Suppression," *Shock and Vibration Digest*, Vol. 33, No. 1, January 2001, pp. 15 – 22.
158. Ahmadian, M. and Carter, A. K., "Improving Heavy Vehicle Roll Safety by Semiactive Suspensions with Fuzzy Logic Control," *Business Briefing: Global Truck and Commercial Vehicle Technology*, WMRC Publishing, London, UK, January 2001, pp. 91 – 92.
159. Ahmadian, M., "How Can You Benefit from Working with the Advanced Vehicle Dynamics Laboratory at Virginia Tech?" *Business Briefing: Global Truck and Commercial Vehicle Technology*, WMRC Publishing, London, UK, January 2001.
160. Ahmadian, M. and Pare, K., "A Quarter-Car Experimental Analysis of Alternative Semiactive Control Methods," *Journal of Smart Material Systems and Structures*, Vol. 11, No. 8, August 2000, pp. 604 – 612.
161. Ahmadian, M. and Ahn, Y. K., "Performance Analysis of Magneto-Rheological Mounts," *Journal of Intelligent Material Systems and Structures*, Vol. 10, No. 3, March 2000, pp. 248 – 256.
162. Ahn, Y. K., Ahmadian, M., and Morishita, S., "On the Design and Development of a Magneto-Rheological Mount," *International Journal of Vehicle System Dynamics*, Vol. 32, No 2 – 3, August 1999, pp. 199 – 216.
163. Ahmadian, M., "On the Isolation Properties of Semiactive Dampers," *Journal of Vibration and Control*, Vol. 5, No. 2, March 1999, pp. 217 – 232.

164. Ahmadian, M. and Yang, S., "Effect of System Nonlinearities on Locomotive Bogie Hunting Stability," *International Journal of Vehicle System Dynamics*, Vol. 29, No. 6, June 1998, pp. 365 – 384.
165. Sardar, H. M. and Ahmadian, M., "A Parametric Study of Modified Model Reference Adaptive Control Scheme," *ASME Journal of Vibration and Acoustics*, Vol. 120, No. 3, July 1998, pp. 814 – 821.
166. Ahmadian, M. and Yang, S., "Hopf Bifurcation and Hunting Behavior in a Rail Wheelset with Flange Contact," *Nonlinear Dynamics*, Vol. 15, No. 1, January 1998, pp. 15 – 30.
167. Miller, L. R., Ahmadian, M., Nobles, C. M., and Swanson, S. A., "Modeling and Performance of an Experimental Active Vibration Isolator," *ASME Journal of Vibration and Acoustics*, Vol. 117, No. 3A, July 1995, pp. 272 – 278.
168. Ahmadian, M., "A Substructural Control Technique for Large Structures," *ASME Journal of Vibration and Acoustics*, Vol. 115, No. 2, April 1994, pp. 215 – 221.
169. Sardar, H. M., and Ahmadian, M., "A Modified Model Referenced Adaptive Control Technique for Nonlinear Dynamic Systems," *ASME Journal of Vibration and Acoustics*, Vol. 114, April 1992, pp. 154 – 160.
170. Ahmadian, M. and Marjoram, R. H., "Effects of Passive and Semi-active Suspensions on Body and Wheelhop Control," *SAE International Journal of Commercial Vehicles*, Vol. 98, 1989, pp. 596 – 604.
171. Ahmadian, M. and Chou, S. H., "A New Method for Finding the Symmetric Form of Asymmetric Finite – Dimensional Dynamic Systems," *ASME Journal of Applied Mechanics*, Vol. 54, No. 3, September 1987, pp. 700 – 705.
172. Ahmadian, M., "On the Stability of Multiple – Parameter, Time-Varying, Dynamic Systems," *International Journal of Non-Linear Mechanics*, Vol. 21, No. 6, June 1986, pp. 483 – 488.
173. Ahmadian, M. and Inman, D. J., "Some Stability Results for General Linear Lumped-Parameter Dynamic Systems," *ASME Journal of Applied Mechanics*, Vol. 53, No. 1, March 1986, pp. 10 – 14.
174. Ahmadian, M., "Controllability and Observability of General Linear Lumped-Parameter Systems," *AIAA Journal of Guidance, Control, and Dynamics*, Vol. 8, No. 5, November 1985, pp. 669 – 672.
175. Ahmadian, M. and Inman, D. J., "On the Stability of General Dynamic Systems Using a Liapunov's Direct Method Approach," *Journal of Computers and Structures*, Vol. 20, No. 1 – 3, January 1985, pp. 287 – 292.
176. Ahmadian, M. and Inman, D. J., "Classical Normal Modes in Asymmetric Non-Conservative Dynamic Systems," *AIAA Journal*, Vol. 22, No. 7, July 1984, pp. 1012 – 1015.
177. Ahmadian, M. and Inman, D. J., "On the Nature of Eigenvalues of General Non-Conservative Systems," *ASME Journal of Applied Mechanics*, Vol. 51, No. 1, March 1984, pp. 193 – 195.

Refereed Conference Publications

1. Chen, Y., Pan, Y., and Ahmadian, M., "Electromagnetic Energy Harvesting Tie: Design, Implementation, and Field Testing," the AREMA 2024 Annual Conference and Exposition, Louisville, KY, September 15 – 18, 2024.
2. Kumar, N., Radmehr, A., Ahmadian, M., "Assessment of contact patch on curving forces in two-point contact condition," the AREMA 2024 Annual Conference and Exposition, Louisville, KY, September 15 – 18, 2024.
3. Ahmadian, M., Chen, Y., and Pan, Y., "Laboratory and Field Evaluation of an Energy Harvesting Tie for Energy Generation on Railroad Tracks," Railways 2024, Prague, Czech Republic, September 1 – 5, 2024.

4. Radmehr, A., Mirzaei, M., Larson, I., Holton, C., and Ahmadian, M., "Railroad Track Gage Widening Assessment Using On-board Doppler LiDAR Velocity Measurements and Unsupervised Machine Learning Technique," the 28th Symposium of the International Association of Vehicle System Dynamics, IAVSD 2023, Ottawa, Canada, August 21 – 25, 2023.
5. Chen, Y., Neighborgall, C., Zheng, X., and Ahmadian, M., "Field Testing and Performance Evaluation of Roll Stability Control System of Double-trailer Trucks," the 28th Symposium of the International Association of Vehicle System Dynamics, IAVSD 2023, Ottawa, Canada, August 21 – 25, 2023.
6. Radmehr, A. and Ahmadian, M., "Real-Time Wheel Wear Estimation using Non-Contact Measurements," Proceedings of the 20th International Wheelset Congress (IWC), Chicago, IL, May 8 – 11, 2023.
7. Zhang, Z., Chen, Y., and Ahmadian, M., "Interconnected Roll Stability Control System for Semitrucks with Double Trailers," 2023-01-0906, ISSN: 0148-7191, e-ISSN: 2688-3627, WCX SAE International World Congress Experience, Detroit, MI, April 18 – 20, 2023.
8. Ahmadian, M., Radmehr, A., and Hosseini, S-M, "Non-Destructive Evaluation of Track Stability Using Doppler Lidar Systems," 30th American Society for Nondestructive Testing (ASNT) Research Symposium, St. Louis, MS, June 20 – 23, 2022.
9. Radmehr, A., Yu, P., Tajaddini, A., and Ahmadian, M., "Wheel-Rail Contact Force and Wear Analysis Under Wet and Oil-Contaminated Conditions," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
10. Molzon, M. and Ahmadian, M., "Development of a Mobile Robot System for the Visual Inspection of Railcar Undercarriage Equipment," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
11. Hosseini, S-M, Radmehr, A., and Ahmadian, M., "Data Visualization using Google Earth Engine Coupled with Unsupervised Learning, A Practical Approach to Detecting Track Instability," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
12. Radmehr, A., Yu, P., Tajaddini, A., and Ahmadian, M., "Experimental Evaluation of the Effect of Rail Cant Angle on the Wheel-Rail Contact Forces, Traction Coefficients, and Contact Patch Shapes," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
13. Zhang, Z., Sun, N., Chen, Y., and Ahmadian, M., "Detailed Modeling of Pneumatic Braking in Long Combination Vehicles," SAE International Commercial Vehicle Engineering Congress & Exhibition, 02-14-03-0020, Chicago, IL, September 14 – 16, 2021. (<https://doi.org/10.4271/02-14-03-0020>)
14. Yu, P., Radmehr, A., Tajaddini, A., and Ahmadian, M., "An Experimental Study of the Influence of the Amount of Top-of-Rail Friction Modifiers on Traction," Proceedings of the 2021 ASME Joint Rail Conference, JRC2021-58347, St. Louis, Mo, April 20 – 21, 2021. (<https://doi.org/10.1115/JRC2021-58347>)
15. Pan, Y., Mast, T., Holton, C., and Ahmadian, M., "Performance Evaluation of a Novel Optical Sensing System for Detecting Rail Lubricity Conditions," Proceedings of the 2021 ASME Joint Rail Conference, JRC2021-58435, St. Louis, Mo, April 20 – 21, 2021. (<https://doi.org/10.1115/JRC2021-58435>)
16. Mast, T., Yu, P., Holton, C., and Ahmadian, M., "Intermediate Distance Testing of Optical ToR Lubricity Sensors on a Remote-controlled Rail Cart," Proceedings of the 2021 ASME Joint Rail Conference, JRC2021-58347, St. Louis, Mo, April 20 – 21, 2021. (<https://doi.org/10.1115/JRC2021-58347>)
17. Hosseini, S-M, Hosseinian Ahangarnejad, A., Radmehr, A., Tajaddini, A., and Ahmadian, M., "A Statistical Approach to Evaluating Wheel-Rail Contact Dynamics," Proceedings of the 2021 ASME Joint Rail Conference, JRC2021-58381, St. Louis, Mo, April 20 – 21, 2021. (<https://doi.org/10.1115/JRC2021-58381>)

18. Mast, T., Neighborgall, C., Peterson, A., Holton, C., and Ahmadian, M., "Considerations for Sensor Selection for Detecting Top-of-Rail (TOR) Lubrication," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8028>)
19. Radmehr, A., Hosseini Ahangarnejad, A., Tajaddini, A., and Ahmadian, M., "Surface Profile and Third-body Layer Accumulation Measurement Using a 3D Laser Profiler," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8041>)
20. Afzalan, M., Jazizadeh, F. K., and Ahmadian, M., "Towards Railway Automated Defect Detection from On-board Data using Deep Learning," Proceedings of the 2020 ASME Joint Rail Conference, JRC2020-8031, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8031>)
21. Radmehr, A., Hosseini Ahangarnejad, A., Tajaddini, A., and Ahmadian, M., "Investigating the Influence of Angle of Attack (Yaw) on Wheel-Rail Interface (WRI) Dynamics," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8040>)
22. Yu, P., Zuo, L., and Ahmadian, M., "Design and Bench Tests of a Smart Railroad Tie for Energy Harvesting," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8133>)
23. Tan, Y., Hosseini, S-M, Chen, Y., and Ahmadian, M., "Simulation Evaluation of Fouled Ballast Thermal Characteristics," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020.
24. Dama, N. and Ahmadian, M., "Discrete Element Modeling of Railway Ballast for Studying Railroad Tamping Operation," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020.
25. Hosseini, S-M, Tan, Y., and Ahmadian, M., "Forward-Looking Infrared Radiometry (FLIR) Application for Detecting Ballast Fouling," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8032>)
26. Radmehr, A., Hosseini Ahangarnejad, Pan, Y., A., Tajaddini, A., and Ahmadian, M., "Wheel-Rail Contact Patch Geometry Measurement and Shape Analysis Under Various Loading Conditions," Proceedings of the 2020 ASME Joint Rail Conference, St. Louis, MO, April 19 – 22, 2020. (<https://doi.org/10.1115/JRC2020-8042>)
27. Mast, T., Neighborgall, C., Peterson, A., Holton, C., and Ahmadian, M., "Development of Optics-based Mobile Instrument for Evaluating Top of Rail lubricity trends on in-service track," Proceedings of the 2019 American Railway Engineering and Maintenance-of-Way Association (AREMA) Annual Conference, Minneapolis, MN, September 22 – 25, 2019.
28. Ghodrati, M., Ahmadian, M., Mirzaeifar R., "Studying the Effect of Tangential Forces on Rolling Contact Fatigue in Rails Considering Microstructure," Proceedings of the 2019 ASME Joint Rail Conference, Snowbird, UT, April 10 – 12, 2019.
29. Radmehr, A., Tajaddini, A., Marquis, B., and Ahmadian, M., "Virginia Tech-Federal Railroad Administration Roller Rig Measurement Capabilities and Baseline Measurements," Proceedings of the 2019 ASME Joint Rail Conference, Snowbird, UT, April 10 – 12, 2019. (<https://doi.org/10.1115/JRC2019-1295>)
30. Radmehr, A., Kothari, K., and Ahmadian, M., "Evaluating the Effect of Natural Third Body Layers on Friction Using the Virginia Tech Roller Rig," Proceedings of the 2019 ASME Joint Rail Conference, Snowbird, UT, April 10 – 12, 2019. (<https://doi.org/10.1115/JRC2019-1292>)
31. Neighborgall, C., Mast, T., Peterson, A. W., Ahmadian, M., and Holton, C., "Development of Laser/LED-based Instrument for Optical Detection of Railroad Top-of-rail (TOR) Friction

- Modifiers and Lubricity Conditions,” Proceedings of the 2019 ASME Joint Rail Conference, Snowbird, UT, April 10 – 12, 2019.
32. Afzalan, M., Jazizadeh, F. K., and Ahmadian, M., “A Machine Learning Approach for Track Condition Assessment Through Repeated Historical Data Analysis,” Proceedings of the 2019 ASME Joint Rail Conference, Snowbird, UT, April 10 – 12, 2019.
 33. Tan, Y., Chen, Y., Peterson, A. W., and Ahmadian, M., “Monitoring and Detecting Fouled Ballast using Forward-Looking Infrared Radiometer (FLIR) Aerial Technology – Possibilities and Limitations,” Proceedings of the 2019 ASME Joint Rail Conference, Snowbird, UT, April 10 – 12, 2019.
 34. Kothari, K., Dixit, J., and Ahmadian, M., “Effect of Variation of Angle of Attack on Adhesion-Creepage Behavior Using Virginia Tech–Federal Railroad Administration (VT – FRA) Roller Rig,” Proceedings of the 2018 AREMA Annual Conference, Chicago, IL, September 16 – 20, 2018.
 35. Ghodrati, M., Ahmadian, M., Mirzaeifar R., “Investigating the rolling contact fatigue in rails using finite element method and cohesive zone approach,” Proceedings of the 2018 ASME Joint Rail Conference, Pittsburgh, PA, April 18-20, 2018.
 36. Ahmadian, M., “Magneto-Rheological Semiactive Suspensions for Improving Ground Vehicle’s Ride Comfort, Stability, and Handling,” Rockhampton, Queensland, Australia, August 14 – 18, 2017.
 37. Alami, M. M., Taheri, S., and Ahmadian, M., “Rail Surface Measurement and Multi-Scale Modeling of Wheel-Rail Contact,” Proceedings of the 2016 ASME Joint Rail Conference, Columbia, SC, April 12 – 15, 2016.
 38. Hosseinipour, M., Craft, M. J., Wnek, J. M., Ahmadian, M., “Technical Discussion on Surfacing Methods Currently Used on the Northeast Corridor,” Proceedings of the 2016 ASME Joint Rail Conference, Columbia, SC, April 12 – 15, 2016.
 39. Hasan, A. M., Taheri, M. A., and Ahmadian, M., “On the Application of Laser Technology for Railroad Top of the Rail Lubricity Detection,” Proceedings of the 2016 ASME Joint Rail Conference, Columbia, SC, April 12 – 15, 2016.
 40. Meymand, S., Hosseinipour, M., Taheri, M., and Ahmadian, M., “Vibration Analysis of a Coupled Multibody Dynamic Model of a Contact Mechanics Roller Rig,” Proceedings of the 2016 ASME Joint Rail Conference, Columbia, SC, April 12 – 15, 2016.
 41. Ahmadian, M., Chen, Y., and Zhu, Z. “Achieving Pneumatic Antiroll Bar through Re-designing a Commercial Airspring Suspension for semi-truck,” SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 4 – 6, 2016.
 42. Zhu, Z., Chen, Y., M. A. Taheri, and Ahmadian, M., “Flow Characterization and redesign of Load Leveling Valves for Improving Transient Dynamics of Heavy Truck Air Suspensions,” SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 4 – 6, 2016.
 43. Ahmadian, M., Chen, Y., and Hou, Y., “Failure Mode and Effects Analysis of Dual Leveling Valve Drive-axle Airspring Suspensions on Truck Dynamics,” SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 4 – 6, 2016.
 44. Hou, Y., Chen, Y., and Ahmadian, M., “A Simulation-based Study on the Improvement of Semi-truck Roll Stability in Roundabouts,” SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 4 – 6, 2016.
 45. Chen, Y., Ahmadian, M., and Peterson, A. W., “Pneumatically Balanced Heavy Truck Air Suspensions for Improved Roll Stability,” SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 6 – 8, 2015.

46. Hou, Y. and Ahmadian, M., "Effects of Commercial Truck Configuration on Roll Stability in Roundabouts," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 6 – 8, 2015.
47. Mousaviraad, M., Conger, M., Stern, F., Peterson, A. W., and Ahmadian, M., "Validation of CFD-MBD FSI for High-Fidelity Simulations of Full-Scale WAM-V Sea-Trials with Suspended Payload," Proceedings of the 13th International Conference on Fast Sea Transportation, Washington, DC, September 1 – 4, 2015.
48. Munoz, J., Ahmadian, M., Taheri, M. A., and O'Conner, T., "Accuracy Analysis of Car Body-Mounted Doppler LIDAR Technology Used to Measure Track Speed and Curvature," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
49. Hosseini-pour, M., Meymand, S. Z., and Ahmadian, M., "Vibration Analysis for Improving Powertrain Design and Contact Measurements of a Roller Rig," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
50. Meymand, S. Z., Hosseini-pour, M., and Ahmadian, M., "Development of a Roller Rig for Experimental Evaluation of Wheel-Rail Contact Mechanics for Railway Vehicles," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
51. O'Conner, T., Taheri, M. A., Munoz, J., and Ahmadian, M., "Conversion of Non-Contact LIDAR Velocity Measurements to Spatial Markings and Indication Signals for Commercial Train Systems," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
52. Taheri, M. and Ahmadian, M., "Investigation of parameters influencing hunting performance of a railway vehicle with three-piece trucks," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
53. Meymand, S. Z., and Ahmadian, M., "A Review Study of Wheel-Rail Contact Models," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
54. Taheri, M. A., Munoz, J., O'Conner, T., and Ahmadian, M., "Application of Multifunctional LIDAR for Non-contact Track Geometry Measurement," Proceedings of the 2015 ASME Joint Rail Conference, San Jose, CA, March 24 – 26, 2015.
55. Ahmadian, M., Chen, Y., and Peterson, A. W., "Pneumatically Balanced Heavy Truck Air Suspensions for Improved Stability, Handling, and Ride Comfort," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 7 – 9, 2014.
56. Hosseini-pour, M., Meymand, S. Z., Craft, M. J., and Ahmadian, M., "Modeling of a Roller Rig for Evaluation of Wheel/Rail Contact Mechanics," Proceedings of the 2014 ASME Joint Rail Conference, Pueblo, CO, April 2 – 4, 2014.
57. Wei, W., Ahmadian, M., and Zhang, J., "Heavy Haul Simulation of Air Brake Systems and Longitudinal Dynamics," Proceedings of the 2014 ASME Joint Rail Conference, Pueblo, CO, April 2 – 4, 2014.
58. Peterson, A. W., Ahmadian, M., Craft, M. J., Shen, A., "Analysis of a Single-Wave Impact to Improve the Performance of Wave-Adaptive Modular Vessels," 12th International Conference on Fast Sea Transportation, Amsterdam, The Netherlands, December 2 – 5, 2013.
59. Peterson, A. W., Ahmadian, M., Craft, M. J., Shen, A., "Design, Construction, and Testing of a 2-Post Shaker Rig for Evaluating the Dynamics of Wave-Adaptive Modular Vessels," 12th International Conference on Fast Sea Transportation, Amsterdam, The Netherlands, December 2 – 5, 2013.
60. Iranmanesh, A., West, R. L., Ahmadian, M., "Insulated Railroad ASME Joint Design Evaluation by Coordinated Test and Finite Element Analysis," Proceedings of Rail Transportation Division Fall Technical Conference, Altoona, PA, October 15 – 17, 2013.

61. Munoz, J., Ahmadian, M., and Craft, M. J., "Evaluation of LIDAR Track Measurement Systems in Car Body and Truck-Mounted Configurations," Proceedings of Rail Transportation Division Fall Technical Conference, Altoona, PA, October 15 – 17, 2013.
62. Meymand, S. Z., Craft, M. J., and Ahmadian, M., "On the Application of Roller Rigs for Studying Rail Vehicle Systems," Proceedings of Rail Transportation Division Fall Technical Conference, Altoona, PA, October 15 – 17, 2013.
63. Peterson, A. W., Ahmadian, M., Craft, M. J., Shen, A., "Simulation and Scale Testing to Improve the Next Generation of Wave-Adaptive Modular Vessels," Simulation Multi-Conference, Toronto, Ontario, July 7 – 10, 2013.
64. Munoz, J., Ahmadian, M., Craft, M. J., and Wrobel, S.A., "Multi-Function LIDAR Sensors for Non-Contact Speed Measurement in Rail Vehicles, Part 1: System Installation and Implementation," Proceedings of the 2013 ASME Joint Rail Conference, Knoxville, TN, April 18 – 21, 2013.
65. Wrobel, S.A., Ahmadian, M., Craft, M. J., and Munoz, J., "Multi-Function LIDAR Sensors for Non-Contact Speed Measurements in Rail Vehicles, Part 2: Data Collection and Analysis," Proceedings of the 2013 ASME Joint Rail Conference, Knoxville, TN, April 18 – 21, 2013.
66. Taheri, M., and Ahmadian, M., "Dynamic Model of a Friction Wedge with Profiled Surface," Proceedings of the 2013 ASME Joint Rail Conference, Knoxville, TN, April 18 – 21, 2013.
67. Meymand, S. Z., and Ahmadian, M., "Semiactive Rail Vehicle Suspensions for Reducing Track Dynamic Loading," Proceedings of the 2013 ASME Joint Rail Conference, Knoxville, TN, April 18 – 21, 2013.
68. Ahmad, H., and Ahmadian, M., "Adapting Dynamic Braking of AC Motors to Varying Wheel/Rail Adhesion Conditions," Proceedings of the 2013 ASME Joint Rail Conference, Knoxville, TN, April 18 – 21, 2013.
69. Zhang, X., Ma, F. W., Zhao, F. Q., Guo, K. H., and Ahmadian, M., "Optimization of the Magnetic Property of a Magnetorheological Squeeze Mount," Proceedings of the FISITA 2012 World Automotive Congress, Volume 195 of the series Lecture Notes in Electrical Engineering, December 2012, pp. 611 – 624, DOI: 10.1007/978-3-642-33835-9_56.
70. Tamaddoni, S. H., Taheri, S., and Ahmadian, M., "Cooperative Linear Driver Steering Model: Design, Control, and Robustness," Proceedings of ASME 2012 International Mechanical Engineering Congress & Exposition (IMECE 2012), Houston, TX, November 9-15, 2012.
71. Keylin, A., Ahmadian, M., and Taheri, S., and Tajaddini, A., "Wheel-Rail Contact Characteristics on a Tangent Track vs. a Roller Rig," Rail Transportation Division Fall Technical Conference, Omaha, NE, October 12 – 13, 2012.
72. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Robust Optimal Control of Vehicle Lateral Motion with Driver-in-the-Loop," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 2 – 3, 2012.
73. Nagode, C., Ahmadian, M., and Taheri, S., "Axle Generator for Freight Car Electric Systems," ASME Joint Rail Conference, Philadelphia, PA, April 17-19, 2012.
74. Nagode, C., Ahmadian, M., and Taheri, S., "Energy Harvesting Systems to Power Onboard Railroad Equipment," Rail Transportation Division Fall Technical Conference, Minneapolis, MN, September 21-22, 2011.
75. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Optimal Direct Yaw Controller Design for Vehicle Systems with Human Driver," SAE International Commercial Vehicle Engineering Congress & Exhibition, Detroit, MI, September 2011.
76. Tamaddoni, S.H., Alavi-Tamaddoni, H., Taheri, S., and Ahmadian, M., "Vehicle System Simulator: Development and Validation," SAE International Commercial Vehicle Engineering Congress & Exhibition, Detroit, MI, September 2011.

77. Ahmadian, M., Farjoud, A., and Craft, M., "Detailed Mathematical Modeling of Shock Absorbers for Vehicular Suspension Analysis and Synthesis," 22nd IAVSD International Symposium of Dynamics of Vehicles on Roads and Tracks, Manchester, UK, August 2011.
78. Mahmoodi, S. N., Salehi-Khojin, A., and Ahmadian, M. "Nonlinear Force Analysis of Atomic Force Microscopy," Proceedings of the 2011 ASME International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Washington D.C., USA, August 2011.
79. Tamaddoni, S.H., Ahmadian, M., and Taheri, S., "Optimal Vehicle Stability Control Design Based on Preview Game Theory Concept," IEEE American Control Conference, San Francisco, CA, July 2011.
80. Ahmadian, M., Nagode, C., and Taheri, S., "Effective Energy Harvesting Devices for Heavy Haul Applications," International Heavy Haul Association Conference, Calgary, Canada, June 19-22, 2011.
81. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Game theory approach to control of vehicle lateral motion," Vehicle Dynamics International, Stuttgart, Germany, June 2011.
82. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Linear Quadratic Game Theory Approach to Optimal Preview Control of Vehicle Lateral Motion," SAE International World Congress, Detroit, MI, April 2011.
83. Zhang, X., Zhang, H., Ahmadian, M., and Guo, K., "Study on Squeeze Mode Magneto-Rheological Engine Mount with Robust H-Infinite Control," SAE International World Congress, Detroit, MI, April 2011.
84. Nagode, C., Ahmadian, M., and Taheri, S., "Vibration-based Energy Harvesting Systems for On-board Applications," ASME Joint Rail Conference, Pueblo, CO, March 16-18, 2011.
85. Mahmoodi, S. N., and Ahmadian, M., "Active Control of Structures with Adaptive Modified Positive Position Feedback," Proceeding of the International SPIE 2011 Smart Structures/NDE Conference, San Diego, CA, March 2011.
86. Zhang, X., Ahmadian, M., and Guo, K. H., "Dynamic Testing of MR Squeeze Mount," The National Conference of Electro-Rheological and Magneto-Rheological Fluids, Ningbo, China, 2011.
87. Nagode, C., Ahmadian, M., and Taheri, S., "Rotational Energy harvesting systems for unpowered freight rail cars," Rail Transportation Division Fall Technical Conference, Roanoke, VA, October 12-13, 2010.
88. Farjoud, A. and Ahmadian, M., "Performance Characterization and Modeling of Shim Stack Assemblies in Vehicle Shock Absorbers," SAE International Commercial Vehicle Engineering Congress and Exhibition, Rosemont, IL, October 5 – 6, 2010.
89. Hopkins, B., Taheri, S., Ahmadian, M., and Reid, A. "Yaw Stability Control and Emergency Roll Control for Vehicle Rollover Mitigation," SAE International Commercial Vehicle Engineering Congress and Exhibition, Rosemont, IL, October 5 – 6, 2010.
90. Zhang, X., Ahmadian, M., and Guo, K., "A Comparison of a Semi-active Inerter and a Semi-active Suspension," SAE International Commercial Vehicle Engineering Congress and Exhibition, Rosemont, IL, October 5 – 6, 2010.
91. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Development of Nash Optimal Driver Based Vehicle Stability Control Algorithm," Proceedings of Transport Research Arena (TRA), Brussels, Belgium, October 2010.
92. Farjoud, A., Mahmoodi, N., and Ahmadian, M., "Nonlinear Model of Squeeze Flow of MR Fluids Using Perturbation Techniques," The 12th International Conference on Electro-Rheological Fluids and Magneto-Rheological Suspensions, Philadelphia, PA, August 2010.

93. Farjoud, A., Craft, M., Burke, W., and Ahmadian, M., "Experimental Investigation of MR Squeeze Mounts," The 12th International Conference on Electro-Rheological Fluids and Magneto-Rheological Suspensions," Philadelphia, PA, August 2010.
94. Zhang X., Farjoud, A., Ahmadian, M., Craft, M., and Guo, K. H., "Dynamic Testing and Modeling of an MR Squeeze Mount, The 12th International Conference on Electro-Rheological Fluids and Magneto-Rheological Suspensions," Philadelphia, PA, August 2010.
95. Tamaddoni, S. H., Taheri, S., and Ahmadian, M., "Cooperative DYC System Design for Optimal Vehicle Handling Enhancement," Proceedings of 2010 IEEE American Control Conference (ACC), Baltimore, MD, June 30 – July 2, 2010.
96. Tamaddoni, S.H., Taheri, S., and Ahmadian, M., "Cooperative DYC System Design for Optimal Vehicle Handling Enhancement," IEEE American Control Conference, Baltimore, MD, June-July 2010.
97. Tamaddoni, S. H., Taheri, S., Ahmadian, M., "Development of Nash Optimal Driver Based Vehicle Stability Control Algorithm," Proceedings of 2010 Transport Research Arena (TRA), Brussels, Belgium, June 7 – 10, 2010.
98. Nagode, C., Ahmadian, M., and Taheri, S., "Motion-based Energy Harvesting Devices for Railroad Applications," Proceedings of the American Society of Mechanical Engineers ASME Joint Rail Conference, Urbana, IL, April 27 – 29, 2010.
99. Shahidi, P., Southward, S.C., and Ahmadian, M., "Estimating Crew Alertness from Speech," Proceedings of the American Society of Mechanical Engineers ASME Joint Rail Conference, Urbana, IL, April 27 – 29, 2010.
100. Kirchner, W., Southward, S. C., and Ahmadian, M., "Ultrasonic Acoustic Health Monitoring of Ball Bearings using Neural Network Pattern Classification of Power Spectral Density, Proceedings of the American Society of Mechanical Engineers ASME Joint Rail Conference, Urbana, IL, April 27 – 29, 2010.
101. Nagode, C., Ahmadian, M., and Taheri, S., "Effective energy harvesting devices for railroad applications," SPIE Active and Passive Smart Structures and Integrated Systems, San Diego, CA, March 8 – 9, 2010.
102. Farjoud, A. and Ahmadian, M., "Shim Stack Deflection Analysis in Hydraulic Dampers Using Energy Methods, in Active and Passive Smart Structures and Integrated Systems 2010," SPIE Active and Passive Smart Structures and Integrated Systems, San Diego, CA, March 8 – 9, 2010.
103. Craft, M., Ahmadian, M., Farjoud, A., Burke, W., and Nagode, C., "Force Characterization of a Modular Squeeze-Mode Magneto-Rheological Device, in Active and Passive Smart Structures and Integrated Systems 2010," SPIE - The International Society for Optical Engineering, San Diego, CA, March 8 – 9, 2010.
104. Shahidi, P., Southward, S.C., and Ahmadian, M., "Fuzzy Analysis of Speech Metrics to Estimate Conductor Alertness," Proceedings of the American Society of Mechanical Engineers Rail Transportation Division Conference, Fort Worth, TX, October 19 – 21, 2009.
105. Tamaddoni, S. H., Taheri, S., and Ahmadian, M., "Optimal VSC Design Based on Nash Strategy for Differential 2 – Player Games," Proceedings of 2009 IEEE International Conference on Systems, Man, and Cybernetics (SMC), San Antonio, TX, October 11 – 14, 2009, pp. 2415 – 2420.
106. Mahmoodi, S. N., Jalili, N., and Ahmadian, M., "Subharmonic Resonances of Piezoelectrically Actuated Microcantilevers," Proceedings of the ASME 2009 Dynamic Systems and Control Conference, Hollywood, CA, October 12 – 14, 2009.
107. Marcu, F. M., Ahmadian, M., Southward, S. C., and Janssen, S. B., "A Methodology for Accounting for Uneven Ride Height in Soft Suspensions with Large Lateral Separation,"

- Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, October 6 – 7, 2009.
108. Marcu, F. M., Ahmadian, M., Southward, S. C., and Janssen, S. B., "A Methodology for Laboratory Testing of Truck Cab Suspensions," Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, October 6 – 7, 2009.
 109. Lee, H., Sandu, C., Holton, C., and Ahmadian, M., "An Empirical Approach to Modeling the Friction Coefficient for Wheel – Rail Contact," Proceedings of the ASME 2009 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, San Diego, CA, August 30 – September 2, 2009.
 110. Mahmoodi, S. N., Rastgaar M., and Ahmadian, M., "Active Vibration Control of Aerospace Structures Using a Modified Positive Position Feedback Method," Proceedings of the 2009 American Control Conference, Saint Louis, MO, June 10 – 12, 2009. (Full Paper)
 111. Boggs, C., Ahmadian, M., and Southward, S. "Application of System Identification for Efficient Suspension Tuning in High-Performance Vehicles: Full-Car Model Study," Proceedings of The SAE International World Congress, April 20 – 22, 2009.
 112. Farjoud, A., Ahmadian, M., and Cavey, R., "Rheometer characterization of MR fluids in squeeze mode in Active and Passive Smart Structures and Integrated Systems 2009," SPIE - The International Society for Optical Engineering, San Diego, CA, March 9, 2009.
 113. Boggs, C. M., Ahmadian, M., and Southward, S. C., "Application of System Identification for Efficient Suspension Turning in High-Performance Vehicles: Quarter – Car Study," Proceedings of the SAE International Motorsports Engineering Conference, Concord, NC, December 2 – 4, 2008.
 114. Sandu, C., Taylor, B., Biggans, J., and Ahmadian M., "Building Infrastructure for Indoor Terramechanics Studies: The Development of a Terramechanics Rig at Virginia Tech," Proceedings of the 2008 ISTVS World Congress, Nov. 25 – 28, 2008, Turin, Italy 2008.
 115. Tamaddoni, S.H. and Taheri, S. "Yaw Stability Control of Tractor Semi-Trailers," SAE International Commercial Vehicle Engineering Congress & Exhibition, Detroit, MI, October 2008.
 116. Duprey, B., Tamaddoni, S.H., Taheri, S., "Road Safety Improvements through Enhancement of ABS Control Algorithms for Heavy Trucks," SAE International Commercial Vehicle Engineering Congress & Exhibition, Detroit, MI, October 2008.
 117. Farjoud, A., Cavey, R., Ahmadian, M., and Namuduri, C., "Non-dimensional modeling and experimental evaluation of an MR squeeze mode rheometer," 11th Conference on Electrorheological Fluids and Magnetorheological Suspensions, Dresden, Germany, August 25 – 29, 2008.
 118. Tamaddoni, S.H. and Taheri, S., "A New Control Algorithm for Vehicle Stability Control," ASME 10th International Conference on Advanced Vehicle and Tire Technologies, ASME International Design Engineering Technical Conference, New York, NY, August 2008.
 119. Rastgaar, M., Ahmadian, M., and Southward, S. C., "Actuators' Locations in Vibration Cancellation of a Plate using Orthogonal Eigenstructure Control," Proceedings of the 18th International Symposium on Mathematical Theory of Networks and Systems, Blacksburg, VA, July 28 – August 1, 2008.
 120. Ihsan, S. I., Faris, W. F., and Ahmadian, M., "An Assessment of Semi-active Suspension for Passenger Cars Using Full-car Model," Proceedings of the 13th International Conference on Applied Mechanics and Mechanical Engineering, Cairo, Egypt, May 27 – 29, 2008.
 121. Shahidi, P., Southward, S. C., and Ahmadian, M., "Real-time Estimation of Temporal Word Boundaries without Linguistic Knowledge," Proceedings of the ASME/IEEE 2007 ASME Joint Rail Conference, Wilmington, DE, April 22 – 23, 2008.

122. Ihsan, S. I., Faris, W. F., and Ahmadian, M., "Analysis of Quarter – car 2 Degree of Freedom Semiactive Systems," Proceedings of the IASTED Asian Conference on Modeling and Simulation, Beijing, China, October 8 – 10, 2007.
123. Ahmadian, M. and Blanchard, E. D., "Ride Performance Analysis of Semiactive Suspension Systems Based on A Full-Car Model," Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 9th International Conference on Advanced Vehicle and Tire Technologies, Las Vegas, NV, September 4 – 7, 2007.
124. Ahmadian, M. and Blanchard, E. D., "Non-dimensional Analysis of the Performance of Semi-Active Vehicle Suspensions," Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 9th International Conference on Advanced Vehicle and Tire Technologies, Las Vegas, NV, September 4 – 7, 2007.
125. Ahmadian, M., "A Comparative Study of Actively Controlled and Shunted Piezoelectric Materials for Structural Damping," Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 9th International Conference on Advanced Vehicle and Tire Technologies, Las Vegas, NV, September 4 – 7, 2007.
126. Rastgaar, M., Ahmadian, M., and Southward, S. C., "Vibration Confinement by Minimum Modal Energy Eigenstructure Assignment," Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 9th International Conference on Advanced Vehicle and Tire Technologies, Las Vegas, Nevada, September 4 – 7, 2007.
127. Rastgaar, M., Southward, S. C., and Ahmadian, M., "Effect of the Actuators' Location on Vibration Confinement using Minimum Modal Energy Eigenstructure Assignment," Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 9th International Conference on Advanced Vehicle and Tire Technologies, Las Vegas, NV, September 4 – 7, 2007.
128. Song, X., Ahmadian, M., and Southward, S.C., "Adaptive Skyhook Control for Magneto-Rheological Suspension Systems," Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, 9th International Conference on Advanced Vehicle and Tire Technologies, Las Vegas, NV, September 4 – 7, 2007.
129. Boggs, C. M. and Ahmadian, M., "Efficient Empirical Modeling of a High-Performance Shock Absorber for Vehicle Dynamics Studies," Proceedings of the SAE International World Congress, Detroit, MI, April 16 – 19, 2007.
130. Shimp, S. K. III, Southward, S.C., and Ahmadian, M., "Detecting Crew Alertness with Processed Speech," Proceedings of the 2007 ASME/IEEE ASME Joint Rail Conference & Internal Combustion Engine Spring Technical Conference, Pueblo, CO, March 13 – 16, 2007.
131. Emmons, S. G., Boggs, C. M., and Ahmadian, M., "Parametric Modeling of a Highly – Adjustable Race Damper," Proceedings of ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, November 5 – 10, 2006.
132. Koo, K. H. and Ahmadian, M., "A Comprehensive Off-tuning analysis of damping controlled tuned vibration absorbers," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, November 5 – 10, 2006.
133. Boggs, C. M., Borg, L. T., Ostanek, J. K., and Ahmadian, M., "Efficient Test Procedures for Characterizing MR Dampers," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, November 5 – 10, 2006.

134. Song, X., Ahmadian, M., Southward, S.C., and Miller, L., "Adaptive Skyhook Control for Magneto-rheological Suspension Systems," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, November 5 – 11, 2006.
135. Chan, B. Sandu, C., and Ahmadian, M., "Development of a Virtual Terramechanics Rig for Experimental Validation," Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, October 31 – November 2, 2006.
136. Koo, J. H., Shukla, A., and Ahmadian, M., "Dynamic Performance Analysis of Nonlinear Tuned Vibration Absorbers," Proceedings of the 1st International Conference on Nonlinear Science and Complexity (NSC 2006), Beijing, China, August 7 – 12, 2006.
137. Ahmadian, M. and Mohan, A., "Semiactive Control of Hunting Stability in Rail Vehicles" Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, November 5 – 11, 2005.
138. Ahmadian, M., "Dynamics Analysis of Self-Steering Railway Trucks for Assessing Curving Performance," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, November 5 – 11, 2005.
139. Ahmadian, M. and Dillard, D., "A Preliminary Evaluation and Analysis of Technologies for Eliminating Insulated ASME Joints," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, November 5 – 11, 2005.
140. Ahmadian, M., "Semiactive Fuzzy Logic Control for Heavy Truck Primary Suspensions: Is It Effective?" Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, Illinois, November 1 – 3, 2005.
141. Ahmadian, M., "The Challenge of Designing a Semiactive Damper for Heavy Truck Seat Suspensions," Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, Illinois, November 1 – 3, 2005.
142. Boggs, C. M. and Ahmadian, M., "Field Study to Evaluate Driver Fatigue Performance in Air-Inflated Truck Seat Cushions – Objective Results," Proceedings of the SAE International World Congress, April 11 – 15, 2005.
143. Sandu, C., Sandu, A., Chan, B. J., and Ahmadian, M., "Treatment of Constrained Multibody Dynamic Systems with Uncertainties," Proceedings of the SAE International World Congress, April 11 – 15, 2005.
144. Elahinia, M., Koo, J. H., Woolsey, C. A., and Ahmadian, M., "Backstepping Control of an SMA Actuated Manipulator," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
145. Ahmadian, M. and Vahdati, M., "Practical Issues in Quieting Locomotive Cab Interior," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
146. Elahinia, M., Koo, J. H., and Ahmadian, M., "Robustness Analysis of Shape Memory Alloy Tuned Vibration Absorbers" Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
147. Sandu, C., Sandu, A., Chan, B. J., and Ahmadian, M., "Treating Uncertainties in Multibody Dynamic Systems using a Polynomial Chaos Spectral Decomposition," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
148. Sandu, A., Sandu, C., Chan, B. J., and Ahmadian, M., "Control of Mechanical Systems using a Parameterized Spectral Decomposition Approach," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.

149. Elahinia, M. H., Koo, J. H., and Ahmadian, M., "Shape Memory Alloy Tuned Vibration Absorbers: Robustness Analysis," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
150. Boggs, C. M.; Goncalves, F. D., and Ahmadian, M., "Steady-State Energy Transfer of a Semi-active Suspension under Hybrid Control," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
151. Mohan, A. and Ahmadian, M., "Nonlinear Investigation of the Effect of Suspension Parameters on the Hunting Stability of Railway Trucks," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
152. Elahinia, M. H. and Ahmadian, M., "On the Shortcomings of Shape Memory Alloy Phenomenological Models," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
153. Hou, B., Goncalves, F. D., Sandu, C., and Ahmadian, M., "Dynamic Simulation of a Full Vehicle with Magnetorheological Dampers," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 13 – 19, 2004.
154. Song, X., Ahmadian, M., Southward, S. C., and Miller, L., "Simulation Study of Adaptive Magneto-Rheological Seat Suspension," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 14 – 19, 2004.
155. Boggs, C. M. and Ahmadian, M., "Field Study to Evaluate Driver Fatigue Performance in Air-Inflated Truck Seat Cushions – Subjective Results," Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, October 25 – 28, 2004.
156. Setareh, M., Ritchey, J. K., Murray, T. M. Koo, J. H., and M. Ahmadian, "An Analytical Investigation of the Use of a Semi-active Pendulum Tuned Mass Damper for Floor Vibration Control" Proceedings of the Seventh International Conference on Motion and Vibration Control, Paper No. 104, St. Louis, MO, August 8 – 11, 2004.
157. Koo, J. H., Elahinia, M. Ahmadian, M., and Woolsey, C. A., "Model-Based Nonlinear Control of an SMA-Actuated Robotic Arm: An Experimental Study," Proceedings of the 10th Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures, Blacksburg, VA, July 25 – 29, 2004.
158. Ahmadian, M. and Goncalves, F. D., "A frequency analysis of Semi-active control methods for vehicle applications," Proceeding of the SAE International Automotive Dynamics, Stability, and Controls Conference and Exhibition, Detroit, MI, May 4 – 6, 2004.
159. Ahmadian, M. and Simon, D. E., "Can Semiactive Dampers with Skyhook control improve roll stability of passenger vehicles?" Proceeding of the SAE International Automotive Dynamics, Stability, and Controls Conference and Exhibition, Detroit, MI, May 4 – 6, 2004.
160. Mohan, A. and Ahmadian, M., "Nonlinear Investigation of the Effect of Primary Suspension on the Hunting Stability of a Rail Wheelset," Proceedings of the 2004 ASME/IEEE ASME Joint Rail Conference, Baltimore, MD, April 6 – 8, 2004.
161. Song, X. and Ahmadian, M., "Study of Semiactive Adaptive Control Algorithms with Magneto-Rheological Seat Suspension," Proceedings of the SAE International World Congress, Detroit, MI, March 7 – 12, 2004.
162. Ahmadian, M., "The Challenges of Quieting a Freight Locomotive Cab Interior," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
163. Ahmadian, M. and Poynor, J. C., "Effective Test Procedures for Evaluating Force Characteristics of Magneto-Rheological Dampers," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.

164. Ahmadian, M. and Vahdati, N., "An Analytical Evaluation of the Transient Dynamics of Semiactive Dampers," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
165. Koo, J. H., Ahmadian, M., and Setareh, M., "Robustness Analysis of Semi-active Tuned Vibration Absorbers with Magneto-Rheological Dampers: An Experimental Study," Proceedings of ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
166. Norris, J. A. and Ahmadian, M., "Behavior of Magneto-Rheological Fluids Subjected to Impact and Shock Loading," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
167. Elahinia, M. H. Ashrafiuon, H., Ahmadian, M., and Inman, D., "Application of the Extended Kalman Filter to Control of a Shape Memory Alloy Arm," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
168. Goncalves, F. D., Wang, J., and Ahmadian, M., "Analytical Evaluation of the Effect of Gap Size on Magneto-Rheological Dampers," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
169. Goncalves, F. D., Ahmadian, M., "Experimental Investigation of the Energy Dissipated in a Magnetorheological Damper for Semi-active Vehicle Suspensions," Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
170. Elahinia, M., Ahmadian, M., and Seigler, T. M., "Application of Parametric Identification Methods for Modeling Heavy Truck Frame Dynamics," Proceedings of the ASME 2003 International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
171. Vahdati, N., and Ahmadian, M., "Single Pumper Semi-Active Fluid Mount," Proceedings of the ASME 2003 International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
172. Song, X., Ahmadian, M., and Southward, S. C., "An Adaptive Semiactive Control Algorithm for Vehicle Suspension Systems," Proceedings of the ASME 2003 International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
173. Ha, J. Y., Ahn, Y. K., Yang, B. S., Inman, D. J., and Ahmadian, M., "Dynamic properties of Squeeze type mounts using MR fluid," Proceedings of the ASME 2003 International Mechanical Engineering Congress and Exposition, Washington, D.C., November 16 – 21, 2003.
174. Ahmadian, M., "Laboratory Evaluation of Heavy Truck Dynamics: Are the results useful?" Proceedings of the 2003 SAE International Truck and Bus Symposium, Fort Worth, TX, November 10 – 12, 2003.
175. Ahmadian, M. and Ahn, Y. K., "On-Vehicle Evaluation of Heavy Truck Suspension Kinematics," Proceedings of the 2003 SAE International Truck and Bus Symposium, Fort Worth, TX, November 10 – 12, 2003.
176. Elahinia, M. and Ahmadian, M., "Application of Time – Domain Identification Techniques for Evaluating Heavy Truck Dynamics," Proceedings of the 2003 SAE International Truck and Bus Symposium, Fort Worth, TX, November 10 – 12, 2003.
177. Koo, J. H., Ahmadian, M., and Setareh, M., "Experimental Dynamic Analysis of Magneto-Rheological Tuned Vibration Absorbers," Proceedings of the DETC 2003 19th Biennial Conference on Mechanical Vibration and Noise, Chicago, IL, September 2 – 6, 2003.
178. Goncalves, F., Koo, J. H., and Ahmadian, M., "Experimental Approach for Finding the Response Time of MR Dampers for Vehicle Applications," Proceedings of the DETC 2003, 19th Biennial Conference on Mechanical Vibration and Noise, Chicago, IL, September 2 – 6, 2003.

179. Elahinia, M. H. and Ashrafiuon, H., Ahmadian, M., and Baumann, W., "Design of Extended Kalman Filter for a Shape Memory Alloy Manipulator," Proceedings of the DETC 2003, 19th Biennial Conference on Mechanical Vibration and Noise, Chicago, IL, September 2 – 6, 2003.
180. Ahmadian, M., Seigler, T. M., Clapper, D., and Sprouse, A., "A Comparative Analysis of Air-inflated and Foam Seat Cushions for Truck Seats," Proceedings of the 2002 SAE International Truck and Bus Symposium, Detroit, MI, November 2002.
181. Ahmadian, M., Seigler, T. M., Clapper, D., and Sprouse, A., "Alternative Test Methods for Long Term Dynamic Effects of Vehicle Seats," Proceedings of the 2002 SAE International Truck and Bus Symposium, Detroit, MI, November 2002.
182. Koo, J. H., Ahmadian, M., Setareh, M., and Murray, T., "A Robust Semi-Active Tuned Vibration Absorber for Reducing Vibrations in Force – Excited Structures," Proceedings of the 2002 ASME International Congress and Exposition, New Orleans, LA, November 2002.
183. Simon, D. E. and Ahmadian, M., "On the Design of an Intelligent Suspension for Controlling Passenger Vehicle Roll Stability," Proceedings of the 2002 ASME International Congress and Exposition, New Orleans, LA, November 2002.
184. Goncalves, F. D. and Ahmadian, M., "In Search of a Suitable Control Policy for Intelligent Vehicle Suspensions," Proceedings of the 2002 ASME International Congress and Exposition, New Orleans, LA, November 2002.
185. Ahmadian, M., "On the application of Magneto-Rheological fluid technology for improving rail vehicle dynamics," Proceedings of the 2002 ASME International Congress and Exposition, New Orleans, LA, November 2002.
186. Song, X., Ahmadian, M., and Southward, S.C., "Eliminating the Unwanted Dynamics from the Controllable Suspensions for Vehicle Applications," Proceedings of the 2002 ASME International Congress and Exposition, New Orleans, LA, November 2002.
187. Ahmadian, M. and Simon, D. E., "Improving the Roll Stability of Vehicles with High Center of Gravity by Using Magneto-Rheological Dampers," Proceedings of the 2002 ASME International Congress and Exposition, New Orleans, LA, November 2002.
188. Koo, J. H., Ahmadian, M., Setareh, M., and Murray, T., "In Search of Suitable Control Methods for Semi-active Tuned Vibration Absorbers," Proceedings of the 9th Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures, Blacksburg, VA, July 28 – August 1, 2002.
189. Koo, J. H., Ahmadian, M., and Setareh, M., "Adaptability Analysis of Semi-active Tuned Vibration Absorbers for Controlling Floor Vibrations," Proceedings of the US – Korea Conference on Science, Technology, and Entrepreneurship, Seoul, Korea, July 2002.
190. Ahmadian, M. Poynor, J. C., and Goncalves, F. D., "New Technologies for the Railway Industry- Part I," Proceedings of the 2001 ASME International Congress and Exposition, New York, NY, November 2001.
191. Koo, J. H. and Ahmadian, M., "Dynamic Analysis of Semi-active Tuned Vibration Absorbers Using Closed-Form Equivalent Models," Proceedings of the 2001 ASME International Congress and Exposition, New York, NY, November 2001.
192. Ahmadian, M. and Appleton, R., "On the design of Magneto Rheological Recoil Dampers for Fire out of Battery Control," Proceedings of the 10th Gun Dynamics Symposium, Dallas, TX, April 2001.
193. Ahmadian, M., "The Noise and Vibration Benefits of Soft-Mounted Locomotive Cabs," Proceedings of the 2001 IEEE/ASME Joint Rail Conference, Toronto, Canada, April 2001.
194. Huang, W. and Ahmadian, M., "A Qualitative Analysis of the Adhesion Characteristics of Steerable Bo-Bos and Co-Cos," Proceedings of the 2001 IEEE/ASME Joint Rail Conference, Toronto, Canada, April 2001.

195. Inman, D. J., Ahmadian, M., and Claus, R. O., "Simultaneous Active Damping and Health Monitoring of Aircraft Panels," Proceedings of the IUTAM 2000 Symposium, Magdeburg, Germany, September 2000.
196. Ahmadian, M. and Venezia, J. J., "An Experimental Evaluation of Noise and Vibrations in Modern Locomotive Cabs," Proceedings of the 2000 IEEE/ASME Joint Rail Conference, Newark, NJ, April 2000.
197. Ahmadian, M., Huang, W., "Effect of Self-Steering Locomotive Trucks in Improving Adhesion on Curved Tracks," Proceedings of the 2000 IEEE/ASME Joint Rail Conference, Newark, NJ, April 2000.
198. Ahmadian, M., "Design and Development of Magneto-Rheological Dampers for Bicycle Suspensions," Proceedings of the 1999 ASME International Congress and Exposition, Nashville, TN, November 1999.
199. Ahmadian, M., Poynor, J. C., and Gooch, J. M., "Application of Magneto Rheological Dampers for Controlling Shock Loading," Proceedings of the 1999 ASME International Congress and Exposition, Nashville, TN, November 1999.
200. Ahmadian, M. and Cantwell, R., "Effect of Pedestal Liner Clearance and Resilience on Rail Vehicle Operation," Proceedings of the ASME Rail Transportation Division, Chicago, IL, September 1999.
201. Wei, H. and Ahmadian, M., "What Role does the Steerable Linkage Stiffness Play in the Operation of a Steerable Truck?" Proceedings of the ASME Rail Transportation Division, Chicago, Illinois, September 1999.
202. Ahmadian, M. and Jeric, K. M., "The Application of Piezoceramics for Reducing Noise and Vibrations in Vehicle Structures," Proceedings of the 1999 SAE International Off-Highway Equipment Congress and Exposition, Indianapolis, IN, September 1999.
203. Ahmadian, M., Jeric, K. M., and Inman, D. J., "An Experimental Evaluation of Smart Damping Materials for Reducing Structural Noise and Vibrations," Proceedings of the 1999 ASME Design Engineering Technical Conference, Las Vegas, NV, September 1999.
204. Ahmadian, M. and Song, X., "A Non-Parametric Model for Magneto Rheological Dampers," Proceedings of the 1999 ASME Design Engineering Technical Conference, Las Vegas, NV, September 1999.
205. Simon, D. E. and Ahmadian, M., "Application of Magneto-Rheological Dampers for Heavy Truck Suspensions," Proceedings of the 32nd International Symposium on Automotive Technology and Automation (ISATA), Vienna, Austria, June 1999.
206. Pare, C. A. and Ahmadian, M., "Experimental Evaluation of Semiactive Magneto-Rheological Dampers for Passenger Vehicles," Proceedings of the 32nd International Symposium on Automotive Technology and Automation (ISATA), Vienna, Austria, June 1999.
207. Ahmadian, M., "Filtering Effects of Mid-Cord Offset Measurements on Track Geometry Data," Proceedings of the 1999 IEEE/ASME Joint Rail Conference, Dallas, TX, April 1999.
208. Ahmadian, M. and White, D. L., "An Experimental Evaluation of the Effect of Rail Vehicles Truck Suspensions on Wheel-Rail Forces," Proceedings of the 1999 IEEE/ASME Joint Rail Conference, Dallas, TX, April 1999.
209. Ahmadian, M., Kramp, K. P., and Dembosky, M. A., "TRAKVU: A New Tool for Modeling Track Irregularities in NUCARS," Proceedings of the ASME Rail Transportation Division, 1998 ASME International Congress and Exposition, Anaheim, CA, November 1998.
210. Ahmadian, M. and Dhruna, C. J., "Application of Impedance Methods for Predicting Vibrations of a Locomotive Cab," Proceedings of the ASME Rail Transportation Division, 1998 ASME International Congress and Exposition, Anaheim, CA, November 1998.

211. Ahn, Y. K., Ahmadian, M., and Morishita, S., "On the Design and Development of a Magneto-Rheological Mount," Proceedings of the 4th International Symposium on Advanced Vehicle Control, Nagoya, Japan, September 1998.
212. Ahmadian, M., "A Hybrid Semiactive Control for Secondary Suspension Applications," Proceedings of the Sixth ASME Symposium on Advanced Automotive Technologies, 1997 ASME International Congress and Exposition, Dallas, TX, November 1997.
213. Ahmadian, M., "A NUCARS Investigation of the Effect of Pedestal Liner Compliance on Rail Vehicle Hunting," Proceedings of the ASME Rail Transportation Division, 1997 ASME International Congress and Exposition, Dallas, TX, November 1997.
214. Ahmadian, M. and Yang, S., "Effect of Suspension Nonlinearities on Rail Vehicle Bifurcation and Stability," Proceedings of the ASME Rail Transportation Division, 1997 ASME International Congress and Exposition, Dallas, TX, November 1997.
215. Ahmadian, M., "On the Virtues of Steerable Locomotive Bogies," Proceedings of the ASME Rail Transportation Division, 1997 ASME International Congress and Exposition, Dallas, TX, November 1997.
216. Gellatly, A. W., Petersen, A., Ahmadian, M., and Dingus, T. A., "The Virginia Tech Center for Transportation Research Smart Truck – – An Instrumented Heavy Vehicle for Evaluation of Intelligent Transportation Systems," Proceedings of the 1997 SAE International Truck and Bus Meeting and Exposition, Cleveland, OH, November 1997.
217. Ahmadian, M., Reichert, B.A. and Song, X., "Harmonic Analysis of Semiactive Suspensions," Proceedings of the 1997 ASME Design Engineering Technical Conference, Sacramento, CA, September 1997.
218. Ahmadian, M., "Semiactive Control of Multiple Degree of Freedom Systems," Proceedings of the 1997 ASME Design Engineering Technical Conference, Sacramento, California, September 1997.
219. Ahmadian, M. and Song, X., "Effect of System Delay on Semiactive Suspension Performance," Proceedings of the Sixth International Conference on Recent Advances in Structural Dynamics, Southampton, England, July 1997.
220. Ahmadian, M. and Mosch, E. C., "Designing Heavy Truck Suspensions for Reduced Road Damage," Proceedings of the Sixth International Conference on Recent Advances in Structural Dynamics, Southampton, England, July 1997.
221. Ahmadian, M. and Delorenzo, M. W., "NUCARS Modeling of Locomotive Bogies," Proceedings of the ASME Rail Transportation Division, RTD – Vol. 12, Atlanta, GA, November 1996.
222. Yang, S. and Ahmadian, M., "Nonlinear Analysis of Hunting Stability in High-speed Rail Vehicles," Proceedings of the ASME Rail Transportation Division, Atlanta, GA, November 1996.
223. Ahmadian, M., "Ride Evaluation of a Class 8 Truck with Semiactive Suspensions," Proceedings of the 1993 ASME Winter Annual Meeting, DSC – 52, New Orleans, Louisiana, November 1993.
224. Miller, L. R., Ahmadian, M., Nobles, M. N., and Swanson, D. A., "Modeling and Performance of an Experimental Active Vibration Isolator," Proceedings of the 1992 ASME Winter Annual Meeting, Anaheim, CA, November 1992.
225. Miller, L. R. and Ahmadian, M., "Active Mounts – a Discussion of Future Technological Trends," Proceedings of Internoise – 92, Toronto, Canada, July 1992.
226. Ahmadian, M. and Marjoram, R. H., "On the Development of a Simulation Model for Tractor Semitrailer Systems with Semiactive Suspensions," Proceedings of the Special ASME Joint Symposium on Advanced Technologies, DSC – Vol. 13, 1989 ASME Winter Annual Meeting, San Francisco, CA, December 1989.

227. Ahmadian, M. and Marjoram, R. H., "Effects of Passive and Semi-active Suspensions on Body and Wheelhop Control," Proceedings of the 1989 SAE International Bus and Truck Meeting, SP – 802, Charlotte, NC, November 1989.
228. Ramamurthi, K. and Ahmadian, M., "Model Referenced and Learning Model Adaptive Control for a Robotics Manipulator," Proceedings of the 1987 ASME Winter Annual Meeting, Boston, MA, December 1987.
229. Ahmadian, M. and Inman, D. J., "Some Stability Results for General Linear Lumped – Parameter Dynamic Systems," Proceedings of the 1985 ASME Winter Annual Meeting, Miami Beach, FL, November 1985.
230. Ahmadian, M. and Inman, D. J., "On the Stability of General Dynamic Systems Using a Liapunov's Direct Method Approach," Proceedings of the Symposium on Advances and Trends in Structures and Dynamics, Washington, DC, October 1984.
231. Ahmadian, M. and Inman, D. J., "A Computer Package for the Design and Eigenproblem Solution of Damped Linear Multidegree of Freedom Systems," Proceedings of the Symposium on Advances and Trends in Structural and Solid Mechanics, Washington, DC, October 1982.

Un-refereed Conference Publications/Presentation (based on abstract only)

1. Mirzaei, M., Holton, C., Ahmadian, M., "From Data to Information: The Twists and Turns of Assessing Track Stability," Big Data in Railroad Maintenance Planning 2024 Conference, Newark, DE, December 11 – 12, 2024.
2. Ahmadian, M., Southward, S., Mantovani, G., and Sahju, A., "In-motion Detection, Isolation, and Classification of Wheel Cracks using Air-coupled Ultrasonic Acoustic Emission (UAE) Methods," MxV Rail University Day, August 6 – 7, 2024.
3. Mantovani, G., Kumar, N., Ahmadian, M., "Virginia Tech-Federal Railroad Administration Roller Rig Measurement Capabilities and Efforts to Improve its Capabilities," 2024 Pacific Southwest Region 9 UTC Annual Congress, Las Vegas, NV, March 11 – 12, 2024.
4. Kumar, N., Radmehr, A., Mantovani, G., and Ahmadian, M., "Experimental Evaluation of Loss of Braking due to Leaves on Railroad Tracks," 2024 Pacific Southwest Region 9 UTC Annual Congress, Las Vegas, NV, March 11 – 12, 2024.
5. Chen, Y., Mirzaei, M., Holton, C., and Ahmadian, M., "Application of Laser-induced Fluorescence Technique for Measuring Lubricity Conditions on Rail Gage Face," 2024 Pacific Southwest Region 9 UTC Annual Congress, Las Vegas, NV, March 11 – 12, 2024.
6. Mirzaei, M., Radmehr, A., Holton, C., and Ahmadian, M., "Leveraging Non-contact Doppler LiDAR Sensors and Unsupervised Algorithms for In-motion Assessment of Railroad Track Stability," 2024 Pacific Southwest Region 9 UTC Annual Congress, Las Vegas, NV, March 11 – 12, 2024.
7. Ahmadian, M., Radmehr, A., Mirzaei, S. M. H., "Condition Monitoring of Railroad Tracks in Revenue Service using Doppler Lidar Systems," the 8th International Conference on Condition Monitoring in Non-Stationary Operations (CMMNO 2024), Wenzhou, China, May 10 – 13, 2024.
8. Chen, Y., Mirzaei, S. M. H., Holton, C., Ahmadian, M., "Non-contact Detection and Evaluation of Rail Gage-face Lubricant using Optical Sensing Methods," the TTC Annual Conference, Pueblo, CO, November 7 – 8, 2023. (poster presentation)
9. Radmehr, A., Kumar, N., Ahmadian, M., "Experimental Evaluation of Wheel/Rail Contact, Third Body Layer, and Surface Finish on Risk of Derailment," the TTC Annual Conference, Pueblo, CO, November 7 – 8, 2023. (poster presentation)
10. Ahmadian, M., "Safety Evaluation of Interconnected Roll Stability Control Systems for Articulated Commercial Vehicles," The 16th IFToMM World Congress, Tokyo, Japan, November 5 – 11, 2023.

11. Radmehr, A. and Ahmadian, M., "Can Machine Learning Methods Improve the Identification of Unstable Tracks?" Big Data in Railroad Maintenance Planning 2022, Newark, DE, December 14 – 15, 2022.
12. Neighborgall, C., Chen, Y., and Ahmadian, M., "Field Tests and Simulation Results on Off-Tracking of a Long Combination Vehicle," the SAE International Commercial Vehicle Engineering Congress & Exhibition, Indianapolis, IN, September 20 – 22, 2022.
13. Shaju, A., Southward, S. C., and Ahmadian, M., "A Research Perspective on Truck Platooning and Autonomous Driving," SAE International Commercial Vehicle Engineering Congress & Exhibition, Indianapolis, IN, September 20 – 22, 2022.
14. Ahmadian, M., "An Overview of Some of the Dynamics and Control Challenges of Truck Platooning and Autonomous Driving," SAE International Commercial Vehicle Engineering Congress & Exhibition, Indianapolis, IN, September 20 – 22, 2022.
15. Mast, T., Radmehr, A., Hosseini, S-M. Hosseinian, Holton, C., and Ahmadian, M., "Onboard Installation of LiDAR Doppler Systems for Track Instability Measurements," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
16. Radmehr, A. and Ahmadian, M., "Early Diagnosis of Track Stability through Non-contact LiDAR Measurements and Unsupervised Machine Learning Algorithms," 2nd RailTEAM Symposium on Railroad Infrastructure Diagnosis & Prognosis, Roanoke, VA, May 23 – 24, 2022.
17. Molzon, M. and Ahmadian, M., "Improving Trackside Inspection of Rolling Stock Using a Track Crawler Robot: A Step Toward Better Diagnosis and Prognosis of Railcars," 2nd RailTEAM Symposium on Railroad Infrastructure Diagnosis & Prognosis, Roanoke, VA, May 23 – 24, 2022.
18. 2nd RailTEAM Symposium on Railroad Infrastructure Diagnosis & Prognosis, Roanoke, VA, May 23 – 24, 2022.
19. Pan, Y. and Ahmadian, M., "Design and Field Testing of an Energy Harvester Tie: Enabling Rail Safety and Connectivity," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
20. Hosseini, S-M. Hosseinian and Ahmadian, M., "Unleashing the Power of Statistical Data-driven Models for Analyzing Complex Engineering Data," the 2022 ASME Joint Rail Conference, Baltimore, MD, April 20 – 21, 2022.
21. Ahmadian, M., Radmehr, A., and Pan, Y., "Long- and Short-term effect of Top of Rail Friction Modifiers (TORFM) on Traction," International Collaborative Research Initiative Monthly Meeting, January 2022.
22. Hosseini, S-M. Hosseinian, Radmehr, A., Mast, T. Holton, C., and Ahmadian, M., "Evaluating Track Stability using Unsupervised Machine Learning Models," Big Data in Railroad Maintenance Planning 2021, Newark, DE, December 15 – 16, 2021.
23. Ahmadian, M., "Machine Learning: A New Frontier for Rail Maintenance Planning, Diagnostics, and Prognostics," Big Data in Railroad Maintenance Planning 2021, Newark, DE, December 15 – 16, 2021.
24. Neighborgall, C., Van Kat, Z., Chen, Y., and Ahmadian, M., "Trailer Brake Type Effect on Braking Distance of Class 8 A-Double Tractor-Trailer," the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, September 14 – 16, 2021.
25. Zhang, Z., Chen, Y., and Ahmadian, M., "Dimensionless and Parametric Analysis of Lateral Dynamics of Trucks with Single and Double Trailers," the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, September 14 – 16, 2021.
26. Zhang, Z., Sun, N., Chen, Y., and Ahmadian, M., "Detailed Modeling of Pneumatic Braking in Long Combination Vehicles," the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, September 14 – 16, 2021.

27. Hosseini, S-M. Hosseinian Ahangarnejad, A., Radmehr, A., and Ahmadian, M., "A Statistical Approach to Modeling Rail-Wheel Traction using Big Data," Big Data in Railroad Maintenance Planning 2020, Newark, DE, December 16, 2020. (Virtual)
28. Chen, Y., Zheng, X., Zhang, Z., and Ahmadian, M., "Effect of Uneven Loading on Roll Stability of Multi-trailer Trucks," the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, September 15 – 17, 2010.
29. Ahmadian, M. and Southern, B. M., "Reducing Vehicle Noise and Vibration through Tunable Magnetorheological Fluid-Elastic Mounts," the 27th International Congress on Sound and Vibration ICSV27, Prague, Czech Republic, July 12 – 17, 2020, postponed to July 11 – 16, 2021.
30. Afzalan, M., Jazizadeh, F. K., and Ahmadian, M., "Track Condition Assessment using Scalable On-board Data: A Machine Learning Perspective," Big Data in Railroad Maintenance Planning 2019, Newark, DE, December 11 – 12, 2019.
31. Jazizadeh, F. K., Afzalan, M., and Ahmadian, M., "Determining Track Condition from Onboard Data in Revenue Service through Machine Learning: Fondest Hopes, Wildest Dream," Big Data in Railroad Maintenance Planning 2019, Newark, DE, December 13 – 14, 2019.
32. Neighborgall, C., Mast, T., Peterson, A. W., and Ahmadian, M., "Qualitative Assessment of Rail Lubricity," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
33. Tan, Y., Chen, Y., Peterson, A. W., and Ahmadian, M., "Monitoring and Detecting Fouled Ballast using Forward Looking Infrared Radiometer (FLIR) Technology," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
34. Radmehr, A., and Ahmadian, M., "VT-FRA Roller Rig: Designed and Commissioned to Serve the Railroad Industry," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
35. Afzalan, M., Jazizadeh, F. K., and Ahmadian, M., "Towards Automated Monitoring of Track Using Machine Learning," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
36. Mast, T., Neighborgall, C., Peterson, A. W., and Ahmadian, M., "The Application of Laser Technology for Railroad Top of Rail (TOR) Friction Modifier Detection and Measurements," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
37. Dama, N., Jain, A., and Ahmadian, M., "Advanced Modeling of Railway Ballast for Improving Railroad Tamping Operation," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
38. Jazizadeh, F. K., Afzalan, M., and Ahmadian, M., "Developing Machine Learning Methods for Facilitated Track Condition Assessment using Repeated Inspection Data," The First Annual Symposium on Railroad Infrastructure Diagnosis and Prognosis Symposium, University of Nevada, Las Vegas, NV, October 16 – 17, 2018.
39. Chen, Y., Peterson, A. W., and Ahmadian, M., "A Case Study on Lateral Characteristics of Trucks with Double and Triple Trailers," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, September 11 – 13, 2018.
40. Chen, Y., Peterson, A. W., and Ahmadian, M., "Development of a Simulation Model for Evaluating Lateral Characteristics for Trucks with Double and Triple Trailers," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, September 11 – 13, 2018.
41. Chen, Y., Peterson, A. W., and Ahmadian, M., "A Simulation-based Comparative Study on the Low-speed Offtracking of Long Combination Vehicles," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, September 11 – 13, 2018.

42. Chen, Y., Peterson, A. W., and Ahmadian, M., "Achieving Pneumatic Antiroll Bar through Re-designing a Commercial Airspring Suspension for Semi-truck," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, September 11 – 13, 2018.
43. Peterson, A. W., and Ahmadian, M., "Design and Implementation of a Shaft-mounted Steering Robot for Repeatable and Limit-steer Testing of Commercial Vehicles," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, September 11 – 13, 2018.
44. Mast, T., Neighborgall, C., Peterson, A., and Ahmadian, M., "The Application of Optical Sensors for Railroad Top of Rail (TOR) Friction Modifier Detection and Measurements," 1st Annual AAR Transportation Technology Center, Inc., Student Showcase, Pueblo, CO, July 16, 2018.
45. Afzalan, M., Jazizadeh, F. K., and Ahmadian, M., "Predictive Machine Learning Models for Rail-Vehicle Dynamic Simulation," 1st Annual AAR Transportation Technology Center, Inc., Student Showcase, Pueblo, CO, July 16, 2018.
46. Radmehr, A., and Ahmadian, M., "VT-FRA Roller Rig Design and Measurement Capabilities," 1st Annual AAR Transportation Technology Center, Inc., Student Showcase, Pueblo, CO, July 16, 2018.
47. Korn, A., and Ahmadian, M., "Evolution: From Active Safety Systems to Highly Automated Vehicles," Attorneys Information Exchange Group (AIEG) Conference, Orlando, FL, April 19 – 21, 2017.
48. Ahmadian, M., Afzalan, M., and Jazizadeh, F., "Predictive Machine Learning Models for Rail-Vehicle Dynamic Simulation," Big Data in Railroad Maintenance Planning 2017, Newark, DE, December 14 – 15, 2017.
49. Hossienipour, M., and Ahmadian, M., "The Virginia Tech Roller Rig: Commissioning Report," 2017 ASME Joint Rail Conference (JRC), Philadelphia, PA, April 4- 7, 2017.
50. Nouri, A., Southward, S. C., and Ahmadian, M., "Correlation-Based Detection and Classification of Rail Wheel Defects Using Air-Coupled Ultrasonic Acoustic Emission," ASNT Spring Research Symposium, New Orleans, LA, April 11 – 14, 2016.
51. Peterson, A. W. and Ahmadian, M., "Lessons Learned from Track and City Road Testing of a Semitruck," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 6 – 8, 2015.
52. Peterson, A. W. and Ahmadian, M., "Can Pneumatically Balanced Suspensions Improve Tire Life?" SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 6 – 8, 2015.
53. Ahmadian, M., "Practical Electro-mechanical Energy Harvesters for Industrial Applications," Center for Energy Harvesting Materials and Systems, Annual Industrial Advisory Board Review, Roanoke, VA, September 13 – 16, 2015.
54. Ahmadian, M., "Non-contact Measurement of Track Geometry using Low-power LIDAR Systems," Association of American Railroad (AAR) Annual Review, Colorado Springs, CO, March 31 – April 1, 2015.
55. Doseck, M., Peterson, A. W., and Ahmadian, M. "Advantages of Synchronous and Relational Vehicle Test Data." SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 7 – 9, 2014.
56. Ahmadian, M. "Importance of Networking Through Technical Conferences." SAE International Executive Council Meeting, September 16, 2014.
57. Iranmanesh, A., West, R. L., Ahmadian, M., "Structural Design Optimization of Railroad ASME Joints Using Parametric Finite Element Analysis," Proceedings of the 2014 ASME Joint Rail Conference, Pueblo, CO, April 2 – 4, 2014.
58. Ahmadian, M., Zhang, X., "The Common Pitfalls of Heavy Vehicle Testing," SAE International Commercial Engineering Congress and Exhibition, Rosemont, IL, October 1 – 3, 2013.

59. Ahmadian, M., "Design, Development, and Control of Advanced Suspensions for Improving Vehicle Handling and Agility," International Engineering Symposium, Birmingham, AL, September 8 – 11, 2013.
60. Adjerid, K., and Ahmadian, M., "Dynamic Characterization of a Tunable Magneto-Rheological Fluid – Elastic Mount in Squeeze Mode," Virginia Tech Interdisciplinary Research Symposium, Blacksburg, VA, November 2, 2012.
61. Nagode, C., Ahmadian, M., and Taheri, S., "Vibration Energy Harvester Systems for Freight Rail," 7th Annual Energy Harvesting Workshop and the 2nd Annual CEHMS Conference, Blacksburg, VA, August 2012.
62. Nagode, C., Ahmadian, M., and Taheri, S., "Vibration Energy Harvester Systems for Freight Rail Cars," 7th Annual Energy Harvesting Workshop and the 2nd Annual CEHMS Conference, Blacksburg, VA, August 2012.
63. Taheri, M., and Ahmadian, M., "Dynamic Model of Three-Piece Truck Friction Wedge Dampers," 2nd Annual ISVT Conference, Blacksburg, VA, August 27, 2012.
64. Ahmadian, M., "FRA Non-contact LIDAR-based Tachometer," FRA 2012 R&D Review, Washington, DC, May 22-23, 2012.
65. Ahmadian, M., "Evaluation of Wheel/Rail Contact Mechanics and Dynamics," FRA 2012 R&D Review, Washington, DC, May 22-23, 2012.
66. Tamaddoni, S. H., Ahmadian, M., and Taheri, S., "Application of Linear Quadratic Game Theory in Driver Steering Modeling and Optimal VSC Design," SAE International Heavy Truck Handling, Dynamics & Control Symposium, Greenville, SC, May 15-17, 2012.
67. Mahmoodi, N. and Ahmadian M., "Active Control of Structures with Adaptive Modified Positive Position Feedback," *Proceedings of the International SPIE 2011 Smart Structures/NDE Conference*, San Diego, CA, March 2011.
68. Liam C. and Ahmadian M., "Testing and Modeling of Shock Mitigating Seats for High-speed Craft," FAST 2011 Conference, Honolulu, HI, September 26 – 28, 2011.
69. Ahmadian, M., Nagode, C., and Taheri, S., "High Output Energy Harvesting Devices for Vehicular Applications," IWPMA 2011 and 6th Annual Energy Harvesting Workshop, Roanoke, VA, August 7-11, 2011.
70. Peterson, A. W., and Ahmadian, M., "Simulation and Testing of Wave-Adaptive Modular Vessels," MACC 2011 Conference, Hampton, VA, June 14-15, 2011.
71. Liam C. and Ahmadian M., "Testing and Modeling of Shock Mitigating Seats for High-speed Craft," MACC 2011 Conference, Hampton, VA, June 14 – 15, 2011.
72. Hopkins, B., Taheri, S., Ahmadian, M., and Reid, A., "An Integrate Rollover Mitigation Strategy for Military Trucks." Ground Vehicle Systems Engineering and Technology Symposium, Dearborn, MI, August 17 – 18, 2010.
73. Farjoud, A., Mahmoodi, S. N., Ahmadian, M., "Nonlinear Model of Squeeze Flow of MR Fluids Using Perturbation Techniques," Poster presentation, *The 12th International Conference on Electro-Rheological Fluids and Magneto-Rheological Suspensions*, Philadelphia, PA, August 2010
74. Farjoud, A., Mahmoodi, S. N., and Ahmadian, M., "Nonlinear model of squeeze flow of Magneto-rheological fluids using perturbation methods," To be presented at *Thirteenth Conference on Nonlinear Vibrations, Dynamics, and Multibody Systems*, Blacksburg, VA, May 2010.
75. Nagode, C., Ahmadian, M., and Taheri, S., "Effective energy harvesting devices for railroad applications," *Proceeding of the International SPIE 2010 Smart Structures/NDE Conference*, San Diego, CA, March 7 – 11, 2010.
76. Mahmoodi, S. N. Craft, M. J., and Ahmadian, M., "Active vibration control with optimized modified acceleration feedback equipped with adaptive line enhancer," *Proceeding of the International SPIE 2010 Smart Structures/NDE Conference*, San Diego, CA, March 7 – 11, 2010.

77. Rastgaar Aagaah M., Ahmadian M. and Southward, S. C., "Robustness of Orthogonal Eigenstructure Control to Actuators Failure," *SPIE Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 7 – 11, 2010. (Presentation only)
78. Farjoud, A. and M. Ahmadian, "Shim Stack Deflection Analysis in Hydraulic Dampers Using Energy Methods", *Active and Passive Smart Structures and Integrated Systems 2010*, SPIE – The International Society for Optical Engineering, San Diego, CA, March 7 – 11, 2010.
79. Craft, M., M. Ahmadian, A. Farjoud, W. Burke, and C. Nagode, "Force Characterization of a Modular Squeeze – Mode Magneto-Rheological Device", *Active and Passive Smart Structures and Integrated Systems 2010*, The International Society for Optical Engineering, San Diego, CA, March 7 – 11, 2010.
80. Tammadoni, S., Taheri, S., and Ahmadian, M., "Cooperative Optimal Vehicle Stability Controller Based on Nash Differential LQ Game Strategy," *Proceedings of the 2009 IEEE Conference on Decision and Control*, Shanghai, PP. R. China, December 16 – 18, 2009.
81. Mahmoodi, S. N., Jalili, N., and Ahmadian, M., "Subharmonic Resonances of Piezoelectrically Actuated Microcantilevers," *Proceedings of the 2009 ASME Dynamic Systems and Control Conference*, Hollywood, CA, October 12 – 14, 2009.
82. Ahmadian, M. "Preparing Engineers for the Future Transportation Industry," *Proceedings of the SAE International Commercial Vehicle Engineering Congress & Exhibition*, Chicago, Illinois, October 6 – 7, 2009.
83. Lee, H. W., Holton, C., Sandu, C., and Ahmadian, M., "An Empirical Approach to Model the Friction Coefficient for Wheel – Rail Contact," poster presentation, the NSF CMMI Research and Innovation Conference 2009; June 22 – 25, 2009; Honolulu, Hawaii.
84. Mahmoodi, S. N., Rastgaar Aagaah, M., and Ahmadian, M., "Active Vibration Control of Aerospace Structures Using a Modified Positive Position Feedback Method," *Proceedings of the 2009 American Control Conference*, Saint Louis, MO, June 10 – 12 2009.
85. Mahmoodi, S. N. and Ahmadian, M., "Vibration Control of Piezoelectrically Actuated Microcantilevers," *Proceeding of the International SPIE 2009 Smart Structures/NDE Conference*, San Diego, CA, March 9 – 12, 2009.
86. Reader, D. M., Southward, S. C., Ahmadian, M., "Nonlinear MR model inversion for Semi-active control enhancement," *Proceedings of the SPIE 2009 Smart Structures and Materials/NDE*, San Diego, CA, March 9 – 12, 2009. (Full Paper)
87. Ahmadian, M. and Southern, B. M., "Design and Performance Analysis of a Squeeze-mode MR Mount," *Proceedings of the SPIE 2009 Smart Structures and Materials/NDE*, San Diego, CA, March 9 – 12, 2009. (Presentation Only).
88. Farjoud, A., Ahmadian, M., and Cavey, R. H., "Rheometer characterization of MR fluids in squeeze mode," *Proceedings of the SPIE 2009 Smart Structures and Materials/NDE*, San Diego, CA, March 9 – 12, 2009. (Full Paper)
89. Mahmoodi, S. N. and Ahmadian, M., "Vibration Control of Piezoelectrically Actuated Microcantilevers," *Proceedings of the SPIE 2009 Smart Structures and Materials/NDE*, San Diego, CA, March 9 – 12, 2009. (Full Paper)
90. Rastgaar M., Ahmadian M., and Southward S. C., "Active Vibration Cancellation of Tonal Disturbance using Orthogonal Eigenstructure Control," *SPIE Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, SPIE Vol. 7288, 72880P, San Diego, CA, March 8–12, 2009. (Presentation Only)
91. Lee, H. W., Holton, C., Sandu, C., and Ahmadian, M., "Feasibility Assessment for Estimating Rail Frictional Performance Through the Measurement of Wheel Slip using Optical Fiber Doppler LIDAR Techniques," poster presentation, the 14th Annual Meeting of the Association of American Railroads, Pueblo, CO, March 2 – 4, 2009.
92. Ihsan, S. I., Faris, W. F., and Ahmadian, M., "Analysis of Semiactive Suspension Systems using a Half-Car Model," *FISITA 2008*, Munich, Germany, September 14 – 19, 2008. (Poster Presentation)

93. Southward, S. C., Ahmadian, M., and Reader, D., "High-Performance Semi-active MR Suspensions using Invertible Volterra Filter Models," 14th Annual Automotive Research Center (ARC) Conference, May 20 – 21, 2008, Ann Arbor, MI. (Presentation Only)
94. Ahmadian, M., "Laboratory Evaluation of Heavy Truck Suspension Kinematics and Dynamics," Advanced Suspension Systems 2008, Dearborn, MI, May 19 – 20, 2008. (Presentation Only)
95. Ahmadian, M., "The Magic of MR Fluids: A Review of the State of the Art in Magnetorheological (MR) Fluid Technologies & Its Application in Vehicle Suspension Systems," Advanced Suspension Systems 2008, Dearborn, MI, May 18, 2008. (1/2 – day workshop)
96. Rastgaar M., Ahmadian M., Southward S. C., "Application of Orthogonal Eigenstructure Control to Flight Control Design," *SPIE Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, SPIE Vol. 6928, 69280P, San Diego, CA, March 10–13, 2008. (Presentation Only)
97. Ahmadian, M. and Blanchard, E. D., "A Non-dimensional Evaluation of Semiactive Suspensions for Improving Vehicle Ride, Handling, and Stability," IAVSD, the 20th IUTAM International Symposium on Dynamics of Vehicles on Road and Tracks, Berkeley, CA, August 13 – 17, 2007. (Poster Presentation)
98. Ahmadian, M., "A Reflection on Technologies that Could Benefit the Railroad Industry," *the ASME International Mechanical Engineering Congress and Exposition*, Chicago, IL, November 5 – 10, 2006. (Presentation Only)
99. Koo, J. H., Shukla, A., and Ahmadian, M., "Dynamic Performance Analysis of Nonlinear Tuned Vibration Absorbers," The 1st International Conference on Nonlinear Science and Complexity (NSC 2006), August 7 – 12, 2006, Beijing, China (Presentation Only).
100. Ahmadian, M. and Koo, J. H., "Magneto Rheological Tuned Vibration Absorbers: Can They Solve All Your Vibration Problems?" Proceedings of the 10th International Conference on Electrorheological Fluids and Magnetorheological Suspensions (ERMR 2006), Lake Tahoe, NV, June 18 – 22, 2006. (Full Paper)
101. Ahmadian, M. and Goncalves, F. D., "The Effect of Dwell Time on the Rheological Behavior of MR Fluids," Proceedings of the 10th International Conference on Electrorheological Fluids and Magneto-rheological Suspensions, Lake Tahoe, NV, June 18 – 22, 2006. (Full Paper)
102. Koo, J. H. and Ahmadian, M., "Qualitative Analysis of Magneto-rheological Tuned Vibration Absorbers: Experimental Approach," Proceedings of the 10th International Conference on Electrorheological Fluids and Magnetorheological Suspensions (ERMR 2006), Lake Tahoe, NV, June 18 – 22, 2006. (Presentation Only)
103. Ahmadian, M., Dillard, D. A., and Plaut, R. H., "ASME Jointless Insulated ASME Joint Designs and Performance – Durability Evaluation," Transportation Research Board Meeting, Washington, D.C., January 22 – 26, 2006. (Presentation Only)
104. Eckstein, A. C., Lambrecht, S. W., Lohse-Busch, H. H., Plaut, R. H., Dillard, D., and Ahmadian, M., "Analysis, Characterization, and Design of Adhesively Bonded Insulated ASME Joints for Rail Applications," Transportation Research Board Meeting, Washington, D.C, January 22 – 26, 2006. (Presentation Only)
105. Ahmadian, M., "On the Development of Fuzzy Skyhook Control for Semiactive Magneto Rheological System," *Proceedings of the SPIE 2005 Smart Structures and Materials/NDE*, San Diego, CA, March 6 – 10, 2005. (Full Paper)
106. Goncalves, F. D., Ahmadian, M., "A study on MR fluids subjected to high shear rates and high velocities," *Proceedings of the SPIE 2005 Smart Structures and Materials/NDE*, San Diego, CA, March 6 – 10, 2005. (Full Paper)
107. Ahmadian, M., Goncalves, F. D., and Sandu, C., "An Experimental Analysis of Suitability of Various Semiactive Control Methods for Magneto Rheological Vehicle Suspensions," *Proceedings of the SPIE 2005 Smart Structures and Materials/NDE*, San Diego, CA, March 6 – 10, 2005. (Full Paper)
108. Ahmadian, M., Song, X., and Sandu, C., "Designing an Adaptive Semiactive Magneto Rheological Seat Suspension for Heavy Truck Applications," *Proceedings of the SPIE 2005 Smart Structures and Materials/NDE*, San Diego, CA, March 6 – 10, 2005. (Full Paper)

109. Koo, J. H. and Ahmadian, M., and Elahinia, M. H., "Semi-active Controller Dynamics in a Magneto-Rheological Tuned Vibration Absorber," *Proceedings of the SPIE 2005 Smart Structures and Materials/NDE*, San Diego, CA, March 6 – 10, 2005. (Full Paper)
110. Ahmadian, M. Boggs, C. M., "Safety Effects of Operator Seat Design in Large Commercial Vehicles, Project Completion," Transportation Research Board Annual Meeting, Washington, D.C., January 8 – 14, 2005. (Poster Session and Demonstration)
111. Goncalves, F. D., Ahmadian, M., Carlson, J. D., "Behavior of MR fluids at high velocities and high shear rates," *Proceeding of the 9th International Conference on Electrorheological Fluids and Magneto-rheological Suspensions*, Beijing, China, August 29 – September 3, 2004 (Full Paper).
112. Elahinia, M., Koo, J. H., and Ahmadian, M., "Experimental Study for Controlling Shape Memory Alloy Actuated Manipulator" *10th Nonlinear Vibrations, Stability and Dynamics of Structures*, Blacksburg, VA, July 25 – 29, 2004 (Presentation Only).
113. Hou, B., Sandu, C., and Ahmadian, M., "Dynamics and Control of a High-speed Transfer Arm," *10th Nonlinear Vibrations, Stability and Dynamics of Structures*, Blacksburg, VA, July 25 – 29, 2004 (Presentation Only).
114. Worley, M. E., Sandu, C., and Ahmadian, M., "Vehicle Dynamics Simulation in Dymola Software," *2nd Annual Virginia Tech Undergraduate Research and Potential Graduate Student Conference*, Blacksburg, VA, April 13, 2004 (Presentation Only).
115. Ahmadian, M., Gravatt, J. W., "A Comparative Analysis of Passive Twin Tube and Skyhook MRF Dampers for Motorcycle Front Suspension," *Proceedings of the SPIE 2004 Smart Structures and Materials/NDE*, San Diego, CA, March 14 – 18, 2004. (Full Paper)
116. Ahmadian, M., Vahdati, N., "Effect of Hybrid Semiactive Control on Steady State and Transient Dynamics of Vehicle Suspensions," *Proceedings of the SPIE 2004 The International Society of Optical Engineering*, San Diego, CA, March 14 – 18, 2004. (Full Paper)
117. Ahmadian, M., Norris, J. A., "High-Velocity Behavior of Magneto Rheological Fluids," *Proceedings of the SPIE 2004 Smart Structures and Materials/NDE*, San Diego, CA, March 14 – 18, 2004. (Full Paper)
118. J. H. Koo, Goncalves, F. D., "Ahmadian, M., "An Investigation of the Response Time of Magneto-Rheological Fluid Dampers," *Proceedings of the SPIE 2004 Smart Structures and Materials/NDE*, San Diego, CA, March 14 – 18, 2004. (Full Paper)
119. Elahinia, M. H., Henneke, E. G., II, and Ahmadian, M., "Stress-Based Sliding Mode Control of a Rotary SMA-Actuated Manipulator," *Proceedings of the SPIE 2004 Smart Structures and Materials/NDE*, San Diego, CA, March 14 – 18, 2004. (Full Paper)
120. Ahmadian, M. Boggs, C. M., "Safety Effects of Operator Seat Design in Large Commercial Vehicles, Project in Progress," Transportation Research Board Annual Meeting, Washington, D.C., January 10 – 16, 2004. (Poster Session and Demonstration)
121. Ahmadian, M. and Koo, J. H., "On the Application of Magneto-Rheological (MR) Dampers for Reducing Floor Vibrations," *Acoustical Society of America Annual Meeting*, Austin, TX, November 9 – 14, 2003.
122. Elahinia M. H., Seigler T. M., Leo D. J., and Ahmadian M., "Sliding Mode Control of a Shape Memory Alloy Actuated Manipulator," *Proceedings of the 5th International Conference on Intelligent Materials*, Pennsylvania State University, State College PA, June 2003.
123. Seigler, M. Elahinia, M. H. Leo, D. J., and Ahmadian, M., "Stress Based Control of a Single – degree-of-freedom SMA-Actuated Arm," *Proceedings of the 5th International Conference on Intelligent Materials*, Pennsylvania State University, State College PA, June 2003.
124. Koo, J. H., Ahmadian, M., and Setareh, M., "An Experimental Evaluation of Magneto-Rheological Dampers for Semi-active Tuned Vibration Absorbers," *Proceedings of the SPIE 2003 Smart Structures and Materials/NDE*, San Diego, CA, March 2003. (Full Paper)
125. Ahmadian, M., "The Latest Trends in Reducing Noise and Vibrations in Large Commercial Vehicles: A Tutorial," *Proceedings of the 2002 ASME International Congress and Exposition*, New Orleans, LA, November 2002. (Short abstract)

126. Ahmadian, M., Appleton, R., and Norris, J. A., "Designing Magneto-Rheological Recoil Dampers in a Fire-out-of-Battery Recoil System," *Proceedings of the 11th Symposium on Electromagnetic Launch Technology*, France, May 2002. (Full Paper)
127. Ahmadian, M. and Simon, D. E., "An Analytical Experimental Evaluation of Magneto Rheological Suspensions for Heavy Trucks," *Proceedings of the 17th IUTAM International Symposium on Dynamics of Vehicles on Road and Tracks*, Lyngby, Denmark, August 20 – 24, 2001. (Full Paper)
128. Ahn, Y. K., Kim, Y. C., Yang, B. S., and Ahmadian, M., "Optimal Design of Mount Using an Enhanced Genetic Algorithm and Simplex Method," *Proceeding of the 8th International Congress on Sound and Vibration*, July 2 – 6, 2001, Hong Kong, China. (Full Paper)
129. Ahmadian, M. and Jeric, K. M., "Effect of Shunted Piezoelectric Materials on Increasing Transmission Loss," *Proceedings of the SPIE 8th Annual International Symposium on Smart Structures and Materials*, Newport Beach, CA, March 2001. (Full Paper)
130. Ahmadian, M., Jeric, K. M., and Inman, D. J., "Application of Shunted Piezoceramics for Damped and Undamped Structures," *Proceedings of the SPIE 8th Annual International Symposium on Smart Structures and Materials*, Newport Beach, CA, March 2001. (Full Paper)
131. Inman, D. J., Ahmadian, M., and Claus, R. O., "Simultaneous Health Monitoring and Control of Panels," *Proceedings of the 71st Shock and Vibration Symposium*, Arlington, VA, November 2000. (Full Paper)
132. Inman, D. J., Ahmadian, M., and Claus, R. O., "Suppressing Plate Vibrations with Smart Materials," *Proceedings of the 71st Shock and Vibration Symposium*, Arlington, VA, November 2000. (Full Paper)
133. Ahmadian, M., DeGuilio, A. P., Inman, D. J., Claus, R. O., "Application of Smart Damping Materials and Fiber Optic Sensors for Structural Vibration Reduction," *13th Annual Fiber Optics Biomedical Optics Research Review*, Blacksburg, VA, April 2000. (Extended abstract)
134. Ahmadian, M. and Poynor, J. C., "Application of Magneto-Rheological Dampers for Controlling Gun Recoil," *Proceedings of the Fourth Army Research Office Workshop on Smart Structures*, State College, PA, August 1999. (Extended abstract)
135. Yang, S. and Ahmadian, M., "Analysis of Hopf Bifurcation in Rail Vehicle Dynamics," *Proceedings of the third European Nonlinear Oscillations Conference (ENOC)*, Copenhagen, Denmark, August 1999. (Extended abstract)
136. Ahmadian, M., Song, X. and Reichert, B.A., "Damping Properties of Magneto-Rheological Fluids," *Proceedings of the Third Army Research Office Workshop on Smart Structures*, Blacksburg VA, August 1997. (Extended abstract)
137. Ahmadian, M., Song, X., and Reichert, B.A., "Semiactive Control of Structural Resonance," *Proceedings of the Eleventh Symposium on Structural Dynamics and Control*, Blacksburg VA, May 1997. (Full Paper)
138. Ahmadian, M., Song, X., and Reichert, B.A., "Semiactive Control of Multibody Systems," *Proceedings of the Eleventh Symposium on Structural Dynamics and Control*, Blacksburg VA, May 1997. (Full Paper)
139. Ahmadian, M., "Track Testing of an Innovative Steerable Locomotive Bogie for Heavy Freight Application," *Proceedings of the ASME Rail Transportation Division*, Atlanta GA, November 1996. (Extended abstract)
140. Sardar, H. and Ahmadian, M., "A Modified Model Referenced Adaptive Control Scheme for Active Vibration Control in Machining," *ASME IMECE 96, Materials Division*, Atlanta GA, November 1996. (Extended abstract)
141. Ahmadian, M., Miller, L. R., Southward, S. C., and Roemer, M. J., "Performance Analysis of Active Mounts for Structural Vibration Reduction," *Proceedings of Recent Advances in Active Control of Sound and Vibration*, Virginia Polytechnic Institute and State University, Blacksburg, VA, April 1993. (Full Paper)
142. Miller, L. R., Ahmadian, M., and Vahdati, N., "A New Approach to Meeting Engine Vibration Requirements—Active Mounts," *Aerotech'92*, Anaheim, CA, October 1992. (Short abstract)

143. Pitman, F. M. and Ahmadian, M., "Some Results on Decentralized Control of Large-Scale Modular Structures," *Proceedings of the 6th VPI & SU/AIAA Symposium on Dynamics and Control of Large Structures*, Blacksburg, VA, June 1987. (Full Paper)
144. Ahmadian, M., "A New Computational Scheme for Dynamic Analysis of Spinning Spacecraft," *Proceedings of the 28th Structures, Structural Dynamics and Materials Conference*, Monterey, CA, April 1987. (Extended abstract)
145. Ahmadian, M., "Adaptive Control for Industrial Robots," *Automated Manufacturing Exhibition and Conference*, Greenville, SC, November 1986. (Full Paper)
146. Ahmadian, M. and Inman, D. J., "On the Dynamics of Pseudo-Symmetric Systems," *The 23rd Annual Meeting of the Society of Engineering Science*, Buffalo, NY, August 1986. (Short abstract)
147. Ramamurthi, K. and Ahmadian, M., "Model Referenced Adaptive Control of a Robot Manipulator," *Proceedings of the 1986 International Federation of Automatic Control (IFAC) Symposium on Control of Distributed Parameter Systems*, Los Angeles, CA, June 1986. (Full Paper)
148. Ahmadian, M. and Huang, S. M., "Computational Comparison of Stability Techniques Available for Multiple-Parameter Dynamic Systems," *Proceedings of the 10th U.S. National Congress of Applied Mechanics*, Austin, TX, June 1986. (Short abstract)
149. Ahmadian, M. and Chou, S. H., "Stability Analysis of Multidimensional Time-Varying Systems," *Proceedings of the 10th U.S. National Congress of Applied Mechanics*, Austin, TX, June 1986. (Short abstract)
150. Ahmadian, M., "Stability Results for Lumped Parameter Time-Varying Systems," *The 27th Structures, Structural Dynamics, and Materials (SDM) Conference*, San Antonio, TX, May 1986. (Extended abstract)
151. Ahmadian, M., "On the Computational Efficiency of Stability Techniques Applied to Linear Discrete Dynamic Systems," *The 27th Structures, Structural Dynamics, and Materials (SDM) Conference*, San Antonio, TX, May 1986. (Extended abstract)
152. Ahmadian, M., "Some Stability Results for Multiple – Parameter Time-Varying Systems," *Proceedings of the 22nd Annual Meeting of the Society of Engineering Science*, The Pennsylvania State University, State College, PA, October 1985. (Short abstract)
153. Ahmadian, M., "On the Time Response of Multidegree – of – Freedom Second – Order Systems," *The 22nd Society of Engineering Science Meeting*, State College, PA, October 1985. (Short abstract)
154. Ahmadian, M. and Inman, D. J., "Closed-Loop Stability of Large Space Structures with Reduced-Order Controllers," *Proceedings of the 5th VPI & SU/AIAA Symposium on Dynamics and Control of Large Structures*, Blacksburg, VA, June 1985. (Full Paper)
155. Ahmadian, M. and Inman, D. J., "On the Stability of General Linear Dynamic Systems," *Proceedings of the 21st Annual Meeting of the Society of Engineering Science*, Blacksburg, VA, October 1984. (Short abstract)
156. Ahmadian, M. and Inman, D. J., "Controllability and Observability of Flexible Gyroscopic Systems," *Proceedings of the 21st Annual Meeting of the Society of Engineering Science*, Blacksburg, VA, October 1984. (Short abstract)
157. Ahmadian, M. and Inman, D. J., "Modal Analysis in Non-Conservative Dynamic Systems," *Proceedings of the 2nd International Modal Analysis Conference*, Orlando, FL, February 1984. (Full Paper)

Invited Colloquiums

1. Mirzaei, M., Holton, C., Ahmadian, M., "From Data to Information: The Twists and Turns of Assessing Track Stability," Big Data in Railroad Maintenance Planning 2024 Conference, Newark, DE, December 11 – 12, 2024.
2. Ahmadian, M., Southward, S., Mantovani, G., and Sahju, A., "In-motion Detection, Isolation, and Classification of Wheel Cracks using Air-coupled Ultrasonic Acoustic Emission (UAE) Methods," MxV Rail University Day, August 6 – 7, 2024.

3. Ahmadian, M., Radmehr, A., Mirzaei, S. M. H., "Condition Monitoring of Railroad Tracks in Revenue Service using Doppler Lidar Systems," the 8th International Conference on Condition Monitoring in Non-Stationary Operations (CMMNO 2024), Wenzhou, China, May 10 – 13, 2024.
4. Ahmadian, M., "Safety Evaluation of Interconnected Roll Stability Control Systems for Articulated Commercial Vehicles," The 16th IFToMM World Congress, Tokyo, Japan, November 5 – 11, 2023.
5. Radmehr, A. and Ahmadian, M., "Can Machine Learning Methods Improve the Identification of Unstable Tracks?" Big Data in Railroad Maintenance Planning 2022, Newark, DE, December 14 – 15, 2022.
6. Ahmadian, M., "An Overview of Some of the Dynamics and Control Challenges of Truck Platooning and Autonomous Driving," SAE International Commercial Vehicle Engineering Congress & Exhibition, Indianapolis, IN, September 20 – 22, 2022.
7. Radmehr, A. and Ahmadian, M., "Early Diagnosis of Track Stability through Non-contact LiDAR Measurements and Unsupervised Machine Learning Algorithms," 2nd RailTEAM Symposium on Railroad Infrastructure Diagnosis & Prognosis, Roanoke, VA, May 23 – 24, 2022.
8. Ahmadian, M., Radmehr, A., and Pan, Y., "Long- and Short-term effect of Top of Rail Friction Modifiers (TORFM) on Traction," International Collaborative Research Initiative Monthly Meeting, January 2022.
9. Ahmadian, M., "Machine Learning: A New Frontier for Rail Maintenance Planning, Diagnostics, and Prognostics," Big Data in Railroad Maintenance Planning 2021, Newark, DE, December 15 – 16, 2021.
10. Zhang, Z., Chen, Y., and Ahmadian, M., "Dimensionless and Parametric Analysis of Lateral Dynamics of Trucks with Single and Double Trailers," the SAE International Commercial Vehicle Engineering Congress & Exhibition, Chicago, IL, September 14 – 16, 2021.
11. Ahmadian, M., "Achieving Vehicle Safety Through Autonomy," University of Toledo, College of Engineering Distinguished Speaker Series, February 26, 2021.
12. Hosseini, S-M. Hosseinian Ahangarnejad, A., Radmehr, A., and Ahmadian, M., "A Statistical Approach to Modeling Rail-Wheel Traction using Big Data," Big Data in Railroad Maintenance Planning 2020, Newark, DE, December 16, 2020. (Virtual)
13. Ahmadian, M., "Achieving Vehicle Safety Through Smart Systems," University of California, Riverside, College of Engineering Distinguished Speaker Series, November 13, 2019.
14. Ahmadian, M., "Emergency Collision Avoidance Maneuvers for Long Combination Vehicles: What is Possible and What is Not," 2019 SAE International Commercial Vehicle Engineering Congress (COMVEC), Indianapolis, IN, September 9 – 11, 2019.
15. Ahmadian, M., "Simulation Evaluation on the Rollover Propensity of Multi-trailer Trucks at Roundabouts," 2019 SAE International Commercial Vehicle Engineering Congress (COMVEC), Indianapolis, IN, September 9 – 11, 2019.
16. Ahmadian, M., "Reaching Higher Levels of Railroad Engineering and Productivity through Intelligent Technologies," Invited Lecture, Frauscher Sensor Technology USA, Inc., Princeton, NJ, August 1, 2018.
17. Ahmadian, M., "Traction Measurements on VT-FRA Roller Rig," Invited Lecture, ICRI Monthly Discussions, March 2, 2018.
18. Ahmadian, M., "Railroad Engineering Research: from Torch and Hammer to Super Sensitive LIDAR Systems," Distinguished Seminar Series in Railroad Infrastructure, University of Nevada Las Vegas, November 14, 2017.
19. Ahmadian, M., "Bridging the Gap between Academic Research and Rail Industry's Need Through Affiliated Programs, with Effect on Rail Tanker Car Safety, National Research Council (NRC) Workshop, Ottawa, ON, Canada, August 25, 2017.

20. Ahmadian, M., "Evolution: From Active Safety Systems to Highly Automated Vehicles," Attorneys Information Exchange Group (AIEG) Conference, Orlando, FL, April 19 – 21, 2017.
21. Ahmadian, M., "Application of Non-contacting LIDAR Sensors for Track Geometry Assessment," LTK Engineering Services, Ambler, PA, August 2016.
22. Ahmadian, M., "Integration of Real-time Condition Monitoring Systems for Maintaining and Sustaining Railroad Infrastructure," Defense Materials, Manufacturing and Infrastructure Standing Committee (DMMI), The National Academies Science, Washington, DC, May 2016.
23. Ahmadian, M., "Top-of-rail Lubricity Measurements: Tests Results and Discussion," Norfolk Southern, Roanoke, VA, February 2016.
24. Ahmadian, M., "Application of Non-contacting LIDAR Sensors for Track Geometry Assessment," Transportation Review Board Annual Meeting, Washington, DC, January 2016.
25. Ahmadian, M., "Non-dimensional Analysis of Semiactive Magneto-Rheological Suspensions for Optimizing Vehicle Ride, Handling, and Stability," Villanova University, April 2015.
26. Ahmadian, M., "Overview of Railroad Research Activities at Virginia Tech's Railway Technologies Laboratory," Marshall University, April 2015.
27. Ahmadian, M., "Simulation and Analysis of Geometric and Dynamic Parameters Influencing Truck Maneuvering and Stability in Roundabouts," Segrave Industries, May 2015.
28. Ahmadian, M., "Comprehensive Evaluation of Dynamically Balanced Pneumatic Suspensions for Improved Heavy Truck Rollover Stability," FedEx Ground, May 2015.
29. Ahmadian, M., "Magneto Rheological Fluid Behavior in Squeeze Mode," Rice University, March 2011.
30. Ahmadian, M., "A Walk down the Memory Lane with Magneto-Rheological Technology for Vehicle Applications," Michigan Technological University, November 2011.
31. Ahmadian, M., "Magneto Rheological Tuned Vibration Absorbers: Can They Solve all your Vibration Problems?," Lawerance Technological University, February 2009.
32. Ahmadian, M., "Closed-form Analysis of Vehicle Suspension Ride and Handling Performance," EUROMECH 500, Lyngby, Denmark, June 2008.
33. Ahmadian, M., "Advanced Systems for Improving Rail Operation Safety and Efficiency," Lockheed Martin Maritime Systems and Sensors, Manassas, VA, December 2008.
34. Ahmadian, M., "Recent Trends in Applications of Smart Materials for Automotive Applications," IIUM College of Engineering, Kuala Lumpur, Malaysia, May 2008
35. Ahmadian, M., "A Non-dimensional Evaluation of Semiactive Suspensions for Simultaneously Improving Vehicle Ride, Handling, and Stability," University of Toledo, March 2006.
36. Ahmadian, M., "Smart Devices for Improving Heavy Truck Dynamics and Safety," SAE International Symposium on Truck Handling, Dynamics, and Control, Greenville, SC, May 2005.
37. Ahmadian, M., "Application of Semiactive Magneto-Rheological Suspensions for Improving Vehicle Ride, Handling, and Stability," Michelin Americas Research & Development Corporation, Greenville, SC, May 2005.
38. Ahmadian, M., "Center for Vehicle Systems & Safety," The Goodyear Tire and Rubber Company, Akron, OH, February 2005.
39. Ahmadian, M., "The Virginia Institute for Performance Engineering and Research: What's all the Excitement About?," Danville Rotary Club, Danville, VA, January 2005.
40. Ahmadian, M., "The Virginia Institute for Performance Engineering and Research (VIPER)," Ford Motor Company, Dearborn, MI, June 2004.
41. Ahmadian, M., "Biodynamics: Human Body's Reaction to Noise and Vibrations," ASME Virginia Section, Roanoke, VA, January 2004.
42. Ahmadian, M., "Magneto-Rheological Fluids and Applications," Smart Materials Short Course, Center for Intelligent Material Systems and Structures, Blacksburg, VA, May 12 – 14, 2003.

43. Ahmadian, M., "Semiactive Control of Rollover Dynamics in High CG Vehicles," SAE International TOPTEC on Heavy Vehicle Rollover and Crash Avoidance, Baltimore, MD, April 22 – 23, 2003.
44. Ahmadian, M., "On the Application of Magneto Rheological Dampers to Recreational Vehicles," Detroit Steel Products, Inc., Morristown, IN, March 2003.
45. Ahmadian, M., "Absorbing Shipboard Shocks with Magneto-Rheological Dampers," Northrop Grumman Newport News, Newport News, VA, October 2002.
46. Ahmadian, M., "Controlling Gun Recoil with Magneto-Rheological Devices," United Defense, L.P., Minneapolis, MN, June 2002.
47. Ahmadian, M., "What can Magneto-Rheological Technology do for you?" Naval Surface Warfare Center, Dahlgren, VA, April 2002.
48. Ahmadian, M., "Benefits of Magneto Rheological for Automotive Applications," Paulstra Corporation, Grand Rapids, MI, January 2002.
49. Ahmadian, M., "An Innovative Approach to Measuring Driver Fatigue due to Heavy Truck Seats," The ROHO Group, Belleville, IL, October 2001.
50. Ahmadian, M., "Magneto Rheological Devices: What They Do and How They Work," Volvo Corporation, Gothenburg, Sweden, August 2001.
51. Ahmadian, M., "Working with Advanced Vehicle Dynamics Laboratory," DaimlerChrysler Corporation, Rochester Hills, MI, June 2001.
52. Ahmadian, M., "The Magic of Magneto-Rheological Fluids," ASME Virginia Section, Roanoke, VA, September 2000.
53. Ahmadian, M., "On the Development of a .50 caliber Gun Recoil Demonstrator for Controlling Recoil Dynamics with Magneto-Rheological Dampers," Naval Surface Warfare Center, Dahlgren, VA, April 2000.
54. Ahmadian, M., "Application of Magneto-Rheological Devices for High-Frequency Vibration Control," Bridgestone–Firestone Corporation, Akron, OH, April 2000.
55. Ahmadian, M., "Advanced Technologies for Improving Railway Operations," Norfolk Southern, Inc., Roanoke, VA, February 2000.
56. Ahmadian, M., "The Many Uses of Magneto-Rheological Systems for Automotive Applications," Visteon Corporation, Dearborn, MI, October 1999.
57. Ahmadian, M., "An Assessment of Power Hop Phenomenon in Heavy – axle Off-Road Vehicles," Goodyear Tire and Rubber Company, Akron, OH, March 1999.
58. Ahmadian, M., "Magneto-Rheological Suspensions for Passenger Automobiles," Delphi Automotive Systems Corporation, Dayton, OH, November 1998.
59. Ahmadian, M., "Railroading Across the U.S. and Abroad," ASME Virginia Section, Roanoke, VA, September 1998.
60. Ahmadian, M., "Application of Magneto-Rheological Fluids for Railroad Applications," Datong Railroad Institute, Datong, China, October 1998.
61. Ahmadian, M., "Recent Advances in Railroad Technologies around the World," Shijiazhuang Railway Institute, Shijiazhuang, China, October 1998.
62. Ahmadian, M., "The Potential Benefits of Magneto-Rheological Technology for the Chinese Railway," Shijiazhuang Railway Institute, Shijiazhuang, China, October 1998.
63. Ahmadian, M., "Magneto-Rheological Fluids: An Innovative Material for Controllable Systems," Institute of Mathematical Modeling, The Technical University of Denmark, Lyngby, Denmark, March 1998.
64. Ahmadian, M., "Semiactive Control of Magneto-Rheological Seat Suspensions," Virginia Tech Department of Electrical Engineering, Blacksburg, VA, October 1997.
65. Ahmadian, M., "Practical Applications of Active Mounts for Structural Vibration Reduction," University of Maryland at Baltimore County, April 1996.

66. Ahmadian, M., "A Substructural Active Control Technique for High-Order Systems," Department of Mechanical Engineering, Virginia Tech, May 1994.
67. Ahmadian, M., "Design and Performance Analysis of Electromechanical Active Mounts for Structural Vibration," Purdue University, West Lafayette, IN, April 1993.
68. Ahmadian, M., "How to Get Rid of Those Annoying Noises and Vibrations," University of Michigan, Flint, MI, March 1993.
69. Ahmadian, M., "Dynamic and Control Analysis of a Tractor Semitrailer System with Semi-active Primary Suspensions," Department of Aeronautical and Astronautical Engineering, University of Illinois, Urbana, IL, May 1989.
70. Ahmadian, M., "Dynamic and Control Analysis of a Tractor Semitrailer System with Semi-active Primary Suspensions," Department of Mechanical and Aerospace Engineering, State University of New York at Buffalo, Buffalo, NY, April 1989.
71. Ahmadian, M., "Control of Robots: Fondest Hopes, Wildest Dreams," Society of Manufacturing Engineering – Robotics International, Charlotte, NC, February 1986.

(Last Revised: March 2025)

EXHIBIT 2

MATERIALS CONSIDERED

In developing my opinions in this matter, I reviewed and/or relied upon the documents cited or discussed in my Declaration and any exhibits or attachments thereto, as well as the following documents:

- Legal filings and pleadings generated in this matter, including the public docket, as well as the following claim construction related documents:

Railware's Proposed Claim Terms for Construction, dated February 10, 2025

SEPTA's Identification of Claim Terms for Construction, dated February 10, 2025

Railware's Claim Constructions, Supporting Evidence, and Identification of Claim Construction Experts, dated February 24, 2025

SEPTA's Identification of Proposed Constructions of Claim Terms, dated February 24, 2025

- Discovery responses generated in this matter, including:

SEPTA's Responses and Objections to Plaintiff's First Set of Interrogatories to SEPTA (Nos. 1-7), dated September 12, 2024

SEPTA's First Supplemental Responses and Objections to Plaintiff's First Set of Interrogatories to SEPTA (Supplementing Nos. 1-4, 7), dated October 23, 2024

SEPTA's Responses and Objections to Plaintiff's Second Set of Interrogatories to SEPTA (Nos. 8-9), dated December 2, 2024

SEPTA's First Supplemental Responses and Objections to Plaintiff's Second Set of Interrogatories to SEPTA Nos. 8-9, dated January 27, 2025 and exhibits thereto

Railware's Preliminary Infringement Contentions, dated December 16, 2024, and exhibits thereto

SEPTA's Invalidity Charts 1-37

SEPTA's Supplemental Preliminary Invalidity Contentions "Cover Pleading," dated February 27, 2025

- U.S. Patent Nos. 9,517,782 (the "'782 patent"), RE47,835 (the "'835 patent"), RE49,115 (the "'115 patent"), also referred to in my Declaration as the Asserted Patents, and the associated file histories of each
- U.S. Patent No. 9,403,545 (the "'545 patent") and the associated file history

- Legal filings and pleadings generated in the *Railware v. National Railroad Passenger Corporation d/b/a Amtrak*, No. 1:22-cv-5013 (SDNY) case
- Legal filings and pleadings generated in IPR2023-01179, IPR2023-01180, and IPR2023-01181
- Dictionary sources, including the following:

Collins English Dictionary, 9th Ed. (2007)

Concise Oxford English Dictionary, 11th Ed., Revised (2009)

Merriam-Webster's Collegiate Dictionary, 11th Ed. (2012)

IBM Dictionary of Computing, 9th Ed. (1993)

Railway Age's Comprehensive Railroad Dictionary, 2nd Ed. (2002)

- Other publicly available sources, including the following:

https://www.thedp.com/article/2010/10/reporters_notebook_taking_a_look_at_septa_control

<https://x.com/SEPTAPHILLY/status/1250759355416432640/photo/1>

NORAC Operating Rules, 6th ed., 6 (Jan. 1, 1997)

Federal Railroad Administration, Railroad Workplace Safety; Roadway Worker Protection Miscellaneous Revisions (RRR) at 75-76 (May 26, 2016)

- Documents produced in this matter, including the following bates numbers:

SEPTA_0004280
SEPTA_0004487
SEPTA_0245223
SEPTA_0245319
SEPTA_0245343
SEPTA_0245373

RAILWARE_(SEPTA)_0006651
RAILWARE_(SEPTA)_0034111
RAILWARE_(SEPTA)_0034125