

出國報告（出國類別：其他 國際會議）

參加 2012 年 TRB(美國運輸研究委員會)年會 出國報告



服務機關：交通部臺灣區國道新建工程局

姓名職稱：羅財怡科長

派赴國家：美國

出國期間：101 年 1 月 21 日至 101 年 1 月 27 日

報告日期：101 年 4 月 19 日

摘要：

美國運輸研究委員會（Transportation Research Board，簡稱 TRB）每年都在 1 月期間於華盛頓特區（Washington D.C.）舉辦年會暨研討會，為全球交通運輸界最具規模之學術與實務經驗交流會議，參加人員除可吸收交通運輸研究及實務經驗資訊，並可瞭解世界各地運輸領域於過去 1 年之重大研究成果及未來發展主軸，並知悉世界各國目前交通運輸政策之發展重點，作為國家未來相關議題研究與推動之重要參考，本局往年均多次派員與會觀摩學習。

本(第 91)屆 TRB 年會自 2012 年 1 月 22 日至 26 日舉行，共吸引超過 1,1000 位來自世界各國之產、官、學界人士報名參加，5 天期間內，會議場次多達 650 餘場，發表論文超過 4,000 篇以上，筆者有幸奉派參加本屆 TRB 年會活動，得以學習新知並開拓視野，回國後爰將本次出國所見所聞，作重點式之整理介紹，並提出與會心得及建議，供有興趣讀者參考。

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參加 2012 年第 91 屆美國運輸研究委員會(TRB)年會報告

一、參訪目的

(一)TRB 簡介

美國運輸研究委員會(Transportation Research Board，以下簡稱 TRB)，成立於 1974 年，前身為 1920 年成立之美國公路研究諮詢委員會(National Advisory Board on Highway Research)及 1925 年改制之公路研究委員會(Highway Research Board)，係隸屬於美國國家研究協會(National Research Council)之非營利私人機構，設立宗旨係提供美國國家科學學院(National Academy of Science)及美國國家工程學院(National Academy of Engineering)有關交通運輸之研究成果，同時藉由辦理重要研究、促進資訊傳播和鼓勵研究成果的實際執行等方式來推動運輸發展和升級，並透過近 200 個範圍涵蓋各運輸領域之常設技術委員會和專案小組之運作，出版及傳播各項研究成果和技術報告，管理研究計畫與進行重大運輸政策研究，以及舉辦全球性年會等會務運作方式來提供服務。

TRB 組織架構有以下 5 個部門及 1 個委員會，概述如下：

- 1.技術活動部(Technical Activities Division)：專責辦理各項研討會及工作會議等活動。
- 2.研究資訊部(Studies and Information Services Division)：主管研究與資訊服務。
- 3.管理財務部(Administration and Finance Division)：負責行政管理與財務工作。
- 4.計畫研發部(Cooperative Research Programs Division)：負責辦理合作研究計畫。
- 5.特殊計畫部(Special Programs Division)：主管各項專案計畫。

6.海洋運輸委員會(Marine Board)：主管有關港埠、內陸水運之規劃與環境相關之研究計畫。

TRB 之中心任務係藉由研究及相關從業人員之互動，促進運輸界研究之創新與進步，並鼓勵促使研究結果之推動實施。除於美國國會及政府相關單位之要求下，主導運輸政策研究及維護政府運輸研究網站資訊外，並且負責舉辦每年吸引超過 1 萬名國內外運輸專業人士參加的年會，故本次年會之舉辦亦為 TRB 之重要中心任務之一。

(二)參與 TRB 年會目的

TRB 年會係全世界交通運輸相關領域最具規模之經驗交流會議，可吸收交通運輸研究及實務經驗資訊，並可瞭解世界各地運輸領域於過去 1 年之重大研究成果及未來發展主軸，並知悉世界各國目前交通運輸政策之發展重點，故參與年會除可蒐集豐富資料外，研習心得並可作為國內未來各項相關議題研究與推動之重要參考。

二、行程紀要

(一)行程表

本次奉派參加 TRB 會議核定行程自 101 年 1 月 21 日至 1 月 27 日共計 7 日，其中年會議程自美東時間 1 月 22 日至 1 月 26 日共計 5 日舉行，相關行程謹彙整如表 2-1 所示。

表 2-1 奉派參加第 91 屆 TRB 會議行程表

| 日期 | 起迄地點 | 行程紀要 |
|-----------------|-----------------------------|--------------------------------|
| 1 月 21 日 (六) | 臺北－洛杉磯 洛杉磯－華盛頓特區 (去程) | 桃園中正機場－洛杉磯機場 洛杉磯機場－華盛頓特區 |
| 1 月 22 日 (日) | 華盛頓特區 | 參加專題研討會、論文發表會 |
| 1 月 23 日 (一) | 華盛頓特區 | 參加專題研討會、論文發表會 、海報研討會及參觀廠商展覽 |
| 1 月 24 日 (二) | 華盛頓特區 | 參加專題研討會、論文發表會 、海報研討會及參觀廠商展覽 |
| 1 月 25 日 (三) | 華盛頓特區 | 參加專題研討會、論文發表會 及海報研討會 |
| 1 月 26 日 (四) | 華盛頓特區 | 參加專題研討會 |
| 1 月 27 日 (五) | 華盛頓特區－洛杉磯 洛杉磯－臺北 (返程) | 華盛頓特區－洛杉磯機場 洛杉磯機場－桃園中正機場 |

(二)行程概述

本次 TRB 會議時間適逢我國春節假期，筆者於 1 月 21 日即俗稱小年夜當天下午 1630 搭乘華航自桃園機場起飛離開年味甚濃的臺灣，由於時差關係，於 1 月 21 日(美西時間)中午 12 時許抵達洛杉磯，並於當地時間下午 1545 轉飛華盛頓特區，1 月 21 日晚間 2325(美東時間)抵達華盛頓杜勒斯機場(Washington Dulles International Airport)。由於本次入境美國係屬公務性質，出關過程尚屬順利。

1 月 22 日下午即前往辦理報到手續，受惠於本局人事單位協助提早簽辦本次出國與會事宜，使筆者有充分時間在出國前即已完成註冊繳費程序，故年會報到手續很快即辦理完成，大會行政流程簡潔清楚，接待人員態度親切，可供國內借鏡。

主辦單位於 1 月 22 日即開始舉辦專題討論會(Workshops)活動，另主辦單位為利首次參與年會活動之參加者儘速進入狀況，特別於當天下午安排舉行「新鮮人歡迎會」，主要介紹說明參與年會之各項活動竅門及注意事項。

1 月 22 日至 1 月 26 日為年會研習期間，各項研習活動包括專題研討會(Workshops)、論文發表會(Sessions)、海報研討會(Poster Sessions)、委員會議(Committees)等。

本屆年會另有 1 個重要節目活動，也就是廠商展覽(Exhibits)，本屆參展廠商近 200 家，佔地超過 2,500 坪，參展主題包羅萬象，軟硬體兼具，實是年會觀摩之重點，展覽場位於 Marriot Wardman Park Hotel(詳圖 2-2)大會堂，展期為 1 月 23 日至 24 日共計 2 日。

1 月 26 日中午年會活動結束，下午則至華盛頓 DC 市區觀摩交通相關設施情形，於 1 月 27 日清晨筆者即整理行囊前往華盛頓杜勒斯機場，上午 8 時飛往洛杉磯機場轉機返回桃園機場，結束本次 TRB 年會觀摩學習之旅。

三、參加 TRB 年會紀要

(一)舉辦時間、地點

TRB 年會往例均於每年 1 月份在美國華盛頓特區舉行，今(2012)年第 91 屆會議亦於當地時間 1 月 22 日(星期日)至 26 日(星期四)舉行，為期 5 天。因會議場次多達 650 餘場，主辦單位亦循例分別於 **Marriott Wardman Park Hotel**、**Hilton Washington Hotel** 及 **Omni Shoreham Hotel** 三處飯店(詳圖 3-1~3-4)之各會議廳舉行年會各項研習活動。

Marriott Wardman Park Hotel 為主會場，規模最大，廠商展覽(Exhibits)之展覽會場亦在此飯店，本屆參展廠商近 200 家，佔地超過 2,500 坪，參展主題包羅萬象，軟硬體兼具，實是年會觀摩之重點。

主辦單位於會議期間並安排有大型接駁巴士(詳圖 3-5)來回穿梭於各會場間接送與會人員，班距約 15 至 20 分鐘，往返 Hilton 及 Marriott 之車程約 5 分鐘，步行時間亦僅約 15 分鐘，而 Omni 則與 Marriott 隔鄰一條街，往返交通可說相當便利。

三處會場均位於捷運車站附近，Marriott 與 Omni 緊鄰 Woodley Park Zoo 站，Hilton 則靠近 Dupont Circle 站，交通四通八達，華盛頓特區捷運網路由 5 條路線組成，共 90 個車站，170 公里長度，附近景點有白宮、國家歷史博物館等，餐館、商店密佈，生活機能相當便利。



圖 3-1 第 91 屆 TRB 年會舉辦會場及附近街道地圖



圖 3-2 攝於 Marriot Wardman Park Hote



圖 3-3 攝於 Hilton Washington Hotel



圖 3-4 攝於 Omni Shoreham Hotel



圖 3-5 攝於報到會場(Marriot Wardman Park Hotel)

(二)年會議程

本屆年會議程請詳表 3-1 所示，共計 5 日，包含註冊報到、新人歡迎會(New and Young Attendees Welcome Session)、專題研討會(Workshops)、論文發表會(Sessions)、海報研討會(Poster Sessions)、廠商展覽(Exhibits)及委員會議(Committees)，除委員會議需該學術委員會之委員方得參加外，其餘會議場次均可視需求自由參加。其中廠商展覽於 1 月 23~24 日上午 0930 至下午 1600 展出，海報研討於 1 月 23~25 日，而 1 月 23 至 24 日均研習至晚間 9 點為止，研習內容可說相當緊湊豐富，全部會議於 1 月 26 日中午結束。

本屆年會發表論文超過 4,000 篇以上，主辦單位將論文依屬性歸類為 39 項主要議題，分別為經營及管理、航空、橋梁及其他結構、施工、資料及資訊系統、設計、經濟、教育訓練、能源、環境、財務、貨運系統、地工、歷史、水文與水利學、法律、維護與保育、海運、材料、汽車貨運、營運及交管、乘客運輸、鋪面、行人及騎士、規劃與預測、運輸政策、公共運輸、軌道、研發、安全與人為因素、保全與緊急應變、社團、場站設施、運輸概論、車輛與設備等(詳表 3-2 第 91 屆 TRB 年會主要議題一覽表)，各主要議題下安排多達 650 餘場會議場次，各場會議安排數篇至 10 餘篇題目屬性相近之論文發表，每場會議並依其中論文題目訂定會議名稱，每篇約 15 分鐘發表時間，時間非常緊湊。本次年會主要議題及相關各場會議名稱詳附錄一。

表 3-1 第 91 屆 TRB 年會議程表

| 日期 時間 | 1 月 22 日 星期日 | 1 月 23 日 星期一 | | | 1 月 24 日 星期二 | | | 1 月 25 日 星期三 | | | 1 月 26 日 星期四 | | | | | | | | |
|----------|-----------------|-----------------|-------|-------|-----------------|-------|-------|-----------------|-------|-------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 8:00 | | | | | | | | | | | | | | | | | | | |
| 9:00 | | 註冊及報到 | 專題研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 廠商展覽 | 委員會會議 | 論文發表會 | 海報研討會 | 廠商展覽 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 專題研討會 | | | |
| 10:00 | | | | | | | | | | | | | | | | | | | |
| 11:00 | | | | | | | | | | | | | | | | | | | |
| 12:00 | | | | | | | | | | | | | | | | | | | |
| 13:00 | | | | | | | | | | | | | | | | | | | |
| 14:00 | 新人歡迎會 | 專題研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 廠商展覽 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 專題研討會 | | |
| 15:00 | | | | | | | | | | | | | | | | | | | |
| 16:00 | | | | | | | | | | | | | | | | | | | |
| 17:00 | | | | | | | | | | | | | | | | | | | |
| 18:00 | 歡迎會 | 委員會會議 | 論文發表會 | 海報研討會 | 廠商展覽 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 論文發表會 | 海報研討會 | 委員會會議 | 專題研討會 |
| 19:00 | | | | | | | | | | | | | | | | | | | |
| 20:00 | | | | | | | | | | | | | | | | | | | |
| 21:00 | | | | | | | | | | | | | | | | | | | |

表 3-2 第 91 屆 TRB 年會主要議題一覽表

| 主要議題名稱(英文) | 主要議題名稱(中文) |
|--|-----------------------|
| Administration and Management | 經營及管理 |
| AICP (American Institute of Certified Planners) Certification Maintenance Session | 美國註冊規劃師協會證書維持 論文發表 |
| Aviation | 航空 |
| Bridges and Other Structures | 橋梁及其他結構 |
| Construction | 施工 |
| Data and Information Technology | 資料及資訊系統 |
| Design | 設計 |
| Economics | 經濟 |
| Education and Training | 教育訓練 |
| Energy | 能源 |
| Environment | 環境 |
| Finance | 財務 |
| Freight Transportation | 貨運系統 |
| Geotechnology | 地工 |
| History | 歷史 |
| International Activities | 水文與水利學 |
| Law | 法律 |
| Maintenance and Preservation | 維護與保育 |
| Marine Transportation | 海運 |
| Materials | 材料 |
| Motor Carriers | 汽車貨運 |
| Operations and Traffic Management | 營運及交管 |
| Passenger Transportation | 乘客運輸 |
| Pavements | 鋪面 |
| Pedestrians and Bicyclists | 行人及騎士 |
| Planning and Forecasting | 規劃與預測 |
| Policy | 運輸政策 |
| Public Transportation | 公共運輸 |
| Rail | 軌道 |
| Research (about research) | 研發 |
| Safety and Human Factors | 安全與人為因素 |
| Security and Emergencies | 保全與緊急應變 |
| Society | 社團 |
| Terminals and Facilities | 場站設施 |
| Transportation, General | 運輸概論 |
| Transportation: Putting Innovation and People to Work | 運輸：大眾運輸新思維 |
| Vehicles and Equipment | 車輛與設備 |

(三)年會各類型研討會議簡介

本次年會之研討議題，涵蓋交通運輸相關之各類領域範疇，內容相當廣泛，為達最佳研討及經驗交流效果，本次年會仍循往年慣例採用以下各類型會議方式進行，茲分別簡介說明如下。

1.新人歡迎會(New and Young Attendees Welcome Session)

TRB 年會主辦單位為幫助首次參與年會活動的新鮮人能儘早瞭解大會作業，循例於年會首日(2012 年 1 月 22 日)下午 1430 安排新人歡迎會，邀請首次參加者與會，說明年會特色及參與各項活動之重點及注意事項。

筆者為首次參加 TRB 年會，所以也被邀請參加新人歡迎會，當天會場係以圓桌方式擺設座位，參加人員除可聽取臺上人員說明外，亦可藉此讓同桌人員增進互相認識及交流機會，可見主辦單位之用心。(詳圖 3-6)



圖 3-6 新人歡迎會(攝於 Hilton Washington Hotel 飯店)

2. 專題研討會(Workshops)

專題研討會形式主要係以國際上於前一年度即 2011 年之交通運輸領域重要議題及事項進行報告與討論為主，包括各國學術單位之重要研究成果及各國政府機關納入實施之交通措施等。與會人員可藉提問溝通，瞭解世界各地新推動之交通措施及其目前成果，亦為解決本身交通課題之考量方向(詳圖 3-7、8)。



圖 3-7 專題研討會會場

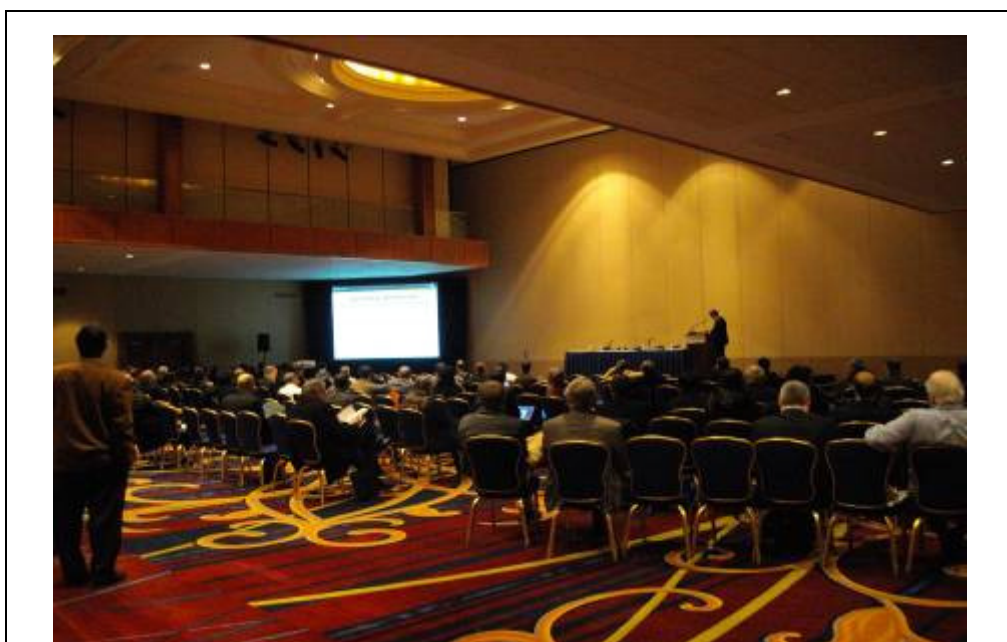


圖 3-8 專題研討會會場

3.論文發表會(Sessions)

論文發表會形式主要以各國大學院校及研究單位等學術研究機構之論文發表為主，由於 TRB 年會之研討議題，涵蓋交通運輸相關之各類範疇，包羅萬象，內容廣泛，本次年會發表論文超過 4,000 篇以上，安排之論文發表會議場次多達 650 餘場，規模之盛大，令人嘆為觀止。

筆者於參加期間查閱會議資料發現，臺灣於本次 TRB 年會亦有不少大學院校、顧問公司等單位之學者專家參與投稿並參與論文發表，投稿單位諸如臺灣大學、成功大學、中央大學；海洋大學、台北科技大學、高雄第一科技大學、高雄餐旅大學、開南大學、中興顧問公司、鼎漢顧問公司等，發表論文共計約 24 篇，其中又以成功大學發表論文最多，計有 9 篇，其次為臺灣大學計有 6 篇。

另值得一提的是，筆者在 TRB 會場中巧遇國立成功大學土木工程研究所陳建旭教授，陳教授為國內瀝青混凝土界知名學者，與筆者算是舊識，在人生地不熟的遙遠美國巧遇，真有他鄉遇故知的感覺。本局國道 6 號南投段工程之道路鋪面係國內首次大規模採用石膠泥瀝青混凝土(Stone Matrix Asphalt ,簡稱 SMA)及多孔隙瀝青混凝土(Porous Asphalt Concrete,簡稱 PAC)，即是由陳教授進行成效評估之研究，陳教授此次參加 TRB 年會亦是發表有關多孔隙瀝青混凝土(PAC)工程性質與行為之論文。



圖 3-9 論文發表會會場



圖 3-10 論文發表會會場

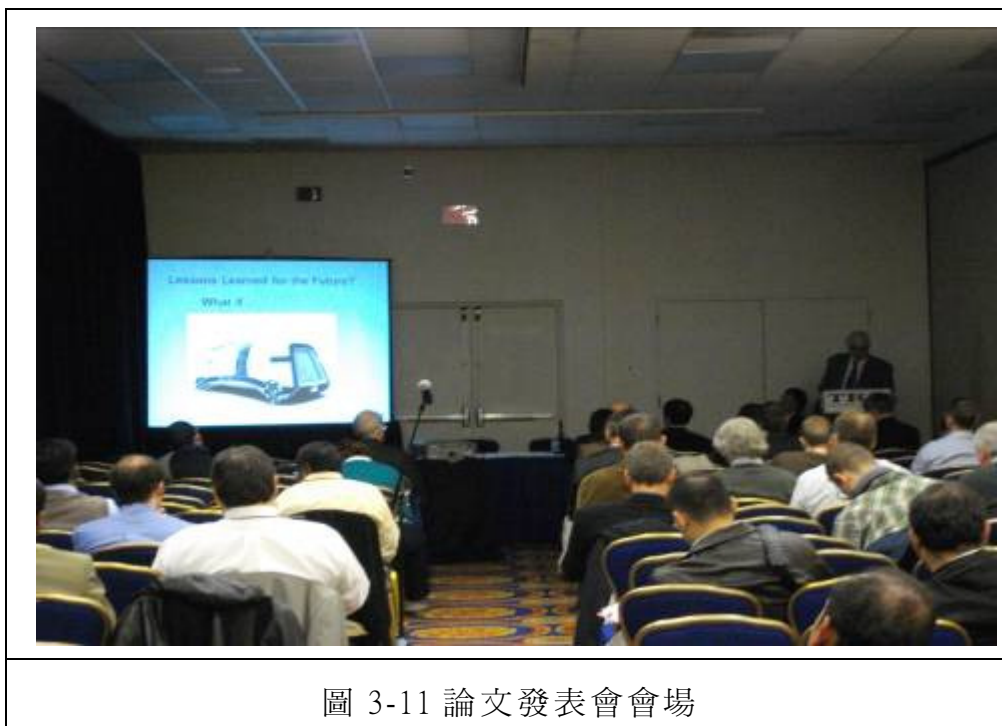


圖 3-11 論文發表會會場



圖 3-12 筆者於 TRB 會場巧遇成功大學土研所陳建旭教授(左立者)

4.海報研討會(Poster Sessions)

海報研討會係論文發表者將論文之重點以海報方式直接張貼於看板上，並於現場與對論文內容有興趣之與會者當面說明溝通，與會者可於大會手冊中找到相關場地及時段直接前往參與研討。

海報研討會為 TRB 年會之重要特色，筆者係首次參與海報研討會，由於是與論文作者面對面溝通，一問一答，提問可以馬上得到回覆答案，研討學習效果相當良好，惟仍須具備一定語文溝通能力，且熱門之論文須等候作者一一溝通說明，較為費時。惟此種形式為一相當不錯之論文發表及研討方式，直接有效果，頗值得國內大型研討會議採納(詳圖 3-9~3-12)。

筆者於參加海報研討會現場亦遇到國內知名學者臺灣大學土木工程研究所周家蓓教授及其指導研究生，周教授正以海報研討方式解說有關回收瀝青鋪面有關節能減碳效益之論文。



圖 3-13 台大周家蓓教授於海報研討會發表論文



圖 3-14 海報研討會會場



圖 3-15 海報研討會會場

5. 廠商展覽(Exhibits)

廠商展覽於 1 月 23 日至 24 日在主會場 Marriott Wardman Park Hotel 大會堂舉行，共分為 A、B、C 三個展場，佔地約 2,500 坪，參展廠商近 200 家，主題包括橋梁結構、施工、設計、環境工程、貨運、公路、交通維持、材料、鋪面、交通管理、行人及騎士、大眾運輸、軌道、車輛設備、政府部門出版品等，展示內容包含相關之交通軟、硬體及印刷出版品(參展廠商一覽表及廠商攤位平面圖詳附錄二)。

當天走入展覽會場，參展廠商攤位種類繁多，令人目不暇已，好像走入大型百貨公司一般。展覽內容與本局業務較相關者包含規範書籍展售、交通規劃及交通模擬軟體、交通安全設施、施工交通維持規劃、碰撞緩衝設施、鋪面或結構或地工檢測儀器設備等產品展示，相關展覽成果相當豐富多元，或以實體展示，或以影片播放，更有實景模擬等方式；部分展示攤位亦提供書面資料或 CD、DVD 光碟片供與會者索取參考。(詳圖 3-16~3-27)

廠商展覽中有一道路標線之參展攤位，其產品為”冷塑性道路標線”，與國內常用之熱處理聚酯標線不同，依 DM 資料及人員介紹，”冷塑性道路標線”具有施工快速、耐磨耐久、反光效果佳等優點，尤其在雨天天夜晚之反光效果更明顯優於傳統標線。另值得一提的優點，本局國道 6 號南投段工程之道路鋪面採用多孔隙瀝青混凝土(PAC)，自完工通車後成效良好，惟有反應傳統熱熔標線會滲入 PAC 內因而阻隔路面排水，造成應用成效的困擾，而此種”冷塑性道路標線”因非採熱熔方式施工，並不會產生阻隔排水問題，經當場詢問廠商人員其產品價格較傳統標線高約 2~3 成，但因其使用年限較久，相對費用亦不會較傳統標線高，初步探討功能性、耐久性、施工性及經濟性而言，本局日後工程 PAC 路面應可再進一步檢討將此種”冷塑性道路標線”納入參考採用。(詳圖 3-26~3-27)



圖 3-16 AASHTO 展覽攤位



圖 3-17 ASCE 展覽攤位



圖 3-18 高強度鋼筋展覽攤位



圖 3-19 行車模擬軟體展覽攤位



圖 3-20 結構監測及非破壞檢測展覽攤位



圖 3-21 行車模擬軟體展示(攝於會場)



圖 3-22 土工檢測儀器設備展覽攤位



圖 3-23 鋪面長期行為監測分析展覽攤位

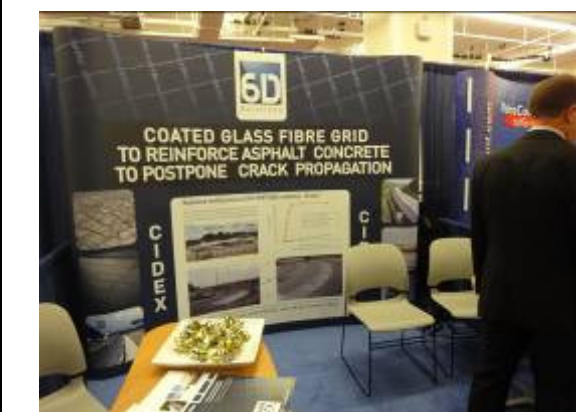


圖 3-24 玻璃纖維瀝青混凝土展覽攤位



圖 3-25 瀝青鋪面試驗儀器展覽攤位

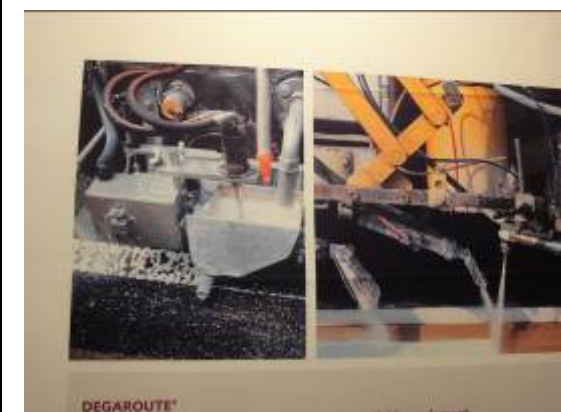


圖 3-26 “冷塑性道路標線”展示資料



圖 3-27 “冷塑性道路標線”展示品

(四)年會主要議題概述

本屆年會中研討議題包含與交通運輸相關之各類議題，主辦單位共分成 39 項議題，因時間內容廣泛，以下僅針對年會橋梁及其他結構、設計、施工、材料、維護與保養、鋪面等議題各擇一論文，作概略性之介紹說明。

1.橋梁及其他結構(Bridges and Other Structures)

會議編號及名稱：219 Long-Span, Spliced, and Continuous Prestressed Girder Bridges Continuous Precast, Prestressed Concrete Girder Bridge Systems

論文名稱：challenges of long-span prestressed girder bridges in washington state

PCI 梁橋具易施工及經濟性等優點，唯一般可施作跨徑大多受限於 45m 以內。根據現有的文獻顯示，使用高性能材料或組合梁段(Half-Joint 接頭)等方法可延長 PCI 梁橋的跨度範圍。然而，若想兼顧預鑄及運輸施工，並能顯著增加跨度，似乎只能從採取變梁深和提供連續性橋跨配置著手。作者試圖從設計面出發，改進 Half-Joint 結構，提出完全預應力、部份預應力及全面增強(非預應力)混凝土系統，將 Half-Joint 接頭變成連續梁，適用跨徑範圍將可增加至 90m 以內，同時亦可減少維修成本，提高耐久性。

此外，在美國華盛頓州 PCI 梁編號 WF100G 之梁深為 254cm (國內最高為 215cm)，可施作最大跨徑為 60m，同樣亦可達到減少落墩、降低環境衝擊，以及減少製造、運輸和安裝成本。

2.設計(Design)

會議編號及名稱：726 Design, Construction, and Evaluation of Precast Concrete Pavements

論文名稱：Design considerations for jointed precast concrete systems

預鑄混凝土鋪面(Precast Concrete Pavements PCP)在國外行之有年，主要是應用在交通流量大及無法封路者，雖然是採預鑄施工，但仍需要一小部分的現場澆鑄及養護時間，方能開放通車。規劃設計考慮要點為夜間施工性、混凝土耐久性及接點處載重傳

遞方式及面板支撐條件等。

3. 施工(Construction)

會議編號及名稱：775 Accelerated Construction: A Look at Today and Tomorrow

論文名稱：Future of Construction

安全與品質一直是工程施工所追求的目標，未來的施工環境為營造有利於安全與品質的作業環境，讓所有團隊成員均能安心工作，更能增進工作效率。要達到快速施工，可從調查、設備、效用及管理系統等四方面著手，調查係指對工程進行完整詳細的調查，才能清楚知道風險及規劃避險，此外大量選用自動化機具施工設備，可避免人員曝險，亦可提升品質，並透過效用評估來篩選合宜的機具與工法，全程使用管理系統才能清楚掌控工程進度與品質。作者提出 4D、5D 及 6D 管理模式，4D 為傳統 3 維施工加入「時程控管」、5D 則是又加入「品質與成本」，至於 6D 則是再加入「維護與操作」，與目前國內所強調的全生命週期管控有異曲同工之妙。

4. 材料(Materials)

會議編號及名稱：475 New Applications for Fiber-Reinforced Polymers in Infrastructure Repair

論文名稱：New Adhesives and FRP Materials for Strengthening Civil Engineering Infrastructure

FRP (Fiberglass Reinforced Plastics) 是玻璃纖維強化塑膠的簡稱。FRP 簡單的說就像鋼筋混泥土中的鋼筋與混泥土兩種複合材料經過混合後就能有優良的強度，玻璃纖維所使用的樹脂材料具有耐水、耐藥、耐熱等特性且有良好的表面張力，因此玻璃纖維複合材同時具有優良的耐蝕性及高強度，這是其他材料所沒有的。國內偏重於建築結構補強應用範疇，橋梁工程較少使用。國外最新發展為使用新的粘合劑、纖維、組態及錨碇系統等，以改進 FRP 之延展性、強度、耐燃及應用面。

此外，另有一工程案例「Gandy Bridge, Tampa Bay, 2004」係

使用 FRP 材料補強橋柱，該工程下構採樁柱系統，橋柱已嚴重腐蝕導致鋼筋外露，利用 FRP 具高強度及抗腐蝕特性，補強墩柱及減緩鋼筋鏽蝕。

5. 維護與保養 (Maintenance and Preservation)

會議編號及名稱：151 Continuous Deflection Measurements for Highway Infrastructure Assessments

論文名稱：Deflectograph and Traffic Speed Deflectometer: United Kingdom Experience

本篇為介紹英國所發展之鋪面管理系統，最新檢測機具為所謂 Traffic Speed Deflectimeter TSD，能以 80km/h 車速快速建立車道寬之路面資訊(含變位)，並以公正客觀數據作為維護管理決策依據，更有利於運用有限的資源做最有效的品質提昇。

道路平整度一直是用路人判斷道路好壞最直覺的感受，也就是基於此點，工程會才會將道路平整度列為施政重點，台北市政府更推出路平專案，企圖給予國人最直接的體驗。雖然台灣也有所謂鋪面管理系統，並由中華顧問與中央大學共同研發出「鋪面檢測車」，但是礙於國內主客觀因素的複雜影響，導致目前尚未有持續且實際運作之鋪面維護管理系統落實於工程界。

6. 鋪面 (Pavement)

會議編號及名稱：290 Pavement Materials and the Urban Climate: New Developments

論文名稱：Benefits in Energy Savings and CO₂ Reduction by Using Reclaimed Asphalt Pavement

本篇為臺灣大學土木工程研究所周家蓓教授及其指導學生所撰寫。本篇研究使用「環境與經濟評估效益的道路生命週期估價方法」(PaLATE)配合臺灣地區瀝青拌合廠提供的能源消耗量來確認回收瀝青(RAP)的節能減碳效益。而其他影響因子，例如工廠的節能對策、RAP 路面的行為等，也都列入考量。

根據研究的結果顯示：相對於天然瀝青混合料，生產含有 30%RAP 的瀝青混合料，將會只產生 84%能源消耗量，及 80%的

CO₂ 散發量。雖然有些研究顯示，含有 RAP 的瀝青混合料其行為比不上天然瀝青混合料，但只要 RAP 混合料的壽命有天然瀝青混合料的 80%，這將會對生命週期的節能減碳產生正面的助益。在路面混合料中使用 RAP 對於提升道路工程的環保性來說，的確是一個可行及有潛力的方法。

(五)參觀華盛頓 DC 地區交通設施概述

筆者利用參加 TRB 年會之餘，參觀華盛頓 DC 地區交通設施，作概略性之介紹說明討。

1. 橋梁路段採剛性路面

此次筆者前往華盛頓 DC 參加 TRB 年會，係住宿鄰近之維吉尼亞州，於往返會場途中發現，該地區之道路係採瀝青混凝土(AC)之柔性鋪面，而經過橋梁路段時係採混凝土之剛性鋪面，此種作法與國內橋梁路段皆採瀝青混凝土鋪面之作法不同，應可再瞭解其考量原因，檢討兩種方式之差異及優缺點比較，供國內工程參考。



圖 5-1 橋梁路段採剛性路面(1)



圖 5-2 橋梁路段採剛性路面(2)

2. 拱橋造型優美，與當地環境融合

筆者經過華盛頓 DC 河邊道路有兩座拱橋，皆為拱橋構造，造型古樸優美，與當地環境融合，可供國內設計參考。



圖 5-3 華盛頓 DC 地區拱橋(1)



圖 5-4 華盛頓 DC 地區拱橋(2)

3. 橋臺採用預鑄面版加勁式擋土牆

此次筆者參加 TRB 年會期間，於往返會場途中發現，美國華盛頓 DC 地區橋臺邊坡及道路邊坡採用預鑄面版加勁式擋土牆情形非常普遍，除可減少用地面積外，造型優美，用路人視覺景觀佳，可供國內工程參考採用。



圖 5-5 預鑄面版加勁式擋土牆(1)



圖 5-6 預鑄面版加勁式擋土牆(2)

4. 工程告示牌，清楚解說工程內容及目的

此次筆者前往會場附近之國家廣場及紀念公園(National Mall & Memorial Parks) 參觀時，看到國會山莊前之草皮廣場正在進行工程施工，工程圍籬上掛有工程告示牌，清楚解說該工程係在進行土壤排水系統改善，可多收集雨水以用來灌溉，減少使用可飲用水，進而改善地區用水品質，此種告示牌具有教育意義及告知功能，值得國內工程參考採用。



圖 5-7 工程圍籬上掛有工程告示牌



圖 5-8 工程告示牌解說工程內容目的

三、心得及建議事項

(一)建議本局可加入 TRB 團體會員，每年派員參加年會吸取經驗

TRB 年會皆於每年 1 月間舉辦，內容涵蓋交通運輸領域各個層面，該年會已經是全球交通運輸界公認為最重要年度活動之一，每年吸引來自全世界各國政府運輸相關部門、學術機構及民間公司等產官學界合計超過 1 萬人員以上參與研習，對於提昇國內交通運輸全生命週期各層面之實務技術，實有莫大正面助益。

惟筆者本次奉派出國參加開會，發現本局編列之經費尚嫌不足，且逐年遞減，筆者特趕在 2011/11/30 前報名，費用為美金\$610 元，因 2011/11/30 後報名費提高為美金\$915 元)，而報名前經瞭解交通部運輸研究所係為 TRB 團體會員，每年可有 2 名免費名額，故建議本局未來與高公局整併後，可加入 TRB 團體會員，並編足經費派員參與年度大會，以吸收國際間交通運輸界最新發展技術資訊及寶貴經驗。

(二)國內產、官、學界可踴躍投稿論文或設攤參展，積極參與 TRB 年會國際盛會

由於 TRB 年會已為全球交通運輸界重要年度活動，各國參與者非常擁躍，產、官、學界交通運輸人才雲集，甚受國際交通運輸界重視，

本屆 TRB 年會共有超過 4000 篇以上投稿論文發表，而臺灣大學院校、顧問公司等單位發表論文共計約 24 篇，僅佔千分之 6 左右，比例甚少，相形之下，中國大陸近年在參與 TRB 年會上，不論與會人數、發表研究論文成果等各層面皆相當踴躍，頗值得國內省思。

建議國內產、官、學界可踴躍投稿論文或設攤參展，積極參與 TRB 年會國際盛會，以增加臺灣在國際間交通運輸界之知名度與實力。

(三) 論文資料以線上方式瀏覽，方便有效率又環保

本屆年會中發表之論文超過 4,000 篇，研討會議超過 650 餘場，由於論文數量龐大，主辦單位為節省紙張並達到環保之目的，近年來已不印製書面論文集，報名與會者在給付報名費後即提供一組帳號及密碼，參加人員從網站上登入後，所有論文資料以線上方式瀏覽，並可透過搜尋系統，瀏覽欲參閱之論文資料，同時主辦單位也在各會場內設置多處即時線上查詢系統，提供最新之會議進行資訊，方便與會者選擇欲參加之場次，此種作法，方便有效率又環保，實可供國內舉辦類似大型研討會議時參考仿倣。

(四) 國外新工法、新材料可供國內參採

本次參加 TRB 年會期間，於聽取發表之論文，其中 PCI 梁可施作最大跨徑為 60m 之工程案例，具有減少落墩、降低環境衝擊，以及減少製造、運輸和安裝成本等優點。雖然目前本局工程採用 PCI 梁之機會條件較少，惟日後若有適合條件亦可請顧問公司納入評估方案參考。另有關玻璃纖維強化塑膠（Fiberglass Reinforced Plastics，簡稱 FRP）材料，具有重量輕、高強度及耐蝕性等優點，國內偏重於建築結構補強應用範疇，橋梁工程較少使用，參加期間有聽聞國外已有應用於實際橋梁工程案例，後續應可再搜集相關資料，作為國內工程應用參考。

另於廠商展覽中所參觀之“道路標線產品”冷塑性道路標線”，具有施工快速、耐磨耐久、反光效果佳等優點，尤其在雨天夜晚之反光效果更明顯優於傳統標線。此種“冷塑性道路標線”因非採熱熔方式施工，並不會造成 PAC 阻隔排水問題，應可再進一步探討其功能性、耐久性、施工性及經濟性等，檢討後續工程 PAC 路面將此種“冷塑性道路標線”納入參考採用。

(五) 節能減碳，地球公民共同責任

伴隨著地球暖化、氣候變遷，人們對於節能減碳的環保意識日漸抬頭，環保運動已成為了地球公民的共同責任。本次 TRB 年會，針對節約能源、減少二氧化碳排放量、碳足跡、環境保護等相關議題，有非常多的研究論文發表，節能減碳已經是全球運輸界一致公認最重要議題之一。反觀國內運輸工程建設，於工程規劃、設計、施工階段對於二氧化碳排放量、碳足跡的探討研究及節能減碳作法尚在起步階段，應可多搜集國外相關經驗與作法等資料，作為國內運輸工程建設推動節能減碳之參考。

五、附錄

(一) TRB 年會主要議題及各場會議名稱

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- 767 Rail Transit Systems: Improving the Reliability, Planning, and Design of Transit Lines

• Research (about research)

- 221 Rail Capacity Research
- 529 International Transportation Research and Resources
- 567 Emerging Artificial Intelligence Techniques in Transportation
- 736 Best Papers from Seventh Annual Interuniversity Symposium on Infrastructure Management

• Safety and Human Factors

參加 2012 年第 91 屆 TRB 年會出國報告

- 200 Achieving Balance Between Pedestrians and Vehicles at Roundabouts
- 212 Traffic Operations in Adverse Weather
- 224 Baby on Board: Exploring the Relationship Between Children and Travel Needs and Patterns
- 227 Biking to and Within Public Lands
- 237 Developments in Safety Improvements for Low-Volume Roads
- 240 Highway Safety Management Improvement Through Research
- 245 Traffic Law Enforcement Research
- 251 Best Papers from First International Conference on Access Management
- 258 Managing Safety: Research Insights
- 260 Pedestrians and Safety
- 262 Weather Impacts on Surface Transportation
- 286 Bicycling Infrastructure and Safety
- 294 Truck and Bus Safety Research
- 311 New Research on Alcohol, Drugs, and Transportation Safety
- 317 Research on Traffic Sign Minimum Retroreflectivity and Pavement Marking Presence
- 345 Keeping Safety and Mobility for Older Persons
- 353 Planning Applications of Geospatial Technologies
- 371 Pavement Marking Visibility and Retroreflectivity Under Wet Conditions
- 373 Visibility and Lighting Issues
- 397 Impact of Access Management Research
- 398 Impact of Information on Transportation Operations, Safety, and Users
- 399 Making a Difference in Occupant Protection: Research Findings
- 400 Motorcycles, Mopeds, and Rider Research
- 404 Work Zone Analysis Tools
- 405 Work Zone Safety and Mobility
- 429 Railroad Operational Safety Research
- 431 Research All About Roundabouts
- 432 Research for the Sake of Safety
- 436 Yellow Change Interval: Traffic Control Device Dilemma
- 461 Evaluating and Managing Work Zone Traffic Impacts
- 463 Highway-Rail Grade Crossing Safety: Methods to Quantify Risk and Prioritize Improvements
- 470 Incorporating Safety into Pavement Management Systems
- 494 Traffic Sign Detection and Pavement Marking Management and Durability
- 510 Improving Driver Understanding and Behavior in Work Zones
- 536 Safety Performance of High-Speed Facilities
- 537 Safety: Performance, Screening, and Contributing Factors
- 552 Traffic Monitoring and Control Using Mobile, Onboard, and Roadside Sensors
- 558 Safety Risk Assessment Applications Including Use of Fuzzy Logic
- 586 Current Research on Transportation Security and Protection of Critical Infrastructure
- 604 Current Issues in School Transportation Safety
- 607 Vehicle-to-Vehicle Communication for Traffic Management and Safety Control
- 644 Access Management Implementation, Safety, and Analysis

參加 2012 年第 91 屆 TRB 年會出國報告

- 646 Bicycle Safety and Infrastructure from a Multiuser Perspective
- 648 Highway Safety Performance
- 652 Pedestrian Safety and Operations
- 653 Planning for Pedestrians
- 704 Data-Driven Scenario Design and Analysis
- 705 Driver Speed and Longitudinal Control
- 707 Human Factors Research
- 708 Statistical Research for Transportation Applications
- 724 Understanding Traffic Mobility and Safety Benefits of Winter Maintenance
- 751 Intersection Safety Findings, Capacity Adjustments, and Accommodation of Trucks and Superloads at Roundabouts
- 770 Traffic Safety and Traffic Management in China
- 778 "Operator Performance Measurement Using a Driving Simulator"
- AHD55 Signing and Marking Materials Committee
- AT040 Transportation of Hazardous Materials Committee
- AW040 Marine Safety and Human Factors Committee (AW040)

• Security and Emergencies

- 586 Current Research on Transportation Security and Protection of Critical Infrastructure
- 706 Emergency Evacuation Research Developments
- 752 Putting Emergency Evacuation Research into Practice
- AT040 Transportation of Hazardous Materials Committee

• Society

- 279 Environmental Justice, Transit, and Mobility
- 296 Community Impact Assessment: Highlighted Approaches in Delivering Projects and Offering Community Solutions
- 298 Health, Transportation, and Data
- 300 Research on Social and Economic Factors of Transportation
- 421 Public Involvement in Transportation
- 446 Analysis Tools for Environmental Justice in Transportation
- 451 Mode Choice and Accessibility Issues
- 574 Travel Behaviors and Choices of Seniors and People with Disabilities
- 590 Around the World: Does Gender Influence Travel?
- 712 Telecommuting and E-shopping
- 733 Addressing Equity in Generating Transportation Revenues
- 739 How Do Information and Communications Technologies Continue to Re-form How We Travel, Teleshopping, and Even Industrial Uses?
- ADD50 Environmental Justice in Transportation Committee

• Terminals and Facilities

- 220 Port Operations and Port Performance
- 441 Developments in Intermodal Freight Terminal Operations

- 496 Current Research on Intermodal Freight Terminal Design and Operations and International Trade

• **Transportation, General**

- 336 Parking: Getting the Supply Right
- 393 Transportation Demand Management and the Business Community
- 697 Learning and Interest Development in the Transportation Field Through Innovative Approaches
- 736 Best Papers from Seventh Annual Interuniversity Symposium on Infrastructure Management
- 798 Understanding and Improving Community Mobility for All

• **Transportation: Putting Innovation and People to Work**

- 205 Innovative Pavement Applications
- 276 Assessing National, Regional, and Local Performance, Accessibility, and Economic Impacts of Transportation Investments
- 279 Environmental Justice, Transit, and Mobility
- 283 Macroeconomic Impacts of Transportation Energy Research, Innovation, and Regulation: Where Are the Jobs? Part 2--Fuel Economy Standards and Other Green Energy Initiatives (Part 1, Session 229)
- 289 Innovative Concrete Technology
- 309 Intercity and Commuter Rail Equipment Technologies
- 426 Innovations in Bridge Construction
- 501 Advancing Quality in Geoengineering
- 532 Social Media and Public Transportation
- 573 Transportation for National Parks and Public Lands: Promoting Livability, Sustainability, and Strong Local Economies
- 574 Travel Behaviors and Choices of Seniors and People with Disabilities
- 614 Future Course for Cargo and Commerce, Part 4: Focus on Urban Goods Movement (Part 1, Session 467; Part 2, 513 Session; Part 3, Session 554)
- 629 Plug-in Hybrid Electric Vehicles: Steps Toward Reality
- 697 Learning and Interest Development in the Transportation Field Through Innovative Approaches
- 699 New Technologies to Improve Commuter Rail Service Delivery
- 750 Emerging Technological Approaches to Analyzing Highway Projects

• **Vehicles and Equipment**

- 350 Accessible Transportation and Mobility: Research and Practice
- 488 Advances in Winter Maintenance Equipment
- 719 Critical Issues Affecting Maintenance Equipment in Departments of Transportation

附錄(二)

參展廠商一覽表及展場平面圖

Exhibits

Marriott, Exhibit Hall

TRB is hosting commercial exhibits at the Annual Meeting as an extension of the TRB Annual Meeting educational program. Visit the exhibit hall to see a variety of transportation-related products and services showcased. Also on display are exhibits from TRB sponsors on recent research projects and products. Join us for the opening of the exhibits on Sunday. Food concessions will be available in the Marriott Atrium, between sessions.

The TRB exhibit features information about affiliate services, publications, the Cooperative Research Programs,

the Transportation Research Information Services (TRIS), and the Innovations Deserving Exploratory Analysis (IDEA) Programs. In addition, this year's display will highlight the second Strategic Highway Research Program (SHRP 2).

Exhibit hours are

- Sunday, January 22, 4:00 p.m.–7:00 p.m. (Opening and Reception)
- Monday, January 23, 9:30 a.m.–4:00 p.m.
- Tuesday, January 24, 9:30 a.m.–4:00 p.m.

EXHIBITORS AT A GLANCE

| | | | |
|--|------|---|------|
| 3d-Radar | 1106 | Highway Safety Information System (HSIS) | 3205 |
| 3M | 1100 | Highways for LIFE | 3009 |
| 6 D SOLUTIONS | 3707 | Local & Tribal Technical Assistance Program (LTAP/TTAP) | 3115 |
| Advanced Mobile Asset Collection | 1110 | Long Term Pavement Performance Program (LTPP) | 3008 |
| Advitam | 2101 | Long-Term Bridge Performance Program (LTBP) | 3010 |
| AgileAssets, Inc. | 1404 | National Highway Institute (NHI) | 3109 |
| AMEC | 1514 | National Historic Covered Bridge Preservation Program | 3014 |
| American Arminox, Inc. | 2005 | Office of Federal Lands Highway (FLH) | 3211 |
| American Association of State Highway and Transportation Officials | 3401 | Office of Freight Management and Operations | 3107 |
| American Coal Ash Association | 3804 | Office of Highway Policy Information | 3007 |
| American Concrete Pipe Association | 1416 | Office of Innovative Program Delivery (IPD) | 3001 |
| American Galvanizers Association | 1209 | Office of International Programs | 3005 |
| American Public University | 3806 | Office of Operations | 3101 |
| American Society of Civil Engineers | 1210 | Office of Safety | 3207 |
| American Transportation Research Institute (ATRI) | 3202 | Office of Technical Services (OTS) | 3114 |
| Applied Geomechanics | 2002 | Pavements Program | 3004 |
| Applied Research Associates, Inc. | 1206 | Resource Center | 3110 |
| ASCE Publications | 1306 | Surface Transportation Environment and Planning Cooperative Research Program (STEP) | 3832 |
| AssetWorks, Inc. | 3808 | Sustainable Highways Program and INVEST Tool | 3836 |
| ATSSA–American Traffic Safety Services Association | 1314 | Transportation Asset Management | 3002 |
| Barrier Systems, Inc. | 1102 | Transportation Planning Capacity Building Program | 3830 |
| Bridge Diagnostics, Inc. | 1510 | Universities and Grants Program | 3113 |
| Caliper Corporation | 1202 | Federal Motor Carrier Safety Administration (FMCSA) | 3208 |
| Campbell Scientific, Inc. | 1217 | Federal Railroad Administration (FRA) | 3206 |
| Cargill SafeLane (TM) Surface Overlay | 2112 | Federal Transit Administration (FTA) | 3313 |
| CERATECH | 3702 | FEHRL | 3826 |
| Certainty 3D | 2107 | FP2 Inc. | 1322 |
| Chase Construction Products | 2000 | Freyssinet, Inc. | 2105 |
| Citilabs | 1310 | Fugro | 2011 |
| Congress for the New Urbanism | 3810 | Geophysical Survey Systems | 1511 |
| Construction Cost Systems, Inc. | 3706 | Gibraltar Cable Barrier Systems | 3606 |
| CoVal Systems, Inc. | 1203 | Greenwood Engineering A/S | 1320 |
| CTS Cement Mfg. Corp. | 2100 | Gregory Highway Products | 1105 |
| Dayton Superior Corporation | 2109 | Harris Corporation | 1214 |
| DBi Services | 1114 | Hobas Pipe USA | 1104 |
| Decagon Devices, Inc. | 1417 | Humboldt Mfg. Co. | 2008 |
| Deighton Associates Limited | 1215 | IDS North America | 3600 |
| Dewberry | 1300 | Image Microsystems | 1504 |
| District Department of Transportation | 3214 | Infrastructure Corporation of America | 2120 |
| Dynatest Consulting Inc. | 1418 | INRO | 1222 |
| Eco-Counter | 1423 | InspectTech | 1508 |
| Econolite Group, Inc. | 3820 | InstroTek, Inc. | 2006 |
| EDR Group | 1207 | Intercomp | 2001 |
| Emerald Group Publishing | 1219 | International Municipal Signal Association | 2016 |
| Engineering and Research Int'l, Inc. | 1121 | International Road Dynamics Inc. | 1520 |
| Enterprise Information Solutions, Inc. | 2118 | Interstate Road Management | 1117 |
| Evonik Degussa Corporation | 1302 | ITEM, Ltd. | 3802 |
| Expanded Shale, Clay and Slate Institute | 1307 | Iteris, Inc. | 1400 |
| Federal Highway Administration (FHWA) | | ITS America | 3814 |
| Building Better Bridges | 3012 | Japan International Transport Institute, USA | 2111 |
| Congestion Mitigation and Air Quality Improvement Program | 3834 | Kessler Soils Engineering Products, Inc. | 2013 |
| Corporate RD&T: From Research to the Road—Putting Good Ideas Into Practice | 3215 | Kwik Bond Polymers | 2010 |
| Data and Safety Analysis Tools | 3201 | LeddarTech | 2119 |
| Every Day Counts (EDC) | 3100 | Lodex Engineering Corporation | 1319 |
| Exploratory Advanced Research (EAR) Program | 3213 | Maccaferri, Inc. | 2104 |
| Highway Driving Simulator | 3203 | Mala Geoscience USA, Inc. | 2014 |
| | | Mandli Communications, Inc. | 1305 |

Exhibits (continued)

Exhibitors at a Glance (continued)

| | | | |
|--|------------|---|-----|
| McTrans Center | 1402 | SoilVision Systems Ltd. | 210 |
| MetroCount | 3705 | South Coast Air Quality Management District | 34 |
| Midwestern Software Solutions | 3818 | SSL | 21 |
| Minnesota Department of Transportation | 3413 | Stirling Lloyd Products, Inc | 15 |
| Miovision Technologies Inc. | 1507 | STRESSTEEL | 21 |
| MISTRAS Products and Systems | 1201 | TAPCO | 200 |
| MOBA Corporation | 1316 | Taylor & Francis | 12 |
| MTJ Engineering | 2015 | TenCate Geosynthetics | 11 |
| Mute Wall Systems | 2106 | Tensar International Corporation | 130 |
| Mygistics, Inc. | 1405 | The Association of Pedestrian and Bicycle Professionals | 21 |
| National Advanced Driving Simulator | 1108 | The National Academies | 38 |
| National Highway Traffic Safety Administration | 3309 | The Reinforced Earth Company | 210 |
| National Transportation Safety Board (NTSB) | 3200 | TomTom | 140 |
| National Work Zone Safety Clearinghouse | 3822 | Topcon Positioning Systems | 200 |
| NEXCO-West USA, Inc. | 1111 | TRACC-Argonne National Laboratory | 150 |
| Novatek, Inc. | 3703 | TraFFix Devices, Inc | 200 |
| Olson Engineering, Inc. | 1208 | Transpo Industries, Inc. | 14 |
| OmniBond Systems, LLC | 1301 | Transportation Research Board | 360 |
| Optech, Incorporated | 2017 | TransTech Academy, Cardozo High School | 38 |
| Parsons Brinckerhoff | 1303 | TRE Canada Inc. | 370 |
| Pathway Services Inc. | 1406 | Trimble | 21 |
| Pavement Technology, Inc. | 1419 | Trinity Highway Products, LLC | 12 |
| Pavemetrics Systems | 1323 | Troxler Electronic Laboratories, Inc. | 20 |
| Plastic Safety Systems, Inc. | 2021 | TSS-Transport Simulation Systems | 14 |
| Polara Engineering, Inc. | 1103 | Uretex USA Inc | 21 |
| Proto Manufacturing Inc. | 3824 | U.S. Army Corps of Engineers (USACE) | 32 |
| PTV America, Inc. | 1408, 1409 | U.S. DOT / RITA | |
| QinetiQ North America | 1107 | Bureau of Transportation Statistics (BTS) and National | |
| Quadstone Paramics | 1218 | Transportation Library (NTL) | 330 |
| Quality Counts | 1119 | Intelligent Transportation Systems (ITS) Program | 330 |
| Redi-Rock International | 1515 | Positioning, Navigation and Timing (PNT) | 330 |
| Regional Economic Models, Inc. | 1101 | Research and Innovative Technology Administration | 330 |
| Regional University Transportation Centers | 2113 | (RITA) | |
| Roadtec | 1315 | Research Development and Technology (RDT) and | 330 |
| Rubber Pavements Association | 1518 | University Transportation Centers (UTCs) | |
| Schnabel Foundation Company | 2003 | Small Business Innovation Research (SBIR) | 330 |
| SHRP 2 | 2019 | Transportation Safety Institute (TSI) | 330 |
| SIDRA SOLUTIONS | 1116 | Volpe National Transportation Systems Center (Volpe) | 330 |
| SIMCO Technologies Inc. | 1516 | U.S. Environmental Protection Agency | 33 |
| SINAK Corporation | 1415 | Vector Corrosion Technologies | 150 |
| Skycomp, Inc. | 3700 | Virginia Department of Transportation | 340 |
| Smart Eye | 2117 | Waylink Systems Corporation | 12 |

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SINAK Corporation—Booth 1415

Julie Sikora
Journals Marketing Manager
Taylor & Francis—Booth 1216

Alex Gerodimos
President
TSS-Transportation Simulation Systems—Booth 1420

Exhibit Hall Floor Plan

