Transportation News

A Resource for Military Transportation Engineers

Volume 26, March 2005

In This Issue

e-news coming soon

Receive the latest tri-service transportation systems pavement information by signing up to receive quarterly e-news. You can sign up by faxing in the form on the back or by e-mailing **mary.j.adolf@usace.army.mil** (please put "e-news" in the subject line). If you are currently receiving notification of Transportation News on-line you do not need to sign up for e-news. The plan is to continue publishing *Transportation News,* but only once a year.

Corps Loses Best of the Best

On 31 March 2005 the Transportation Systems Center will lose its best employee yet. Betty Carmody will be retiring from USACE to join her brother and sisters in Wessington, South Dakota. She is looking forward to being with family, spending time with her 3 cats (Tasha, Toby and Jay), remodeling her newly acquired home in Wessington, and hopefully visiting with her new grandson, Lander, in San Francisco, California.

Betty Carmody, professional assistant for the Transportation Systems Center retires to South Dakota

Ms. Carmody joined the TSC in 1998 and has spoiled the team ever since. Her strong sense of duty and selfless service compel her to do whatever is required to get the job done. She often works late, on weekends or at home, to complete a task. She is always willing to learn new things, accept new responsibilities and to help others. She always treats everyone with respect and dignity and never has a bad word to say about anyone. Many customers (HQUSACE, HQUSAF, NAVFAC, Districts, and Installations) have commented on her very responsive and friendly attitude. Betty's dedication, "positive can do attitude", sense of duty, selfless service, work ethics and personal courage are extraordinary. She is a highly valued member of the TSC team and her presence will be sorely missed both as a team member and friend.

Best Wishes Betty! You deserve the best for you are the Best!

Changes to Railroad Standards

by Dan Boyer, USACE, Transportation Systems Center

A committee of personnel from the Navy and Army, with input from the Air Force, is converting the old Technical Manual 5-628, *Railroad Track Standards,* into a Tri-Service manual, UFC 4-860-03, by the same title. The primary change is the incorporation of safety and maintenance standards into one document.

In the new UFC the *safety standards* will define the track condition limits that will result in restrictions on the rail operation. The *maintenance standards* will define the limits and conditions to ensure the Department of Defense (DOD) tracks are maintained at a full compliance condition that exceeds DOD safety and the Federal Railroad Administration (FRA) safety standards. The concept used for DOD is to maintain railroad tracks at an operational condition that will permit some degradation of the track without falling below the safety standards.

The committee members have achieved agreement between the Army, Navy, and Air Force on uniform standards for DOD tracks, with only a few exceptions. The Army will continue to require track inspectors to be certified, where as the Navy requires the track to be certified by a Certifying Official.

Primarily, installation personnel will use this document during the inspection of railroad tracks. Corps of Engineers District personnel may also use the UFC to develop O&M contracts for installation support. For more information contract Dan Boyer at 402-221-7266 or e-mail **dan.j.boyer@usace.army.mil**.

Criteria Update

The following documents are under development or revision. When complete they will be posted on the TECHINFO website at **www.hnd.usace.army.mil/techinfo**.

Unified Facilities Criteria (UFC)
UFC 3-230-01, Airfield Drainage
UFC 3-250-01, Pavement Design for Roads, Streets, Walks, and Open Storage Areas
UFC 3-250-03, Standard Practice for Flexible Pavements
UFC 3-250-04, Standard Practice for Rigid Pavements,
UFC 3-250-08, Standard Practice for Joint/Crack Sealing
UFC 3-260-01, Airfield & Heliport Planning & Design
UFC 3-260-02, Airfield Pavement Design
UFC 3-260-11, Model Design-Build (D-B) RFP for Airfield Contracts
UFC 3-270-05, PAVER – PCI (Concrete Pavements)
UFC 3-270-06, PAVER – PCI (Asphalt Pavements)
UFC 3-270-07, Airfield Damage Repair
UFC 4-860-03, Railroad Track Standards

Unified Facilities Guide Specification (UFGS) Updates
UFGS 02300, Earthwork
UFGS 02712, Lime-Stabilized Base Course, Subbase, or Subgrade
UFGS 02721, Base Course for Rigid & Select Materials & Subbase Courses for Flexible Paving
UFGS 02722, Crushed Aggregate Base Courses
UFGS 02761/63, Airfield & Roadway Pavement Markings
UFGS 02821A, Fencing
UFGS 02951/81, Paint & Rubber Removal
UFGS 02xxx, Jet-Blast Fences
UFGS 02xxx, Polymer Composite Micro Overlays

Air Force Instructions (AFIs) & Engineering Technical Letters (ETLs)
AFI 32-1041, Airfield Pavement Evaluation and Maintenance Program
AFI 32-1042, Standards for Marking Airfields
ETL 05-xx, Mooring/Tie Down and Jacking Guidance for Selected Aircraft
ETL 05-xx, Alkali-Silica Reactivity (ASR) Guidance
ETL 05-xx, Design, Construction, Maintenance, and Evaluation of the McMurdo Sound Sea Ice Runway for Heavy Wheeled Aircraft Operations
ETL 05-xx, Installation of MB 60.9.9.C & MB 100.10.C Emergency Aircraft Arresting Systems
ETL 05-xx, Aircraft Characteristics Data
ETL 05-xx, Use of Off-the-Shelf Admixtures in Concrete as Antifreeze Admixtures
ETL 05-xx, Design, Construction, Maintenance, and Evaluation of Deep Snow Runways...

Completed documents now available on TECHINFO:
UFGS 02740, Stone Matrix Asphalt (SMA) for Airfield Pavements
UFGS 02742, Hot-Mix Asphalt Pavement (w/o Pay Factors)
UFGS 02749, Hot-Mix Asphalt (HMA) for Airfields
UFGS 02751, Concrete Pavement for Airfields & Other Heavy-Duty Pavements (<10,000 yd^3)
UFGS 02753, Concrete Pavement for Airfields & Other Heavy-Duty Pavements
ETL 03-8, Rejuvenation of Hot-Mix Asphalt (HMA) Pavements
ETL 04-2, Standard Airfield Pavement Marking Schemes
ETL 04-4, Trenchless Technology (TT) for Crossing Air Force Pavements
ETL 04-6, Inspection of Drainage Systems
ETL 04-7, C-130 and C-17 Landing Zone (LZ) Dimensional, Marking and Lighting Criteria
ETL 04-8, Stone Matrix Asphalt (SMA) for Air Force Pavements
ETL 04-9, Pavement Engineering Assessment (EA) Standards
ETL 04-10, Determining the Need for Runway Rubber Removal

Guide Specification Number Changes

A number of USACE guide specification numbers have changed and some have been eliminated as they are combined with Navy specifications. Soon, by Congressional mandate, there will only be one set of guide specifications to be used by all the armed services and NASA. The changes are decided by a Steering Committee which includes representatives from each of the services. A revised index of all UFGS, along with a listing of the "updated, new and deleted" specifications can be found on the TECHINFO website (**www.hnd.usace.army.mil/techinfo/**) under *Publications*. Pavement related specification changes are summarized in the table below.

Don't get too attached to the new numbers because this fall all specification numbers will be changed to the Construction Specification Institute (CSI) 6 digit numbering system using MasterFormat™. "MasterFormat is the specifications-writing standard for most commercial building design and construction projects in North America."

The most significant change is the new numbering system and expanded number of divisions. The five-digit specification numbers will become six digits in groups of two, separated by spaces. The six-digit numbering is for all Divisions, 00-49, and also allows for two additional digits to the right of the decimal point, i.e. for multiple contracts or alternate systems.

00 24 16 Scopes of Proposals
    00 24 16.13 Scopes of Proposals (Multiple Contracts)
    00 24 16.16 Scopes of Proposals (Multiple-Prime Contract)

The numbers and titles are intentionally structured for anticipated growth and expansion in the future. The plan is to have the UFGS updated to the new numbering system by October 2005. Program changes to SpecsIntact are also being developed to accommodate the new system.

More information on MasterFormat™ is available at **http://www.csinet.org/s_csi/docs/9400/9361.pdf**. CSI "encourages all interested parties to provide input to CSI so that as the built environment evolves so can MasterFormat". Information about CSI is available at **http://www.csinet.org/s_csi/index.asp**.

SRM Function Moves to AFCESA

The Air Force Civil Engineer Support Agency's (AFCESA) mission expanded on 1 October 2004 when it assumed responsibility for managing and executing Air Force operations and maintenance (O&M) Sustainment, Restoration and Modernization (SRM) projects. The function was previously managed by the Air Force Center for Environmental Excellence, Brooks AFB, Texas. To support the new role, a new directorate - Installation Support - has formed at AFCESA. The directorate has four divisions (POL/Fuels, Vertical, Pavements and Utilities) and will be staffed with project managers who will help installations monitor and manage construction quality, timeliness and costs. AFCESA's subject matter experts will provide technical support to the new directorate.

SRM contacts at AFCESA
Director—Myron Anderson, DSN 523-6470, comm. 850-283-6470
POL--Pat Mumme, DSN 523-6361, comm. 850-283-6361
Vertical—Norm Fowler, DSN, 523-6345, comm. 850-283-6345
Utilities—Mike Giniger, DSN 523-6520, comm. 850-283-6520
Pavements—Jim Greene, DSN 523-6334, comm. 850-283-6334

			Superseding	
UFGS #	**Title**	**Current Date**	**UFGS #**	**Date**
02708	Lime-Stabilized Base Course, Subbase, or Subgrade	08/04	02712A	12/97
~~Deleted~~	~~Recycled Asphalt Concrete Intermediate Wearing Courses for Roads~~	---	~~02969~~	---
02703	Hot Mix Asphalt (HMA) for Roads	08/04	02741A	09/99
02701	Bituminous Binder and Wearing Courses (Central-Plant Cold-Mix)	08/04	02742A	07/97
02231	Clearing and Grubbing	09/03	02231	07/02
~~Deleted~~	~~Recycled Asphalt Concrete Intermediate and Wearing Courses~~	---	~~02968~~	---
02709	Portland Cement-Stabilized Base or Subbase Course	08/04	02711A	03/98
02707	Bituminous Base Course	08/04	02713A	08/97
02706	Drainage Layer	08/04	02714A	07/01
02705	Subbase Courses	08/04	02721A	03/97
02704	Aggregate and/or Graded-Crushed Aggregate Base Course	08/04	02722A	05/01
02986	Grooving for Airfield Pavements	08/04	02981A	11/97
~~Deleted~~	~~Asphalt Slurry Seal~~	---	~~02787~~	~~09/01~~

ASTM Changes

ASTM has reissued the Marshall method as ASTM D6926-04, *Standard Practice of Bituminous Specimens using Marshall Apparatus* and D6927-04, *Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures*. The old Marshall method (D1559) was discontinued without replacement several years ago. Making specimens is covered by D6926-04, which includes a manual hammer or mechanical hammer compaction option. AASHTO M320-03, *Standard Specification for Performance-Graded Asphalt Binder* replaces the provisional MP 1a that we have used since the beginning of the PG grading system. These revisions will be incorporated into UFGS 02749, Hot-Mix Asphalt (HMA) for Airfields and UFGS 02941, *Hot-Mix Asphalt (HMA) for Roads* and be available in April 2005.

New Asphalt Institute Software

The Asphalt Institute announced the release of their new thickness design software, SW-1. The software is an integrated package for pavement design of highways, airports, and other pavements based on Asphalt Institute methods (MS-1, MS-11, MS-17, and MS-23). For more information on the software and how to purchase it, visit the website at www.asphaltinstitute.org.

UFGS Status Report

UFGS 02703 - Hot-Mix Asphalt (HMA) for Roads
This UFGS was formerly UFGS 2741, which was renumbered in August 2004; however, the content has not been updated since September 1999. This specification is undergoing a major revision to align with AASHTO practice and industry guidance for selection of Performance Grade Asphalt Cements, Superpave mix design alternates, and mat /joint density calculations using theoretical maximum density. This revised version is anticipated to be available on TECHINFO* by May 2005.

UFGS 02704 – Aggregate and Grade Crushed Aggregate Base Course
This UFGS was formerly 02722A. Currently, 02722 is the Navy version. A first draft of a Tri-Service version was circulated to the Army, Navy and Air Force last year. Comments have been addressed and two issues are being considered: 1) revision of the 0.02 mm requirements for frost-free materials, and 2) the impacts of recycling alkali Silica reactivity (ASR)-infected PCC as base course aggregate. This revised version is anticipated to be available on TECHINFO* by April 2005.

UFGS 02749 - Hot-Mix Asphalt (HMA) for Airfields
The current version of this UFGS is January 2004. The Airfield HMA User/Producer Group met in January 2005 to review proposed changes to UFGS 02749, "Hot-Mix Asphalt for Airfields". Minor changes are proposed to the aggregates, asphalt cement binder, job-mix formula (JMF) adjustment, and test section portions of the specification. The major change will be to include an accept-reject payment tailoring option to the current pay-for-performance payment provision. This revised version is anticipated to be available on TECHINFO* by May 2005.

UFGS 02753 - Concrete Pavement for Airfields and Other Heavy-Duty Pavements More Than 10,000 Cubic Yards
The current version of this UFGS is May 2004. The Tri-Services met in January 2005 to review proposed changes to UFGS 02753, "Concrete Pavement for Airfields and Other Heavy-Duty Pavements More Than 10,000 Cubic Yards" and discuss developments in the concrete paving industry that could impact current or future Tri-Service guide specifications. This was the first review since the 2004 major revision, and only minor changes were identified. Changes are proposed to update ASR publications, expand the Designer's Notes, and add web-site addresses for additional information. This revised version is anticipated to be available on TECHINFO* by May 2005.

*TECHINFO website: http://www.hnd.usace.army.mil/techinfo/

Where Can I Find…

Where can I find a publication that specifies the standard criteria and procedures for conducting airfield surveys?

UFC 3-260-03, *Design: Airfield Pavement Evaluation* paragraph 3. a. (2) indicates that the procedures in **ASTM D 5340, *Standard Test Method for Airport Pavement Condition Index Surveys*** should be used for conducting airfield condition surveys. ASTM D5340 is available to Corps, Navy and Air Force personnel via **www.wbdg.org**. To find the ASTM on the website: click on the DOD logo on the far right side of the home page, go to the appropriate agency and scroll down to Non-Government Standard –HIS, click on "Specs and Standards 3.0" in the first column, and search for ASTM D 5340.

UFC 3-260-05, *O&M: Paver Concrete Surfaced Airfields Pavement Condition Index (PCI)* and **UFC 3-260-05, *O&M: Paver Asphalt Surfaced Airfields Pavement Condition Index (PCI)*** are the current distress manuals that are available at **www.hnd.usace.army.mil/techinfo/engpubs.htm**.
(Continued Page 5)

Latest in Airfield Paving Workshops

HQUSACE Memorandum, "Military Construction Management Policy for Airfield Pavement Projects," dated 2 Feb 2001, requires the USACE Transportation Systems Center (TSC) to conduct on-site Airfield Paving Workshops for all airfield pavement projects constructed by the Corps of Engineers with CWE over $5M. Workshops are provided for Corps QA personnel and designers, contractor/subcontractor, QC and paving personnel, materials suppliers, testing lab personnel, A-E designers and installation design and construction personnel. Workshops are conducted for Air force or Navy constructed airfield projects, upon request.

HMA Airfield Paving Workshops are one day and are conducted by Dr. Ray Brown, Director, National Center for Asphalt Technology (NCAT). Cost of HMA workshops are approximately $8,000±, depending on travel costs, and include the following topics: mix design, plants, surface preparation, laydown, compaction, QC/QA, performance and review of contract specification 02749. PCC Airfield Paving Workshops are two days and are conducted by Gene Gutierrez, Rick Donovan and Terry Sherman. Cost of PCC workshops are approximately $10,000±, depending on travel costs, and include the following topics: materials, mix design, plants, uniformity testing, demolition, slip form paving (finishing, texturing, edging, curing, etc), fixed form paving, dowel installation, joint sawing/sealing, CQC testing, control charts, CQC inspection, acceptance testing, repair and review of contract specification 02753. Cost of HMA and PCC Workshops (together) are approximately $15,000±, depending on travel costs.

In FY04, the TSC conducted 22 Airfield Paving Workshops (15 PCC and 7 HMA) that were attended by 434 attendees. Workshops were conducted for projects at Portland ANG, OR, Laughlin AFB, TX, Rota NAS, Spain, Ft. Drum, NY, Elmendorf AFB, AK, Ft. Greely, AK, Ft. Dix, NJ, Ramstein AB, Germany, Pope AFB, NC, Al Udeid AB, Qatar, Randolph AFB, Egypt Area Office, Cairo, Egypt, Jordan/Iraq projects, Cairo, Egypt, Indian Springs (Las Vegas), NV, Al Udeid AB, Qatar and Bagram AB, Afghanistan. Workshops in the Middle East were in direct support of Global War on Terrorism.

To date in FY05, the TSC has conducted 4 Airfield Paving Workshops (3 PCC and 3 HMA) that were attended by 250 attendees. Workshops were conducted for projects at Homestead ARB, FL, Tyndall AFB, FL, Charleston AFB, SC, and Grand Forks, ND. At the Tyndall AFB workshop, personnel from Corps of Engineers' offices in Alabama, Florida, Honduras, Peru, El Salvador, Ecuador and Columbia attended.

Tentatively scheduled workshops in FY05 include HMA/PCC workshops England Air Park, LA (16 – 18 Mar 05), and Sheppard AFB, TX (22 – 24 Mar 05). Workshops will also be held at Andersen AFB, Guam, Mountain Home AFB, MT, Eielson AFB, AK, Kunsan AB, Korea, and Al Dhafra AB, UAE. For more information or to schedule a workshop, please contact Terry Sherman, 402-221-7260, **terry.w.sherman@usace.army.mil**.

Where Can I Find…(Con't)

These distress manuals are currently being updated. The new draft manuals update the distress identification/severity levels and are available at the following ftp site: **ftp://ftp2.cecer.army.mil/pub/** in the folder: Air Force Distress Manuals.

Information in **UFC 3-260-16FA,** ***Design: Airfield Pavement Condition Survey Procedures***, found on the website **www.hnd.usace.army.mil/techinfo/UFC/UFC3-260-16FA/UFC3-260-16FA.pdf** supercedes **TM 5–826-6/AFR93-5,** ***Procedures for US Army and US Air Force Airfield Pavement Condition Surveys*** which is outdated and should not be used.

If you are searching for pavement-related information and not sure where to look contact the Transportation Systems Center and we'll try to point you in the right direction. Submit inquiries to Terry Sherman, 402-221-7260 or e-mail at **terry.w.sherman@usace.army.mil**.

Excellent Resource for Geosynthetics

*The Geosynthetic Institute (GSI) is a consortium of organizations interested in, and involved with, geosynthetics (i.e. geotextiles, geomembranes, geogrids, geonets, geocomposites, geosynthetic clay liners, geopipe and geofoam). The mission of GSI is to develop and transfer knowledge, assess and critique geosynthetics, and provide service to the member organizations.**

GSI fulfills its mission by providing consultation on specific geosynthetic technical issues and projects, providing training at reduced cost to member organizations, conducting research, and developing test methods and design tools. GSI is an excellent technical resource for geosynthetics. For all the services provided to member organizations visit the GSI website at **www.geosynthetic-institute.org**.

The Corps has reaped the many benefits of GSI membership since 1993, thanks to funding and coordination by the USACE Hazardous, Toxic, and Radioactive Waste Center of Expertise (HTRW CX). Due to the growth of geosynthetics usage Corps-wide, beyond that of just HTRW applications, the HTRW CX has looked to Corps Districts and the Transportation Systems Center to help pay the $10,000 annual fee for the past few years. If you would like more information on GSI services or would like to help defer the cost of the membership fee please contact the Corps GSI POC, Dave Jaros, USACE HTRW CX at (402) 697-2668 or e-mail at **dave.l.jaros@usace.army.mil**.

*(n.d.). retrieved 11 Jan 05, from Geosynthetic Institute Web site: www.geosynthetic-institute.org.

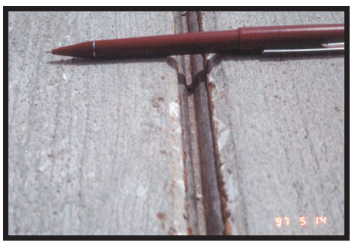
Kudos to…

Charlie Schiavino, Naval Facilities Engineering Service Center, for receiving the prestigious Navy Meritorious Civilian Service Award for his many years of outstanding service to the Navy, Marine Corps, and to the Tri-Service Team. For the last almost 40 years Mr. Schiavino has been going from airfield to airfield solving problems, reducing the scope and cost of repairs, and saving the Government millions of dollars. Mr. Schiavino is cited for "serving the Navy in a number of capacities including NAVFAC Subject Matter Expert for Pavements, NAVFAC Public Works Specialized Expert for Pavements, and NAVFAC Facilities Division Center of Expertise for Pavements and Assessments."

Mary Adolf, USACE Transportation Systems Center, for receiving the Commander's Award for Civilian Service signed by Lt. Gen. Strock. The award was in recognition for "exceptional leadership and overall management for the planning and execution of the Tri-Service Transportation Systems 2004 Workshop held in Ft. Lauderdale, Florida from 28 March - 2 April 2004."

The Transportation Team, composed of 25 personnel from the USACE Northwestern Division and Districts and Defense Contract Audit Agency (DCAA), received an award at the "Iraq Reconstruction Contracting Teams Recognition Ceremony" held at the Pentagon on 24 August 04. The Transportation Team was honored as one of the 7 teams to advertise and award contracts with a total value of $5 billion in 90 days. Dan Boyer, USACE Transportation Systems Center, served on the Transportation Team. The award was presented by the Deputy Secretary of Defense, Mr. Paul Wolfowitz.

To Bevel or Not to Bevel



This is a photo of a beveled joint. To date there is no clear data available to support or not to support the use of beveled joints. Proponents of beveled joints reason that with the bevels joint seals are easier to install and there is less spalling compared to a sawed joint. In the north, the thought is that with beveled joints there is less damage to the joints due to snow plows. The FAA currently bevels joints. The Air Force does not typically use beveled joints unless requested and approved by the MAJCOM. For Army projects, it is up to the designer.

Jet Fuel Resistant Joint Sealants for Airfields

In this day and age of good environmental stewardship it is necessary to evaluate joint sealant materials in use at installations not only for function but also for final disposition after their useful life. The following paragraphs address the various materials in use today, their toxicity, and information on disposition after use.

The Jet-Fuel-Resistance (JFR) joint sealant materials meeting the requirements of ASMT D 3569 (Federal Specification SS-S-1614) typically utilize coal tar materials that may be considered toxic. Contractors are required to follow the manufacturer's installation instructions and review and adhere to all environmental and safety precautions included in the Material Safety Data Sheets (MSDS). They can be hazardous to those involved in putting them down not the least of which they are put down hot. As far as removal is concerned, initial investigation indicates that the coal tar materials are not likely to be a regulated waste but users should check with their local regulators to see if it might be a problem in the future. Since this sealant is JFR, it should not absorb jet fuel during its life and that should not be a problem at disposal time. However if jet fuel gets past the sealant it may or may not be absorbed by the backer rod.

Jet Fuel and Jet Blast resistant sealant meeting Federal Specification SS-S-200 is a two-component cold applied sealant. These two-component sealants typically have a polysulfide modified coal tar composition and require the contractors to follow the manufacturer's installation instructions and adhere to all environmental and safety precautions included in the Material Safety Data Sheets (MSDS). However they are applied cold and do not have the inherent dangers of working with a hot liquid. The use of materials containing coat tar can still be permitted. This material has the same removal concerns that the ASMT D 3569 described above.

Non-toxic sealant options include preformed neoprene compression seals preferred by Army and most Air Force MAJCOMs on new construction. The sealant material itself is not known to be toxic and it is installed at ambient temperature so again there is no danger of hot liquid. It is possible compression seals may absorb a small amount of fuel if fuel is allowed to be in contact with the seal. When the sealant is removed there may be residual jet fuel in the material which needs to be considered in the disposal. There are no backer rods or other materials associated with compression seals.

Another non-toxic sealant is silicone. The Navy prefers silicone sealants for new construction. According to Air Force ETL 01-8, silicone sealants can be used on PCC pavements except for "areas exposed to frequent fuel spills (defined as more than one spill daily) that are allowed to pool in concrete joints." Volatile fluids such as fuels will cause temporary swelling but will not cause adhesion loss after evaporation if fuel contact does not occur on a daily basis. Silicone joint sealant can be damaged by water blasting during rubber removal. Also if silicones are used the joint "shape factors" will need to be in accordance with manufactures' recommendations. Silicones have shape factors different than traditional field molded sealants. For disposal silicones are not considered toxic unless they are swelled with jet fuel. The jet fuel contamination may be a concern. Check with the local regulators.

For re-seal projects it is encouraged that advanced testing be done on the seals to be removed to characterize their landfill options. The intent of this testing would be to identify any special requirements that the contractor might have to abide by to meet local landfill regulations.

Public Works Bulletin Provides Guidance on the Reuse of Concrete

In an effort to meet DOD's goal of diverting 40% (by weight) of solid waste from landfills and incineration, the public and Government are encouraged to use recycled materials. By weight, concrete makes up the largest portion of the solid waste stream. Since previous research covers mainly recycled concrete pavements, the Army published Public Works Technical Bulletin (PWTB) 200-1-27, "Reuse of Concrete Materials from Building Demolition." The PWTB presents information on the physical properties of recycled concrete aggregate (RCA), pros and cons of using RCA for typical installation requirements, specifications, processing equipment, and economics. PWTB 200-1-27 can be downloaded from the TECHINFO website at: **www.hnd.usace.army.mil/techinfo/CPW/pwtb.htm**.

Pavement-related issues addressed in the Bulletin include (but are not limited to):
- Alkali-Silica Reactivity (ASR) (page 13)
- Not recommended for new concrete airfields (page 17)
- Drainage (Page 19 and 23)
- Recommended for asphalt pavement (page 24)

The bulletin also references the Recycled Materials Resource Center website at **www.rmrc.unh.edu**. The Center is a federal/university research partnership "to systematically test, evaluate, develop appropriate guidelines for and demonstrate environmentally acceptable increased use of recycled materials in transportation infrastructure construction and maintenance".

TSC Welcomes New Member

On 1 November 2004 the Transportation Systems Center (TSC) welcomed Gene Gutierrez to their team. Gene isn't new to the team; he had been working as a virtual team member from the Albuquerque District for the past several years.

Gene Gutierrez brings with him 27 years of experience with USACE. He is an expert in batch plants, uniformity testing, preparatory inspections for all aspects of paving, materials and soils testing, lab inspections, etc. For the TSC Gene will be providing technical support to USACE Districts and customers during construction, reviewing designs and transmittals related to pavements and materials, supporting ERDC in lab inspections, and conducting Airfield Paving Workshops.

When Gene is not working he enjoys golfing, reading mysteries and techno-thrillers, fishing, watching football, basketball, and boxing, spending time with his family and watching New Mexico sunsets.

He is now teleworking from his home in Albuquerque, New Mexico. He can be contacted at 505-890-1149 or e-mail **gene.gutierrez@usace.army.mil**.

Agencies Eagerly Awaiting New Surface Drainage Design Manual

Many stakeholders of the new Unified Facilities Criteria (UFC) 3-230-01, "Surface Drainage Design", are eagerly awaiting the release of the new manual scheduled for March 2005. The manual will be a combination of numerous drainage documents covering a variety of topics from all the stakeholders (FAA, Air Force, Army, and Navy). During the first draft review in March 2004 it was discovered that numerous problems existed due to outdated procedures and a lack of maintenance on drainage criteria over the last 30 years. In an effort to address the numerous technical issues, a panel of experts from academia, various DOD agencies, and the highway community convened in late August. The document was drastically revised and sent out for review again in November with the final review meeting in December. Comments are currently being incorporated and will be reviewed one more time to make sure everyone concurs with the changes. For more information contact Travis Mann, ERDC, (601) 624-3531 or e-mail **travis.a.mann@erdc.usace.army.mil**.

Gene Gutierrez with his wife of 25 years (Jo) and three daughters (Jaime 25; Janelle 23; and Joslin 21).

Thank You for Your Participation at TSworkshop 2004

Thanks to all the attendees, speakers, and exhibitors at the Transportation Systems 2004 Workshop. Due to all the participation, the workshop was a huge success. There were 383 attendees, 183 presentations, 116 speakers, 45 moderators, 40 sponsors & exhibitors, 4 computer labs, and the FHWA Mobile Concrete Laboratory.

Brigadier General Pat Burns, Air Combat Command Civil Engineer, gave a presentation on "Supporting DOD Operations Worldwide"

The Transportation Systems 2004 Workshop was held in Fort Lauderdale, Florida, 29 March – 2 April 2004. The workshop started on Monday with half-day seminars on various subjects (the workshop agenda and subject descriptions are still available on the website at **www.tsworkshop.net**). Tuesday was the official start of the workshop with dynamic opening speakers from the tri-services. Brigadier General Pat Burns, Air Combat Command Civil Engineer, gave a presentation on "Supporting DOD Operations Worldwide". From Marine Corps Headquarters, Jane Brattain briefed "Design and Construction Services in the Department of the Navy" and for the Army, Dr. Albert J. Bush, III, USACE-ERDC, presented "Army Engineers Supporting Contingency Operations". The opening session concluded with a touching and inspirational speech from Mr. Wayne Smith, retired fighter pilot, POW, and Corporate Executive, as he shared his experiences as a prisoner of war. At the conclusion of the opening session attendees had the option to attend one of the three concurrent sessions. Sessions were available through Thursday with the workshop closing on Friday with more half-day seminars.

Jane Brattain, Marine Corps Headquarters, helps open the Workshop with presentation on "Design and Construction Services in the Department of the Navy".

Above: PAVER computer lab (one of the four labs offered at the Workshop). Below: Airboat ride in the everlades.

If all that wasn't enough there were activities each evening to keep everyone busy and further enhance the team building experience. At Monday's Ice Breaker reception there was lots of good food and an abundance of Florida shrimp for all workshop attendees as they viewed the exhibitor booths. On Tuesday some folks took the Jungle Queen Riverboat Tour with a buffet dinner and a hilarious variety show. Wednesday evening participants could take a ride down to the Beach Place for the outdoor mall, entertainment, and of course, the beach. On Thursday there was the option to play in the best ball golf tournament or go on the Sawgrass Tour which provided an airboat ride in the Everglades and tour of a Seminole Indian village.

If you missed the workshop, not to worry, just stay tuned for…

Transportation Systems 2008 Workshop

Above:Monday's Ice Breaker reception in the Exhibit hall. Lots of good food and exhibits. Below: Participants in the best ball golf tournament, Jeb Tingle, Travis Mann, Bob Grau, and Al Bush

www.internet.addresses

http://ten.usace.army.mil/TechExNet.aspx

The TEN, or Technical Excellence Network, is somewhat of an online learning community for issues related to engineering and construction. The website allows access to a wide range of technical information. On the one site, users may go to locate technical information through a number of different outlets. Information is provided on the site through Communities of Practice (CoP's), sub-CoP's, subject matter experts, educational resources, the USACE Center of Expertise, or other resource. The site is very beneficial in that all the information is centralized and information is available to help understand that which is outside one's field of expertise.

www.concretepavements.org

The International Society for Concrete Pavements (ISCP) hosts conferences on concrete pavements and ultrathin and thin whitetopping. The site contains links to agendas from the conferences, minutes from ISCP meetings, and membership application.

www.livejournal.com/users/dave_ferry/

This site is a journal chronicling Dave Ferry's expeditions to Antartica and New Zealand. Dave Ferry is a US Air Force Civilian from St. Louis, MO. Throughout the journal, Dave's personal narratives give an anectdotal view of his travels.

Difficult Challenges Posed By Old Soviet Precast Airfield Slabs

The Soviet Union often used precast concrete slabs for pavements starting from the 1930s until more recent times (e.g., Rollings, Raymond S. and Y. T. Chou. 1981. "Precast Concrete Pavements," Miscellaneous Paper GL-80-3, USACE Waterways Experiment Station, Vicksburg, Mississippi.). The slabs were used for fast construction to increase the capacity of an existing airfield. These slabs varied from simple hexagonal slabs 1 meter per side to larger 2m x 6m rectangular slabs. Thickness, reinforcing, and prestressing varied depending on the application and period. Methods of leveling and joining slabs also varied.

Now as US operations are expanding into Eastern Europe and Central Asia, we are beginning to encounter these paving slabs with which we have no previous experience. We have been able to operate on these slabs, but currently there is poor guidance on how to evaluate this type of pavement. If plans require you to operate on such surfaces, it would be prudent to enlist the aid of pavement experts at ERDC and AFCESA for evaluation of these unusual pavements.

Example of Soviet-era precast airfield slabs

Some common problems associated with precast concrete slab construction include:
Roughness. Precast construction of pavements historically provides rougher fields than conventional cast in-situ construction.
Broken welds. Precast slabs were sometimes welded together at several points and traffic from large body aircraft sometimes broke the welds. This resulted in excessive creep and opening of joints.
Rocking. Precast slabs have a history of rocking under heavy transport aircraft.
Structural capacity. Precast slabs are typically of dimensions that make the Westergaard theory used in our criteria and PCASE software invalid, therefore estimates of structural capacity based on current criteria would be incorrect.
Interface conditions. These slabs may be placed on an underlying slab of lean or conventional concrete with a leveling course of sand, cement-stabilized sand, or grout. These intermediate layers seem to be present to allow better leveling of the precast surface slabs. Even if grout is present, it would be unwise to assume these precast slabs are bonded to the underlying slab.

For more information contact: Ray Rollings, USACE ERDC, 603-646-4821, **raymond.s.rollings@erdc.usace.army.mil**; Gary Anderton, USACE-ERDC, 601-634-2955, **gary.l.anderton@erdc.usace.army.mil**; or Captain Tom Defazio, AFCESA, 850-283-6081, **tom.defazio@tyndall.af.mil**.

FAA Software

FAA Software available at **http://www.airporttech.tc.faa.gov/naptf/download/index1.asp#soft**:

FEDFAA 1.3 Beta* - Finite Element Design of airport pavements - A test version of a new FAA thickness design program that incorporates 3D finite element structural response computation for rigid pavements and layered elastic analysis for flexible pavements.

FEAFAA* - Finite Element Analysis of Rigid Airport Pavements - 3D finite element analysis of multiple-slab rigid airport pavements and overlays. It is useful for computing responses (stresses, strains and deflections) of rigid pavement structures to individual aircraft landing gear loads.

LEDFAA 1.3 - Layered elastic design software for airport pavements – an approved design standard of FAA.

COMFAA - software for computing flexible and rigid Aircraft Classification Numbers (ACNs) and pavement thickness.

BAKFAA - software for backcalculation of Falling Weight Deflectometer (FWD) data and computation of airport pavement load responses by layered elastic analysis.

*Not yet approved by FAA for performing pavement thickness designs. To be in conformance with FAA standards use LEDFAA 1.3.

www.internet.addresses (Cont'd)

http://www.wbdg.org/ccbref/pa_dod.php?category=pa
With links to the USACE, NAVFAC, and the U.S. Air Force Civil Engineer Support Agency, the webpage gives a brief overview of the newly initiated United Facilities Criteria Program. The UFC program is an attempt to streamline the criteria system by unifying all technical criteria and standards, purging all duplicate information, and increasing the DOD's reliance on the private sector standards.

www.hqda.army.mil/acsimweb/homepage.shtml
The website for the Assistant Chief of Staff for Installation Management provides extensive information on army regulations and installations as well as links pertaining to the organization and structure of the ACSIM. Included in the References section of the website is a link to the most updated version of the Installation Design Standards (IDS).

Porous Pavement, One Concept to End Parking Lot Peril

by Bryan Ciccocioppo, Department of the Army Intern

In this day and age, it is no new development that we need to design for the future. Every day, new technologies are being developed to reduce materials, waste, and emissions in an attempt to produce a product that is just as good (if not better) than the older, less-efficient system. Sadly, these technologies are not always utilized due to the initial time and effort that accompanies them. Luckily, over the past few years "green" designs have been "all the rage" and are finally beginning to reform the way construction is approached, as in the case of treatment of storm water.

A major concern of building a new parking lot and paving over a section of land is; where will the storm water go? The old design method involved finding a way to get the storm water as far away from the site as quickly as possible. This usually involves multiple drain and piping systems which creates the problem of having not only a large amount of storm water from one area but also a collection of storm water from multiple areas. The "green" idea is to treat the storm water as a valuable commodity and keep the water in the area.

It may seem like a small step, but a parking lot at Ft. Bragg is one example of how new civil design concepts made a contribution to the Green Revolution. An environmental classroom needed a small parking lot for its students. It was decided that the parking lot would be a great test subject for the green building concept (it was only fitting that the environmental classroom should incorporate as many green designs as possible). The "green" concept was to construct the parking lot using porous pavement.

The design of a porous pavement includes a permeable surface material with a sand/stone base. This new pavement will allow the storm water to seep into the ground and, once again, become part of the natural system. Since the storm water goes straight down, there will be no need for curbs, inlets, or elaborate collection systems. It does not end there; as an added bonus the porous pavement itself will act as a storm water filter.

Water permeable parking lot materials considered for the Ft. Bragg project included: brick or stone blocks, structural turf, porous asphalt or concrete, and rain gardens. Here's the low-down on each of the options:

Brick or stone paving blocks are a viable option to make a great paved surface. The idea is to place the bricks in a grid without adding any grout to fill in the cracks. The lack of grout allows the storm water to flow between the pavers and into the soil. Another method is to separate the pavers allowing sufficient space in between to plant grass. The paving bricks will support vehicles utilizing the parking lot while the grassy areas allow ample spaces for storm water to infiltrate the earth. Another feature of the paving blocks is that maintenance on them is minimal. Without a grout material to hold them together, problem bricks can be replaced with little effort. Pavers are not perfect however. Even though the pavers offer support for the vehicles, the grassy areas do not hold up well. The pavers also tend to settle unevenly. These two factors combined can make for a poor driving surface.

Structural turf pavements will put the guy who produces the "Stay off the Grass" signs out of business. The idea is to add man-made material to the growing medium, which will add strength and increase durability. The synthetic materials used include a grid of structural cells that hold the growing medium or a mesh added to the substrate to increase stability. Both methods work well and together they make a strong pavement that is extremely environmentally friendly. As for the storm water, what better way to combat a problem than with the way nature has taken billions of years to perfect? The storm water goes through the water cycle almost as if the parking lot did not exist. Another benefit of the structural turf system is that it does not collect heat that can greatly affect fragile aquatic ecosystems that collect the runoff. Some problems still need to be worked out of turf pavements. One of the issues is that if a drought hits the area, the entire lot will have to be irrigated which requires vast amounts of water and labor. Another drawback is the fact that the cars will block the sunlight from the grass. A car covering the grass for extended periods will kill the grass and allow the substrate to be blown or washed away. Heavy traffic will also kill the grass on some substrates.

Porous asphalt and concrete products are similar to their conventional counterparts but lack a major component, fine aggregate. Without the fine aggregates clogging up the works, the water can flow freely through the surface and make its way down to the ground. Even without the fine aggregates, porous pavements still have considerable strength and durability. On other hand, there are some downsides to these products. When water infiltrates the pavement surface, it might bring with it small particles that can obstruct the porous material and basically foil the plan to eliminate excess storm water. To solve this problem, regular maintenance must be done with a vacuum sweeper to clear out the dirt and debris, clogging the infrastructure. Another serious issue is
(Continued on page 13)

What are Porous Pavements?

by Dan Boyer, USACE, Transportation Systems Center

Porous pavement is a special type of pavement that allows rain and snowmelt to pass through it. The concept should be given the appropriate consideration in the Best Management Practices (BMPs) for each installation to minimize water quality impacts and attempt to "maintain pre-development runoff conditions". Porous pavement can be constructed of Asphalt, PCC concrete or brick pavers. The porous pavement surface is typically constructed over a highly permeable layer of open-graded granular material, the void space around the aggregate acts as a storage reservoir for infiltrating water. With or with out perforated pipes near the surface, the open-graded material can also discharge the excess storm water into a ditch or drainage system.

When should porous pavements be used?

The single most important consideration for designing porous pavements is the permeability of the subgrade soil. Clay subgrades are practically impervious and will not provide enough ground water recharge to justify the expense of porous pavement. The load-carrying strength of clay soil is greatly diminished with increased soil moisture; therefore porous pavement surfaces may require additional granular material to increase the structural strength. This increase thickness has a negative cost and environmental effect by using more natural resources without improved water management. EPA document number 832-F-99-023 recommends the subgrade have a field-verified permeability rate greater than 0.5 inches per hour to consider the use of porous pavements. The design of a porous rigid pavement, constructed over subgrades with marginally acceptable permeability, should require a pipe outlet in the drainage material to prevent pumping of water/fines through the joints during heavy loading under saturated conditions. Excess pore pressure in the subgrade soils should also be a design consideration.

A second consideration is the geographic temperature zone. The states of Florida and Georgia are leading the way on porous pavement criteria for a good reason; they do not need to worry about frost penetration. Porous pavements have the potential to be damaged by freezing conditions that penetrate into the pavement structure. With a source of water from snowmelt or rain, ice lenses can form and cause extensive pavement heave accompanied with a loss of material strength and/or compaction.

Another consideration is maintenance. The porous pavement surface may require vacuuming or high-pressure washing in order to function properly.

If you are considering using a porous pavement, it would behoove you to take into account the aforementioned considerations. Literature reveals that in the past, porous pavements have experienced a high rate of failure, which may in large be due to ignoring existing soil type, climate, and maintenance needs. For more information contact Dan Boyer at 402-221-7266 or e-mail **dan.j.boyer@usace.army.mil**.

OMNI™: visualizing the big picture

by Tad Britt, USACE, ERDC-CERL

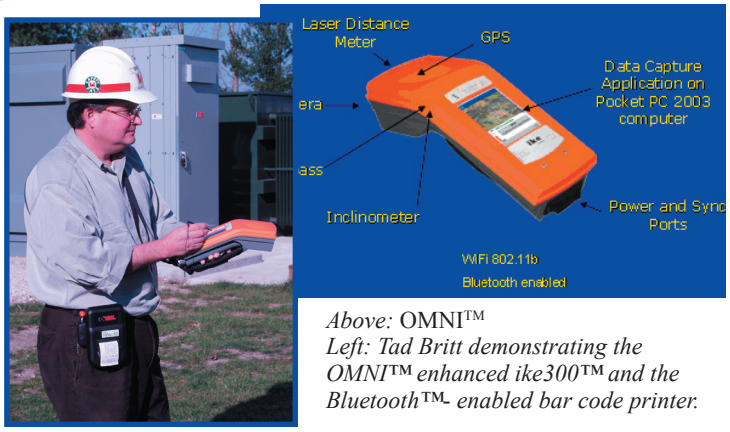
While existing commercial off-the-shelf tools are available for data collecting georeferenced data, they are typically stand-alone technologies having limited functionality and integration capabilities. The answer? Observational Mapping and Noting Instrument (OMNI™): a handheld ruggedized computer that integrates a geographic information system data recordation program with high-resolution digital instrumentation, analysis, and reporting capabilities.

Significantly improving data collection, reliability, and integration, OMNI™ integrates diverse and complex geospatial data in a user-friendly environment. OMNI™ contains a series of pre-loaded digital forms organized in a logical, progressive manner that can be customized and used for all types of routine and complex investigations. It offers flexibility as the user can select and pre-load software applications and configure hardware tailored for the specific type and level of investigation.

A key feature of this unit is a single pushbutton that activates a number of automated and time-saving measurements at once—a "snapshot" with a time stamp that is simultaneously applied to the entire data set. The operator aims the unit at the target and presses the record button, capturing a digital image, obtaining GPS positioning for the target (as well as the recorder's position), elevation, distance, inclination, and other metric attributes, and then stores the data in a database with a time stamp and unique I.D. attached. Because the data is collected digitally, it allows for immediate verification of the quality and usefulness of the data.

The ability to share accurate, georeferenced data across multiple platforms significantly improves real-time decision-making capabilities. The OMNI™ technology demonstrates an innovative, programmatic approach to understanding, anticipating and solving installation management and sustainability issues throughout the life-cycle of the project.

For more information contact Tad Britt, USACE-CERL, 800-872-2375 x-7288 or e-mail **John.T.Britt@erdc.usace.army.**



Above: OMNI™
Left: Tad Britt demonstrating the OMNI™ enhanced ike300™ and the Bluetooth™- enabled bar code printer.

PCASE Update

PCASE2.08 Makes Its Debut

After a year plus of enhancing PCASE2.06, PCASE2.08 has been finally released. There have been so many changes to the software and beta versions of 2.07 that we skipped the final release of 2.07 and jumped ahead to 2.08. The software can be downloaded from **www.pcase.com.** Enhancements include:

Utilities Module
- Vehicles created in Vehicle Edit can now be exported and imported to and from other users
- Packing and unpacking a file automatically imports/exports custom vehicles

Vehicle Edit & Traffic Modules
- More vehicles have been added to the database
- The ability to delete tires has been added to Vehicle Editor

Design Module
- Additions to the Design Module:
  - Airfield shoulder design for flexible and rigid pavements
  - Rigid compaction requirements
  - Default dry unit weights and moisture contents
  - Economical section identification for frost design
- View alternative enhancements
- Discrepancies in frost depth penetration corrected (see article in this issue, *Discrepancies in Frost Depth Penetration Calculations Corrected*)

Evaluation
- APE now notifies the user when DCP layers are available
- Feature label moved to the top of the form
- Modulus report added and AGL/PCN report corrected
- The user can now use Branch or Section level inventory
- "Feature List" button added
- "Defaults" reset to the users' preferences
- No longer have to be in "edit" mode to scroll in the layer grid
- Low Volume functionality hid unless the user turns it on

DCP
- DCP now rounds to the nearest half inch
- CBR now rounds to the nearest 0.5
- Automated DCP import routine corrected

Discrepancies in Frost Depth Penetration Calculations Corrected

Discrepancies in frost depth penetration were found between the Design Module in PCASE 2.03 and the standalone version of ModBerg version 99.2. The difference in frost depth penetration is also evident in PCASE 2.06. The difference in the computed depth of frost may be as much as 24%. Locations with a Design Freezing Index of roughly equal to or less than 1,000 degree F-days appear to have a difference of 13% or less. Locations with a Design Freezing Index value greater than 1,000 degree F-days may have frost penetration differences of up to 24%. An improvement was made in ModBerg version 99.2 where the Design Freezing Index is determined by multiplying the Freezing Index by 1.5 times the standard deviation of the freezing indices of the period of record. This change provides a statistically higher level of confidence in the Design Freezing Index value used to compute the frost depth. Details are described in Cortez, Kestler, and Berg (2000) *Computer-Assisted Calculations of the Depth of Frost Penetration in Pavement-Soil Structures*, Transportation Systems 2000 Workshop, San Antonio, TX. Frost depth values from earlier versions of PCASE are not incorrect, but they do have a lower statistical confidence level. The latest version, PCASE 2.08, determines the Design Freezing Index the same as ModBerg version 99.2.

PCASE Workshops

Attend a PCASE workshop to become familiar with the new enhancements in PCASE2.08. The workshops are free to participants. PCASE Workshops scheduled so far for FY05:

- 30-31 March 2005
  USACE Fort Worth District, Texas
- 22-24 June and 27-29 June
  Ramstein AFB, Germany (will be held in conjunction with 3-day PAVER workshops)
- 13-14 July 2005
  USACE Norfolk District, Virginia

Go to **www.pcase.com** (Workshop page) to register for a workshop at a location nearest you. If new workshops are added, a message will be sent out to all registered users announcing the location and date.

Coming Soon To a Computer Near You

Want to know how many passes were allowed on your runway? A PCN for an airfield? How much weight your taxiway can tolerate? Well you've always had the capability in the PCASE desktop, but coming soon is a simplified stand alone version. You will no longer have to create files, features, and sections and all the input will be on a single screen. Notices will be sent out to PCASE registries as soon as it is available.

New Software Available

Now available now is the Navy Runway Length Calculation Program. Plug in the type of aircraft to be using the runway, location (or altitude and temperature) and the effective gradient and the program will give you the required length of the runway. The program is on-line at **www.triservicetransportation.com** under Software.

PCASE Update (Cont'd)

Under Development

Software and other bonuses currently under development…

Concrete Pavement for Airfields Specification UFGS-02753
Module will provide the contractor with software to input UFGS 02753-related information and automatically upload to an Internet site. Software will also link to the specification and provide an executive summary of results. At the Data Server site the information would be permanently stored and available for future use (i.e. material source for future construction, litigation for failed construction, pavement evaluation reports, etc).

Automated Estimates for Modulus and CBR of pavement layers
System will guide the user through a series of questions to produce reasonable estimates for material properties, given any level of information.

Uncertainty Analysis for Design and/or Evaluation
User inputs ranges for load, structure, etc. and the result provides a cumulative distribution of necessary thicknesses for design and provides "a feel" for his/her level of conservatism.

PCASE User Manual
Developing a comprehensive user's manual for the PCASE desktop.

Multiple Design Builder
Developing a module that will automatically build several design scenarios and then display them as alternatives.

Product Catalog for Engineering Problems
Developing a Wizard that will walk users through finding an approved product or technique for a given problem (i.e. joints, FOD, raveling, dust control, soil stabilization, materials selection, etc.).

Analysis for Dummies
Adding a module to the Desktop for easy pavement analysis similar to the APE Stand Alone. The existing evaluation "results box" will also be improved by providing more information and bar charts to explain the results.

Calendar of Events

Association of Asphalt Paving Technologists Annual Meeting
Long Beach, California
7 – 9 March 2005
www.asphaltechnology.org

Int'l Conference on Best Practices for Ultrathin and Thin Whitetoppings
Denver, Colorado
12 – 15 April 2005
www.pavement.com

ACI Spring Convention – Concrete Soars, Spans & Supports New York and New Jersey
New York, New York
17 – 21 April 2005
www.concrete.org

European Airport Pavement Workshop' in the Netherlands
Amsterdam, Netherlands
11 – 12 May 2005
www.crow.nl/engels/

Continued on page 15

Porous Pavement, One Concept to End Parking Lot Peril (Cont'd)

freezing conditions. The problem is with ice on the pavement. Conventional methods of handling icy roads will not work on this permeable surface. Salting the roads will eventually lower the groundwater quality and sand will clog the system. On the other hand, studies have shown that freezing conditions will not significantly impact the performance of the porous pavement.

Another great idea that can work with all types of pavements (both porous and non-porous) is a "rain garden" which will help contend with storm water, increase shade, and add a visually pleasing centerpiece to any parking lot. Many parking lots today have a series of trees and grasses that are similar to a rain garden, but they are elevated above the lots and surrounded by curbing. No stormwater is allowed to reach these present day parking lot plantings. Rain gardens take an old concept and make it even better. Simply put, a rain garden is a low spot in the parking lot with a group of trees and grasses. The stormwater naturally flows to the low spot in the pavement while the plants (carefully chosen for their filtering, shade, and aesthetic properties) clean the stormwater and reintroduce the water back into the water cycle properly. Rain gardens are intended to help alleviate the runoff problem but are not usually intended to be a fix-all solution.

So what did they end up using at Fort Bragg and how did it work for them? The project is currently being constructed using a combination of porous concrete and pavers along with rain gardens. Both pavers and porous concrete were utilized to see how each method works and to find what will benefit the future designs at Fort Bragg. Porous concrete was used instead of asphalt due to the larger pores, which requires less maintenance. Another highlight of the project is that Ft. Bragg is building a traditional parking lot near the permeable parking lot, which will be a "control" section for the new design. The end result of all of this is still to come, but good or bad, it will be a valuable learning tool for many designs to come. Till then, keep fighting the good fight and "Vive la révolution verte!"

New Proposed Aircraft Gear Designation System

A naming convention based upon main gear and body gear configurations is proposed for use in the civilian aircraft industry. Gear type for an individual strut is determined by the number of wheels across a given axle (or axle line) and whether wheels are repeated in tandem. The abbreviated name is based upon the aircraft main gear geometry and may be followed by a second portion depending upon the presence of body/belly gear(s). If body gears are not present, the second portion of the name is omitted. For the main gear, only gear type is noted in the name. For the body gear designation, the gear type is followed by the number of gears present.

The following codes are used for gear designation purposes: S - Single, D-Dual, R-Triple, Q-Quadruple, and T-Tandem

Leading Numeric value – Number of tandem sets, used to identify gears with multiples of wheels in tandem e.g. 3DT = 3 Dual gears in Tandem. Single and Dual values are omitted.

Trailing Numeric Value – Number of occurrences of body gears, used to note the number of body gears e.g. DT1 = One Dual Tandem body gear.

The first portion of the aircraft gear designation is comprised of the main gear designation. This portion may consist of up to 3 characters. Typical names are: S = Single, DT = Dual Tandem, 5DT = Quintet Dual Tandem, 2RT – Double Triple Tandem. If body/belly gears are present the main gear designation is followed by a forward slash (/) then the body gear designation. For example, the Boeing 747 aircraft has two Double Tandem main gear and two Double Tandem belly gears. The full designation for this aircraft is DT/DT2.

Two military aircraft do not fit this naming convention. The C-5 Galaxy and the B-52 Bomber have unique gear types which are difficult to name using the proposed method. These aircraft will be referred to directly as the C5 and the B52. The Ilusyin IL-76 is another aircraft which may cause confusion, see figure 17. However due to the proximity and alignment of the gears, the IL-76 can be designated as 2QT.

Table 1 demonstrates the proposed naming convention as well as the current FAA and Air Force methods. It may be noted that the current Air Force methodology addresses the configuration of the aircraft nose gear. Due to the insignificance of the pavement load imposed by the nose gear, the proposed method will not address nose gear configuration.

Information provided by Rodney Joel, FAA Headquarters, 816-329-2631, e-mail **rodney.joel@faa.gov**.

	Current FAA Designations					Air Force Designations				
Proposed Nomeclature	Current FAA Name	Main Gear	Belly gear	# belly gear	Total # wheels - excluding nose	Air Force Designation	Air Force types	Current Name Air Force	Nose Gear	Typical Aircraft
S	Single Wheel	SW			2	S	A	Single, Tricycle	Single Wheel	
S	Single Wheel	SW			2	S	B	Single, Tricycle	Dual Wheel	
D	Dual Wheel	DW			4	T	C	Twin, Tricycle	Single Wheel	Beech 1900
D	Dual Wheel	DW			4	T	D	Twin, Tricycle	Dual Wheel	B-737
ST	Single Tandem				4	S-TA	E	Single, Tandem Tricycle	Dual Wheel	C-130
2RT					12	TR-TA	L	Twin-Tandem, Tricycle		C-17
DT	Dual Tandem	DT			8	T-TA	F	Twin-Tandem, Tricycle	Dual Wheel	B757, KC135
DT/D1	Dual Tandem	DT	DW	1	10	T-TA	H	Twin-Tandem, Tricycle	Dual Wheel	L1011, DC-10
DT/DT1	Dual Tandem	DT	DT	1	12				Dual Wheel	A340-600
DT/DT2	Double Dual Tandem	DT	DT	2	16	T-TA	J	Twin-Tandem, Tricycle	Dual Wheel	B-747
3DT	Triple Dual Tandem	TDT			12				Dual Wheel	B-777
5DT					20				4 across	An-124
7DT					28				4 across	An-225
DT/3DT2		DT	TDT	2	20				Dual Wheel	A380
C5					24	T-D-TA	K	Twin-Delta-Tandem, Tricycle	4 across	C-5
B52					8	T-T	G	Twin-Twin, Bicycle	single outrigger	B-52
QT					8					HS-121 Trident
2QT					16					IL-76

www.internet.addresses (Cont'd)

www.geodecisions.com/irris
This website provides an overview of IRRIS, a product of the Spatial Information Technology company, GeoDecisions. The site provides insight into the features of IRRIS. These include:

- Visible infrastructure data layer
- Intelligent mapping capabilities
- Turn by turn routing directions and options
- Extensive tracking abilities
- Live traffic and weather feeds with automatic alerts and notifications
- Optional wireless access
- Hazardous material plume analysis

www.ready.gov/
From the US Department of Homeland Security, the webpage helps raise awareness as to the nature of possible terrorist attacks and the measures families and businesses should take to be fully prepared for any such scenario.

www.tipping.org
The website describes the instances in which tipping is deemed appropriate and the proper amount to tip in such cases. Included in the website is a free downloadable tip sheet and a pocket-size tip sheet available for purchase.

www.airporttech.tc.faa.gov
This FAA site contains information relating to certain technical aspects of airports and the aviation industry. Of these aspects, the website offers many links to pavement and runway related technology. Included in these are links to information pertaining to:

- Pavement materials
- Drainage layers
- Advanced Pavement design
- Nondestructive pavement testing
- Runway surface technology
- Visual Guidance and Runway incursion reduction

http://www.fhwa.dot.gov/pavement/recycle.htm
The Federal Highway Administration's website on pavement recycling presentes a variety of links containing both past and current efforts in research and pavement recycling. Included on the site is FHWA's complete Recycled Materials Policy.

http://www.troxlerlabs.com/PRODUCTS/2701.html
The new gage displayed on this page is a product of Troxler Labs. The product, a HMA density guage, uses the properties of dielectrics to sense air voids in the pavement. This electromagnetic design appears to be much simpler and easier to transport than the other Nuclear guages on the market.

www.fema.gov/fhm/en_hydro.shtm
The FEMA website on Flood Hazard Mapping presents a table of the different programs available for use in Hydrologic Models and the determination of Flood Hydrographs. The list includes programs that model single events, continuous events and Interior Drainage Analysis.

Calendar of Events

Seventh Int'l Symposium on Utilization of High-Strength/High Performance Concrete
Washington, D.C.
20 -24 June 2005
www.concrete.org

Tri-Service Infrastructure Systems Conference
St. Louis, Missouri
2 – 4 August 2005
USACE: Toby Wilson, 601-634-3604 or Bob Billmyre, 202-761-4228
Air Force: Mike Clawson, 850-283-6362 or Pat Mumme, 850-283-6361
Navy: Emil Consolacion, 757-322-4205

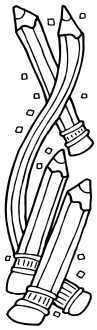
8th Int'l Conference on Concrete Pavements
Colorado Springs, Colorado
14-18 August 2005
www.concretepavements.org

ACI Fall Convention – Spice up your Concrete
New Orleans, Louisiana
6 – 10 November 2005
www.concrete.org

World of Asphalt
Orlando, Florida
14 – 16 March 2006
www.worldofasphalt.com

MUTCD 2003 Online

Manual on Uniform Traffic Control Devices (MUTCD 2003) is a Federal Highway Administration publication. The 2003 Edition of the MUTCD with Revision No. 1 Incorporated, dated November 2004, is available in both PDF and HTML formats at **http://mutcd.fhwa.dot.gov/kno-2003r1.htm**.



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Terry Sherman, Director
(402) 221-7260

Bettyjo Carmody
(402) 221-7264

Mary Adolf
(402) 221-7265

Dan Boyer
(402) 221-7266

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(402) 221-7269

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(402) 221-7267

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505-890-1149

Kordon Kiel
(402) 221-7268

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(402) 221-7263

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