Chapter 800

Radiation Safety & Nuclear Gauge Operation - 14

1. GENERAL CDOT NUCLEAR INFORMATION

1.1 Training of Nuclear Gauge Operators

RSO's - Each Region Materials Engineer (RME) has appointed three properly trained individuals to act as the On-Site Radiation Safety Officers (RSO's). They will operate in coordination with the CDOT RSO to ensure full compliance with the Radioactive Materials License.

Dept. Of Health Documents - The CDOT's nuclear program is guided by two principle documents, both issued by the Colorado Department of Public Health and Environment:

1) "Rules and Regulations Pertaining to Radiation Control"

2) "The Radioactive Materials License"

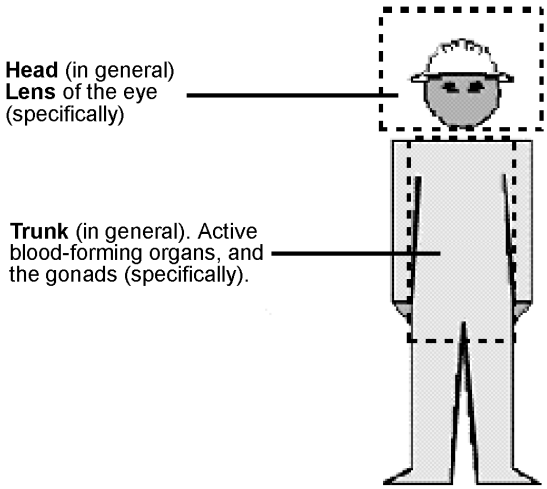
Operator Training - All current or potential Nuclear Gauge Operators must complete the CDOT "School of Radiological Safety and Nuclear Gauge Operation." After successfully passing the course, the individual may begin supervised instruction in testing with a nuclear gauge.

Operator I.D. Card - A "CDOT Nuclear Gauge Operator Identification" card will be issued immediately after the On-Site RSO certifies that the individual is technically qualified to utilize a designated gauge and has acted in a manner equal to the responsibilities required by the CDOT Radioactive Materials License.

Recurrent Training - The U.S. Department of Transportation (49 CFR) stipulates that anyone who transports hazardous materials or prepares these materials for transport must receive training at intervals not to exceed three years.

1.2 Radiological Safety

Health Risks - Nuclear Gauges contain radioactive source material and are potentially dangerous if used improperly. However, research findings indicate no radiological health hazard exists for operators of nuclear gauges when appropriate safety precautions are observed.



Personal Monitoring Devices

The personnel dosimetry devices used by CDOT are categorized as "Whole Body" - the head and trunk in general. The areas of specific concern are the lens of the eyes, active blood-forming organs, and the gonads.

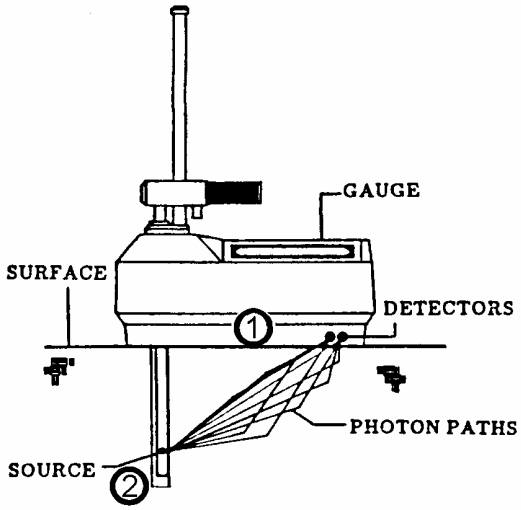
The maximum legal occupational dose (exposure) per year is 0.05 Sieverts (Sv) [5 REMs] to the "Whole Body".

Reducing Exposure - Radiation exposure is significantly reduced by:

1) Decreasing **time** spent near a gauge
2) Increasing **distance** from the gauge
3) Allowing the **shielding** incorporated in the design and construction of the gauge to be utilized as intended.

Leak Wipes –Leak Wipes are to be performed annually on Troxler & CPN gauges and semi-annually on InstroTek gauges to ensure the integrity of the sealed sources (the radioactive source capsules that are double encapsulated). Leak Wipes are also performed if a nuclear gauge has been involved in an accident or a nuclear gauge operator has an unexplainably high radiation exposure on his/her personnel dosimeter. Personnel monitoring is the determination of the amount of ionizing radiation to which an individual has been exposed.

ALARA - The CDOT operates under the concept of ALARA, As Low As Reasonably Achievable. Legal limits are not as important as minimizing radiation exposure.



1.3 Nuclear Gauge Type and Radiological Description

(1) Troxler Moisture/Density (M/D) Gauge:

① Americium-241:Beryllium (AM-241:BE)
1.48 GigaBecquerel (GBq) [40 milliCuries (mCi)]
Alpha & Neutron Radiation

②Cesium-137 (CS-137)
0.30 GigaBecquerel (GBq) [8.0 milliCuries (mCi)]
Beta & Gamma Radiation

(2) CPN Moisture/Density (M/D) Gauge:

① Americium-241:Beryllium (AM-241:BE)
1.85 GigaBecquerel (GBq) [50 milliCuries (mCi)]
Alpha & Neutron Radiation

②Cesium-137 (CS-137)
0.37 GigaBecquerel (GBq) [10 milliCuries (mCi)]
Beta & Gamma Radiation

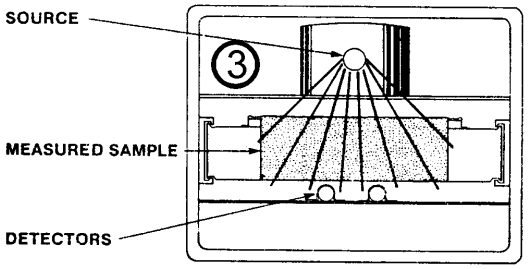
(3) InstroTek Moisture/Density (M/D) Gauge:

① Americium-241:Beryllium (AM-241:BE)
1.48 GigaBecquerel (GBq) [40 milliCuries (mCi)]
Alpha & Neutron Radiation

②Cesium-137 (CS-137)
0.37 GigaBecquerel (GBq) [10.0 milliCuries (mCi)]
Beta & Gamma Radiation

(4) Troxler & CPN Asphalt Content (AC) Gauge:

③ Americium-241:Beryllium (AM-241:BE)
3.7 GBq [100 mCi]
Alpha and Neutron Radiation



The Nuclear Lab of the Staff Materials Laboratory maintains copies of all personnel monitoring exposure records, leak test analysis records, correspondence with the Colorado Department of Health, Rules and Regulations Pertaining to Radiation Control, and the Radioactive Materials License.

CONTACT:
STAFF MATERIALS LABORATORY
NUCLEAR LAB
RADIATION SAFETY OFFICER
Office 303/398-6547 Cell 303/319-9557
4670 N. Holly Street, Unit A
Denver, CO 80216

1.4 Compliance With The Following Points Are Required.

Age - Nuclear gauge operation is prohibited by any CDOT personnel who have not attained the age of 19.

Personnel Monitoring Device - All nuclear gauge operators are required to wear their personnel monitoring device during work hours. CDOT utilizes ThermoLuminescent Dosimeters (TLD's) capable of detecting both gamma and neutron radiation.

Identification - A "Nuclear Gauge Operators I.D." card must be possessed by any CDOT personnel operating a gauge while unsupervised.

Shielded Compartments - Under no circumstances should field personnel enter or attempt to enter the gauge's shielded compartment containing the radioactive source or attempt to remove the source rod.

M/D "Safe" Position - Moisture/Density Gauges should not be placed outside of the safe position until actual testing is ready to begin. This is the "safe" position only for gamma radiation; neutron radiation is always emitted from the bottom of the base. Operators should always be aware of the direction the base is facing to avoid exposure to themselves and others.

Safe Distance from Gauges - Do not position your body within 6 feet of the nuclear gauge for more than a few minutes at a time, regardless of whether the source is shielded or unshielded.

Restricted Areas – A restricted area is an area in which CDOT has control over access. In the restricted area an individual can receive a maximum exposure of 0.05 Sieverts (Sv) [5 REM] per year. In unrestricted areas, those CDOT cannot control the access to, the maximum dose to the public is 0.02 milliSieverts (2 milliREM) per hour and 1.0 mSv (100 mREM) per year.

Minors are prohibited from being within a restricted area. Non-gauge operators may be within a restricted area for only a few minutes at a time. The entire test trailer is a restricted area, as well as 2 meters around a gauge if outside of a building.

If a non-gauge user will be working in a restricted area their exposure shall be monitored.

Storing Nuclear Gauges – All nuclear gauges shall be stored in such a way that two independent physical locks must be defeated to take the gauge. This means that if one of the locks is defeated the other lock remains in full effect.

At Region labs, the vault doors shall be closed and locked unless in the process of checking out or returning a gauge.

When a gauge is stored at a project trailer, it must be stored in a locked cabinet or chained and locked to a permanent structure in the trailer. The structure shall be strong enough to adequately resist breakage. When sharing a location with a consultant, the CDOT and consultant gauges will not be stored under the same lock. Each will have differently keyed locks and they will not have keys to the other's lock. Each entity will post a copy of their Emergency Response forms in accordance with DOH requirements. The gauge case will also be locked.

If leaving a gauge in an unattended vehicle you still need 2 locks. Each lock must act independently to secure the gauge. If one is defeated the other must prevent the gauge from being taken. Transportation cases that the gauge case fits into are acceptable. Transportation cases must be secured by 2 locks that prevent the transportation case from being taken as well as opened. You can also satisfy the 2 lock rule by locking the gauge to something in the vehicle,

such as the steering wheel, and locking the doors. This should be done only when absolutely necessary.

For AC gauges that are chained to the bench, lock the front of the gauge when not in use. AC gauges that are used in Region labs shall be locked to the bench or an anchor in the wall, if they will not be supervised at all times. The front door shall also be locked when it is not in use. At the Region storage vaults, keep the doors closed and locked at all times. If possible, it is best to return the gauge to the vault during prolonged down time.

Proper Placarding - A test trailer or Region Materials Lab must be placarded so that an individual approaching the facility or room will see the "CAUTION RADIOACTIVE MATERIALS" placard, the *completed* "CDOT NUCLEAR INCIDENT PROCEDURES" sheet (Page 9), and the Colorado Department of Health's "NOTICE TO EMPLOYEES" sheet (Page 10).

Completing Nuclear Logs - The "NUCLEAR MOISTURE/DENSITY GAUGE LOG" CDOT Form #746 and the "NUCLEAR ASPHALT CONTENT GAUGE LOG" CDOT Form #772 must be completed, specifically with the operator's full name, every day in which either gauge is operated. They must be returned to Staff Materials-Nuclear Lab upon completing the last line on the Form and always by the end of the calendar year. (Pages 12-13).

Transporting Nuclear Gauges - A nuclear gauge may only be transported within a DOT Type "A" carrying case. It shall be securely fastened to the vehicle to prevent it from moving or being ejected in the event of an accident. Gauges will only be transported by certified gauge users. Gauges shall not be transported outside of the state of Colorado.

In all vehicle types the gauge shall be placed as far from the driver as possible. This typically means the right rear corner of the vehicle. The gauge case shall be locked.

In vans, SUV's and cars, the doors shall be locked during transport. The doors serve as one lock. At least one other lock must be in effect.

In a pickup with a topper, the topper shall be locked during transport.

In open pickup beds, the gauge shall be secured by 2 independent locks. If one lock it defeated the other must prevent the gauge and case from being removed. Gauges will not be transported in the passenger compartment.

Nuclear Gauge Binder - The binder must be accessible to the driver at all times while the vehicle is transporting a nuclear gauge. If the gauge is stored in the vehicle and it is not being transported, place the red gauge binder on the driver's seat or in a pocket on the driver's side door. Four documents must be kept in the gauge binder: Bill of Lading, Source Certificate, Nuclear Incident Procedures, and CDOT's Radioactive Materials License.

Reporting Unsafe Conditions - Any apparent unsafe situation involving the use or storage of nuclear gauges shall be reported directly and immediately to the CDOT RSO.

Gauge Operation During Pregnancy - All female nuclear gauge operators must notify the RSO at Staff Materials immediately once she decides to "declare Her Pregnancy" (Page 11).

2. SAMPLE DOCUMENTS

2.1 CDOT Nuclear Gauge Reference Information. (Color photographs of current CDOT Nuclear Gauges)……..…Page 5

2.2 Nuclear Gauge Reference Information ……..……Page 6

2.3 On-Site Radiation Safety Officer Emergency Notification Telephone Directory…….Page 7

2.1 CDOT Nuclear Gauge Reference Information

CDOT's Nuclear Gauges

Troxler 3440 Moisture/Density

Troxler 3430 Moisture Density

CPN AC-2R Asphalt Content

InstroTek 3500 Xplorer

CPN MC-3 Moisture/Density

Troxler 3241-C Asphalt Content

2.2 Nuclear Gauge Reference Information

NUCLEAR GAUGE REFERENCE INFORMATION

PROPER SHIPPING NAME, CLASSIFICATION, LABELING and MARKING:
USA DOT 7A TYPE A RADIOACTIVE MATERIAL, SPECIAL FORM, UN 3332 RQ
TYPE A PACKAGE, RADIOACTIVE YELLOW II, TI≤0.5

SPECIAL FORM CERTIFICATE: Radioactive materials used in these gauges have been certified as "SPECIAL FORM" by a recognized "COMPETENT AUTHORITY".

LEAK TEST: The Colorado Department of Transportation performs a leak test on each nuclear gauge semi-annually to reveal that the removable activity is less than 0.005 micro curies.

PROPERTY OF CDOT DECAL: The decal has been affixed to all nuclear gauge shells and their respective US DOT 7A TYPE A carrying cases.

COLORADO DEPARTMENT OF TRANSPORTATION
Staff Materials Laboratory
4670 Holly Street, Unit A
Denver, Colorado 80216-6408
303-398-6547
Colorado State Patrol Hazmat Office
(303) 239-4546

CDOT Form #1247

CDOT NUCLEAR GAUGE SPECIFICATIONS

MOISTURE/DENSITY (M/D) GAUGE: Troxler 3400 series, InstroTek 3500 & CPN MC-3
RADIONUCLIDE: Cesium-137 (Ce-137)
ACTIVITY: Troxler: 0.30 GigaBecquerels (GBq) [8.0 milliCuries (mCi)]
CPN & Instrotek: 0.37 GBq (10 mCi)
Sealed Source located in the tip of the source rod.
RADIONUCLIDE: Americium-241:Beryllium (Am-241:Be)
ACTIVITY: Troxler & Instrotek: 1.48 GBq (40mCi)
CPN: 1.85 GBq (50 mCi)
Sealed Source located in the center of the base.

ASPHALT CONTENT (AC) GAUGE: Troxler 3241-C & CPN AC-2R
RADIONUCLIDE: Am-241:Be
ACTIVITY: 3.70 GBq (100 mCi)
Troxler Sealed Source located in top center above chamber.
CPN Sealed Source located in bottom center below chamber.

EMERGENCY ASSISTANCE-RADIATION SAFETY OFFICERS ONLY!

COLORADO DEPARTMENT OF PUBLIC HEALTH & ENVIRONMENT:

LABORATORY & RADIATION SERVICES DIV:	Days	303-692-3428
EMERGENCY MANAGEMENT UNIT:	Nights/Weekends/Holidays	877-518-5608

TROXLER ELECTRONIC LABORATORIES, INC.:

EMERGENCY ASSISTANCE:	24 HOURS, EVERY DAY	919-549-9539

2.2 ON-SITE RADIATION SAFETY OFFICER EMERGENCY NOTIFICATION TELEPHONE DIRECTORY

REGION	PERSONNEL	OFFICE LOCATION	WORK PHONE	HOME PHONE
1	Brent Loomis	Denver	303-398-6804	
	Kevin O'Reilly	Tunnel	303-512-5675	
	Leslie Kochis	Limon	719-775-8004	
2	Robert Bergles	Pueblo	719-546-5776	
	Christine Genger	Colorado Springs	719-634-2323	
	Troy Branom	Lamar	719-336-3228	
3	Trevor Woolley	Grand Junction	970-683-6371	
	Cecil Cubbison	Grand Junction	970-683-6376	
	Andy Rosedahl	Grand Junction	970-683-6374	
4	Steve Gonser	Evans	970-381-0213	
	Joe Burrows	Boulder	303-546-5647	
	Mike Ellis	Evans	970-350-2383	
5	Patrick Murphy	Durango	970-759-5300	
	Robert Byrd	Alamosa	719-587-6520	
	Russell Ebel	Durango	970-385-8364	
6	Matt McMechen	Denver	303-398-6704	
	Eric Bemenel	Denver	720-497-6962	
	Paul Gonzales	Denver	303-972-9112	
HQ	Paul Smith	Denver	303-398-6547	C 303-319-9557
STAFF	Eric Prieve	Denver	303-398-6542	

Revised 3-14-2013

2. SAMPLE DOCUMENTS (continued)

2.4 Certificate of Acceptance for Radiological Safety and Nuclear Gauge Operation. .....Page 9

2.5 CDOT Nuclear Incident Procedure.....Page 10

2.6 Colorado Department of Health - Notice to Employees. .....Page 11

2.7 Nuclear Gauge Operation During Pregnancy.....Page 12

2.8 CDOT Form # 746: Nuclear Moisture/Density Gauge Log.....Page 13

2.9 CDOT Form # 772: Nuclear Asphalt Content Gauge Log. .....Page 14

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3. CDOT Forms - Applicable for Nuclear Gauge Testing, Examples and Instructions

427 Nuclear Soils Moisture/Density Test ..... Page 15-16

428 Nuclear Asphalt Density Test..... Page 17-18

469 Nuclear Asphalt Density Correction ..... Page 19-20

599 Nuclear Asphalt Content Correlation..... Page 21-22

106 Nuclear Asphalt Content Test……..Page 23-24

2.4 Certificate of Acceptance for Radiological Safety and Nuclear Gauge Operation

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Materials and Geotechnical Branch
4670 Holly Street, Unit A
Denver, Colorado 80216

DEPARTMENT OF TRANSPORTATION

Certificate of Acceptance as a Nuclear Gauge Operator

_____ has satisfactorily completed the "CDOT School of Radiological Safety & Nuclear Gauge Operation" on _____ presented by Eric Prieve, or has completed a training course in the safe use and handling of portable nuclear gauges which has been accepted by the U. S. Nuclear Regulatory Commission or Agreement State on _____ by _____.

The above stated individual has also completed a minimum of 8 hours of instruction and supervised hands-on operation of a Moisture/Density gauge and/or Asphalt Content Gauge. I certify that this individual is technically qualified to utilize a _____ gauge, and has acted in a manner equal to the responsibilities required by CDOT's Radioactive Materials License, Colorado 308-01.

_____ _____
ON-SITE RADIATION SAFETY OFFICER DATE

_____ has met the requirements contained within the CDOT Radioactive Materials License and hereby is designated as a CDOT Nuclear Gauge Operator. The CDOT Nuclear Gauge Operator has been issued a CDOT Nuclear Gauge Operator Identification Card (CDOT Form #774). The above stated individual shall attend recurrent training at intervals not to exceed 3 years to retain his/her status as a CDOT Nuclear Gauge Operator.

_____ _____
CDOT RADIATION SAFETY OFFICER DATE

2.5 CDOT Nuclear Incident Procedures

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Materials & Geotechnical Branch
4670 Holly Street
Denver, Colorado 80216-6437

DEPARTMENT OF TRANSPORTATION

CDOT NUCLEAR INCIDENT PROCEDURES

(Required to be posted: Nuclear Gauge Storage, Nuclear Gauge Binders)

1. I, _____, am the individual with primary responsibility for the Nuclear Gauge(s) assigned to this location. My Home Phone / Cellular number is _____.

2. I, _____, as Project Engineer share responsibility and liability for the physical security of all assigned nuclear gauges to this location.

3. **PROPER SHIPPING NAME AND HAZARD CLASS:**

   USA DOT 7A TYPE A RADIOACTIVE MATERIAL, SPECIAL FORM, NON FISSLE OR FISSLE EXCEPTED, UN3332

4. **POTENTIAL HAZARDS, TO HEALTH:**
   (a) Radiation presents minimal risk to nuclear gauge operators and emergency response personnel.
   (b) Nuclear Gauges in undamaged "Type A" carrying cases are safe. Damaged packages may cause external radiation hazard.
   (c) U.S. DOT "Type A" carrying cases contain non-life endangering amount of radio nuclides. Radioactive source capsules may be released in moderately severe accidents.
   (d) Contamination and internal radiation hazards from inhalation, ingestion, or breaks in skin are not expected, but not impossible if special form source capsule is breached.

5. **RADIATION SAFETY OFFICERS (RSO'S) - Within CDOT TO CONTACT:**

	Location	RSO	Work Phone	Home Phone
1-On-Site		_____	_____	_____
2-On-Site		_____	_____	_____
3-On-Site		_____	_____	_____
4-Staff	Denver	Paul Smith	303-398-6547	303-319-9557

6. **MISSING GAUGE:**

   Call the first available RSO, do not telephone the police.

7. **MINOR DAMAGE - [SOURCE CAPSULE(S) REMAIN WITHIN THE NUCLEAR GAUGE]:**
   (a) Inspect from 1 meter away. Turn with a long handled tool.
   (b) If damage is slight, move the gauge to the safety of the test trailer or lab. Call the first available RSO.
   (c) If the source rod on a M/D Gauge is bent (will not retract), place gauge over a five gallon bucket filled with wet soil, shielding the rod and the neutron source area (center, base).
   (d) Relocate gauge/bucket to trailer or lab. Call first available RSO.

8. **MAJOR DAMAGE - [SOURCE CAPSULE(S) SEPARATED FROM NUCLEAR GAUGE]:**
   (a) Establish control. Do not allow the accident site to expand.
   (b) Emergency response actions. First aid &/or extinguishing fire are highest priority. Advise medical personnel that victim may be contaminated with low level radioactive material.
   (c) Rope off restricted area, minimum 6 meter (20 feet) radius from outer edge of nuclear gauge debris.
   (d) Let no vehicles involved leave the site.
   (e) Let only emergency response personnel enter.
   (f) Maintain control of restricted area until officially released. Call first available RSO.

RH 10.2 POSTING OF NOTICES TO WORKERS

The Radioactive Materials License, the Rules and Regulations Pertaining to Radiation Control, and all communication both to and from the Colorado Department of Public Health and Environment may be examined at the CDOT Staff Materials Laboratory, 4670 Holly Street., Denver, Colorado 80216-6437.

Colorado Department of Public Health and Environment

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
Hazardous Materials and Waste Management Division
Radiation Management Program

NOTICE TO EMPLOYEES

Colorado Department of Public Health and Environment

STANDARDS FOR PROTECTION AGAINST RADIATION (PART 4); NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS; INSPECTIONS (PART 10); EMPLOYEE PROTECTION

HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Within Colorado, the Radiation Management Program of the Hazardous Materials and Waste Management Division (the Division) is the regulatory agency responsible for licensing and inspecting the use of radioactive materials and registering and inspecting radiation producing machines.

HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION RESPONSIBILITIES

The Division's primary responsibility is to ensure that workers and the public are protected from unnecessary or excessive exposure to radiation. The Division does this by establishing requirements in the State of Colorado *Rules and Regulations Pertaining to Radiation Control*, 6 Code of Colorado Regulations (CCR) 1007-1 (the Regulations).

EMPLOYER RESPONSIBILITIES

Any individual conducting activities licensed or registered by the Colorado Department of Public Health and Environment (the Department), Hazardous Materials and Waste Management Division, must comply with the Department's requirements. If a violation of the Department's requirements occurs, the license or registration can be modified, suspended or revoked and/or the licensee or registrant can be fined.

Your employer must post or make available Department radiation regulations and must post Department Notices of Violation involving radiological working conditions.

EMPLOYEE RESPONSIBILITY

For your own protection and the protection of your co-workers, you should know how Department requirements relate to your work and should obey them. If you observe violations of the requirements, you should report them.

REPORTING VIOLATIONS

If you believe that violations of the Department rules or of the terms of the license have occurred, you should report them immediately to your supervisor. If you believe that adequate corrective action is not being taken, you may report this to a Department inspector or to the Division.

WORKING IN A RADIATION AREA

If you work with or in the vicinity of radioactive materials or radiation producing machines, the amount of radiation exposure that you may legally receive is limited by the Regulations. The limits on your exposure, as well as limits for an embryo/fetus, are contained in Part 4 of the Regulations. While those are the maximum allowable limits, your employer should also keep radiation exposure as far below those limits as is "reasonably achievable".

OBTAINING A RECORD OF WORKER RADIATION EXPOSURE

If the Regulations require that your radiation exposure be monitored, your employer is required to advise you annually of your dose. In addition, if you terminate employment with the licensee or registrant, you may request that your employer provide, at termination, a report of your radiation exposure during the current year.

IDENTIFYING VIOLATIONS OF DEPARTMENT REQUIREMENTS

The Department conducts regular inspections at licensed and registered facilities to assure compliance with Department requirements. In addition, licensees and registrants are required to perform audits, surveys and/or measurements to assure compliance.

CONTACTING A DEPARTMENT INSPECTOR

Your employer may not prevent you from talking with a Department inspector and you may talk privately with an inspector and request that your identity remain confidential.

REQUESTING AN INSPECTION

If you believe that your employer has not corrected violations involving radiological working conditions, you may request an inspection. Your request should be addressed to the Hazardous Materials and Waste Management Division, Colorado Department of Public Health and Environment, and must describe the alleged violation in detail. You or your representative must sign the request.

CONTACTING THE DEPARTMENT

Call the Division. Department staff would like to talk to you if you are worried about radiation safety or other aspects of licensed or registered activities.

CAN I BE FIRED FOR RAISING A SAFETY ISSUE?

Federal law prohibits an employer from firing or otherwise discriminating against you for bringing safety concerns regarding radioactive material to the attention of your employer or the Department. You may not be fired or discriminated against because you: *

- ask the Department to enforce its rules against your employer;
- refuse to engage in activities which violate Department requirements;
- provide information or are about to provide information to the Department or your employer about violations of requirements or safety concerns;
- are about to ask for, or testify, help or take part in, a Department, Congressional, or any Federal or State proceedings.

* NOTE: Federal law provisions do not apply to workers using only radiation producing machines (x-ray machines).

WHAT FORMS OF DISCRIMINATION ARE PROHIBITED?

It is unlawful for an employer to fire you or to discriminate against you with respect to pay, benefits, or working conditions because you help the Department or raise a safety issue.

HOW AM I PROTECTED FROM DISCRIMINATION?

If you believe that you have been discriminated against for bringing violations or safety concerns to the Department or your employer, you may file a compliant with the U.S. Department of Labor pursuant to Section 211 of the Energy Reorganization Act of 1974 (42 U.S.C. 5851). To do so you may directly contact the Occupational Safety and Health Administration (OSHA) Regional Office to receive your complaint. Your complaint must describe the firing or discrimination and must be filed within 180 days of the occurrence.

Send complaints to:

Department of Labor/OSHA
1999 Broadway, Suite 1690
P.O. Box 46550
Denver, Colorado 80201-6550

or contact the OSHA office by telephone at (303) 844-1600 or by fax at (303) 844-1616.

WHAT CAN THE DEPARTMENT OF LABOR DO?

The Department of Labor will notify the employer that a complaint has been filed and will investigate the case.

If the Department of Labor finds that your employer has unlawfully discriminated against you, it may order that you be reinstated, receive back pay, or be compensated for any injury suffered as a result of the discrimination.

WHAT CAN THE HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION DO?

If the Department of Labor or Division finds that unlawful discrimination has occurred, the Division may issue a Notice of Violation to your employer, impose a fine, or suspend, modify, or revoke your employer's license or registration.

OR-RH-15 (3/04, previous editions are obsolete)

Radiation Management Program, Hazardous Materials and Waste Management Division, Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, CO, 80246-1530, **(303) 692-3300**

2.7 Nuclear Gauge Operation During Pregnancy

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Materials & Geotechnical Branch
4670 Holly Street
Denver, Colorado 80216
303-398-6542

DEPARTMENT OF TRANSPORTATION

Dear_____;

The Colorado Department of Public Health states, a woman has the right to or not to declare her pregnancy. The Colorado Department of Transportation (CDOT) policy regarding nuclear gauge operation during pregnancy is to allow a woman to make an informed decision. A declaration of pregnancy remains confidential, and employment status can not be effected by this decision.

The Colorado Department of Public Health and Environment's "Rules and Regulations Pertaining to Radiation Control," provides a technical reference for our Radioactive Materials License. An employee working within a restricted area may receive a maximum occupational dose of 5.0 REM (5000-milliREM) of exposure per year. An individual in an unrestricted area, may receive a maximum of 100-milliREM of exposure per year. The National Council of Radiation Protection and Measurement recommends that the embryo/fetus does not receive more than 500 milliREM of exposure during the full 9-month pregnancy. Troxler Electronic Laboratories, manufacturer of CDOT nuclear gauges, states that under average conditions a full time employee working with Troxler moisture density gauges and/or asphalt content gauges will receive less than 200 milliREM of exposure per year. CDOT records indicate that very few employees have exceeded half of Troxler's 200-milliREM value for their lifetime exposure.

I,_____, have read the preceding paragraph and I am aware that if I have any questions CDOT's Radiation Safety, Eric Prieve, is available for consultation.

I will maintain my status as an active nuclear gauge operator through my pregnancy, at least until the time when other health concerns prevent my continued involvement in these activities. The estimated date of conception is_____.

_____ _____
(signature) (date)

I wish to be removed temporarily as an active nuclear gauge operator until my child is born. The estimated date of conception is_____.

_____ _____
(signature) (date)

Please return this letter with your original signature to the CDOT Nuclear Office. A letter indicating the date of birth of your child is required.

Sincerely,

_____
Eric Prieve
CDOT Radiation Safety Officer

2.8 CDOT Form #746: Nuclear Moisture/Density Gauge Log

COLORADO DEPARTMENT OF TRANSPORTATION

NUCLEAR MOISTURE/DENSITY GAUGE LOG

CDOT Equipment no.	Gauge model	Date of calibration table
8197	Troxler 3430	6/27/02
Moisture calibration reference standard count		**Density calibration reference standard count**
625.0		2649.9

DAILY REFERENCE MOISTURE STANDARD COUNT: ± 2% PER PREVIOUS 4 DAY AVERAGE
DAILY REFERENCE DENSITY STANDARD COUNT: ± 1% PER PREVIOUS 4 DAY AVERAGE

DATE	MOISTURE REFERENCE STANDARD	DENSITY REFERENCE STANDARD	TESTER (full name, print legibly)	LOCATION OF PROJECT
7/29/03	620	2619	Dan Burrows	I-25,SH 7 to WCR 16
7/30/03	620	2621	Dan Burrows	I-25,SH 7 to WCR 16
7/31/03	610	2630	M. Bruce Waters	I-25,SH 7 to WCR 16
8/1/03	625	2632	M. Bruce Waters	I-25,SH 7 to WCR 16
1/13/03	627	2595	M. Bruce Waters	I-25,SH 7 to WCR 16
4/14/03	618	2603	Sean Eaman	I-25,SH 7 to WCR 16
4/16/03	627	2579	Sean Eaman	I-25,SH 7 to WCR 16

DISTRIBUTION: R.S.O. - Permanent Gauge File

CDOT Form #746 9/03

2.9 CDOT Form #772: Nuclear Asphalt Content Gauge Log.

COLORADO DEPARTMENT OF TRANSPORTATION

NUCLEAR ASPHALT CONTENT GAUGE LOG

CDOT Equipment no. 8203 | Gauge model Troxler 3241-C (100 MCI)

DATE	BACKGROUND CNT	TESTER (full name, print legibly)	LOCATION GAUGE OPERATED
4/12/03	2105	Kathy Peterson	I-25, SH 7 to WCR 16
4/16/03	2105	Kathy Peterson	I-25, SH 7 to WCR 16
4/17/03	2098	Kathy Peterson	I-25, SH 7 to WCR 16
4/21/03	2093	Kathy Peterson	I-25, SH 7 to WCR 16
6/9/03	2104	Kathy Peterson	I-25, SH 7 to WCR 16
6/10/03	2103	Kathy Peterson	I-25, SH 7 to WCR 16
6/11/03	2114	Kathy Peterson	I-25, SH 7 to WCR 16
6/12/03	2097	Kathy Peterson	I-25, SH 7 to WCR 16
6/13/03	2106	Kathy Peterson	I-25, SH 7 to WCR 16
6/18/03	2100	Kathy Peterson	I-25, SH 7 to WCR 16

DISTRIBUTION: R.S.O. - Permanent Gauge File

CDOT Form #772 9/03

3. SAMPLE DOCUMENTS, FORM INSTRUCTIONS AND EXAMPLES

CDOT FORM #427 INSTRUCTIONS

The Nuclear Soils Moisture/Density Test form is a field work sheet used to calculate the in-place dry density and the in-place percent moisture of soil and soil-aggregate. This is the designated form to be used with CP 80, In-Place Density and Moisture Content of Soil and Soil-Aggregate by the Nuclear Method.

Record the moisture reading and the density reading after each one-minute test interval. When recording the moisture readings record the percent moisture not the moisture pounds per cubic foot (PCF). When recording the density reading record the dry density, not the wet density. After you have obtained your four readings average the results.

Curve Values: Obtained from Form #1274, Report from Central Lab.
The W/R (with Rock) values are derived from the same report once the % retained on no.4 sieve (rock) has been determined.

% Relative Compaction: Divide the In-Place Dry Density by the Maximum Dry Density (W/R if applicable), and then multiply by 100.

Calculations for Percent Rock: The Wet Weight Total Sample is collected from beneath the Moisture/Density Gauge. The Wet Weight Rock is the Dry Weight Total Sample multiplied by the % Retained on No. 4 Sieve.

Rock Correction Formula: The wt./cu.ft. of + #4 rock is the specific gravity of the + #4 x 62.4, the weight of a cubic foot of water (i.e. SpG. of 2.588 x 62.4 = 161.5)

Compaction Cylinder Moisture & Density Data: Derived from the utilization of CP 25.

COLORADO DEPARTMENT OF TRANSPORTATION

CP 80 NUCLEAR SOILS MOISTURE/DENSITY TEST AND CP 25 PERCENT RELATIVE COMPACTION

Project No.	Region	Contract ID
IM 0253-151	6	11925

Location: I-25 Overlay

Pit Name	Material	Class	Item	Date
Cooley	Agg Base Course	6	304	6/27/2003

Station/offset	Elevation/Depth	Test No.	Soil Classification
20+78 Lt. 40'	2' Thick	5A	A-1-a(0)

Gauge ID	Moisture Standard Count	Density Standard Count	Tested by	Transmission Depth, in.
8245	633	3522	Kenny Roberts	8

Curve No.	Maximum Dry Density	Optimum Moisture Content	AASHTO T99 or T180	Method A or D
22	123.4 pcf	6.2 %	T180	A

Field Test Data

Gauge Reading	Moisture		Density		
(1) % Moisture	4.9	Wet Dens.		Dry Dens.	126.5
(2) % Moisture	4.8	Wet Dens.		Dry Dens.	127.7
(3) % Moisture	5.3	Wet Dens.		Dry Dens.	125.1
(4) % Moisture	5.0	Wet Dens.		Dry Dens.	126.3
Average	5.0	Average		Average	126.4

M/D Gauge Moisture Check

Wet Soil wt. + pan	639.4
Dry Soil wt. + pan	613.3
Pan wt.	101.5
Dry soil wt.	511.8
Water wt.	26.1
% Moisture =	5.1

Calculations for Percent Rock [Plus #4(Method A) or 3/4 inch(Method D)]

Method A - Oven Dried

Dry wt. of rock 2.23 ÷ Dry wt. total sample 7.74 = 28.8 % Rock & 71.2 % Soil

Method B - Using Gauge MC

Wet weight of rock _____ ÷ (1 + _____ absorption ÷ 100)= dry weight rock _____

Wet weight of soil _____ ÷ (1 + _____ M/D Gauge MC ÷ 100)= dry wt. soil _____

Dry wt. of rock ÷ (Dry wt. of rock + Dry wt. of soil) X 100% = _____ % Rock & _____ % Soil

Rock Correction Formula and Calculations

[(% Soil x Max dry density of Soil) + (% Rock x CF x 62.4 x Sp Gr Rock)] ÷ 100

For AASHTO T99, CF = 0.90 For AASHTO T180, CF = 0.95

% Soil 71.2 x 123.4 Maximum Dry Density of soil = 8786

% Rock 28.8 x CF x 62.4 x 2.59 Specific Gravity of Rock = 4421

Sum = 13207 ÷ 100 =

Corrected Maximum Dry Density: 132.1

Optimum Moisture Correction Calculations

[(% Soil x OMC of Soil) + (% Rock x Absorption of Rock)] ÷ 100

% Soil 71.2 x 6.2 Optimum MC of Soil = 441

% Rock 28.8 x 1.3 Absorption of Rock = 37

Sum = 478

Corrected Optimum Moisture Content, % ÷ 100 = 4.8

1 Point Moisture Determination

Wet Soil wt. + pan	631.8
Dry Soil wt. + pan	605.1
Pan wt.	100.5
Dry soil wt.	504.6
Water wt.	27.2
% Moisture =	5.4

1 Point Check Compaction Cylinder Density Data

Gross wt. 8.615

- Tare wt. 4.230

Net wt. 4.385 ÷ Volume of Mold 0.0335 = Wet Density 130.9 ÷ (100 + 5.4 Moisture Content)x100= Dry Density 124.2

Percent Compaction calculation

Field Dry Density 126.4 ÷ (Corrected Maximum dry density) x 100 or (Curve Maximum Dry Dens) x 100 = 132.1 = 95.7 % Relative Compaction

Specifications: Moisture +/- 2.0 % Compaction Minimum 95.0 %

Remarks:

CDOT Form #427 April 2012

CDOT FORM # 428 INSTRUCTIONS

The Nuclear Asphalt Density Test form is a field work sheet used to calculate the percent relative compaction of the in-place hot mix asphalt pavements. This is the designated form to be used with CP 81, Density of In-Place Bituminous Pavement by the Nuclear Method.

Record the density reading after each one-minute test interval. When recording the density reading record the wet density, not the dry density. After you have obtained your four readings average the results.

T 166 or T 209: List the Laboratory Maximum Specific Gravity under the appropriate test procedure and N/A (not applicable) under the other procedure. Obtained from CDOT Form #43. Convert the Laboratory Maximum Specific Gravity to Laboratory Maximum Density by multiplying the Laboratory Maximum Specific Gravity by 62.4 lbs/cu. ft.

Adjusted Field Density: The field density plus the correction factor from CDOT Form #469.

% Relative Compaction: Obtained by dividing the adjusted field density by the laboratory maximum density.

COLORADO DEPARTMENT OF TRANSPORTATION	Project No. FBR 025-151	Region 7	Contract ID 12345
NUCLEAR DENSITY TEST of HMA	Project Location Behind the big red barn on the north forty to the next county line road		

Standard Count	Equipment (Gauge) ID	Technician's Name	Grading	Item	Mix ID Form #43
2789	4563	Seamor Butts	S(100)	403	720213xASCI01_Q

Test ID Number		5	6	7	8	9
Date of test		2/29/2011	2/29/2012	3/2/2012	3/3/2012	3/6/2012
Daily Rice		2.486	2.486	2.441	2.486	2.441
Station		123+50 NB	1+50 SB	123+50 NB	1+50 SB	123+50 NB
Offset		5' L CL	6' R CL	5' L CL	6' R CL	5' L CL
Course/Lift		top	top	2 nd lift	top	2 nd lift
Backscatter 4, 1 minute readings	Wet Density #1	142.5	142.7	142.0	142.9	142.1
	Wet Density #2	141.9	143.3	143.0	143.1	143.2
Turn Gauge 180°	Wet Density #3	142.4	142.9	142.0	142.6	142.3
	Wet Density #4	142.0	143.6	142.0	143.3	142.4
Sum of the Wet Densities		568.8	572.5	569.0	571.9	570.0
Average Wet Density		142.2	143.125	142.3	143.0	142.5
Correction Factor (#469) **PCF**		1.7	-0.2	0.6	0.5	0.6
Adjusted Wet Density		143.9	142.9	142.9	143.5	143.1
Daily Rice X 62.4 (**PCF**)		155.1	155.1	152.3	155.1	152.3
% Compaction		92.8	92.1	93.8	92.5	93.9

Test ID Number		10	11	12	13	14
Date of test		3/8/2012	3/13/2012	3/15/2012	3/16/2012	3/21/2012
Daily Rice		2.486	2.441	2.486	2.486	2.498
Station		123+50 NB	123+50 NB	1+50 SB	123+50 NB	666+66
Offset		5' L CL	5' L CL	6' R CL	5' L CL	6' R of L curb
Course/Lift		top	2 nd lift	bottom	top	top
Backscatter 4, 1 minute readings	Wet Density #1	142.5	142.1	142.7	142.5	144.1
	Wet Density #2	141.9	143.2	143.3	141.9	145.9
Turn Gauge 180°	Wet Density #3	142.4	142.3	142.9	142.4	143.8
	Wet Density #4	142.0	142.4	143.6	144.0	144.0
Sum of the Wet Densities		568.8	570.0	572.5	570.8	577.8
Average Wet Density		142.2	142.5	143.125	142.7	144.45
Correction Factor (#469)**PCF**		0.6	0.06	-0.1	1.1	-1.01
Adjusted Wet Density		142.8	142.6	143.0	143.8	143.4
Daily Rice X 62.4 (**PCF**)		155.1	152.3	155.1	155.1	155.9
% Compaction		92.1	93.6	92.2	92.7	92.0

Remarks

CDOT Form #428 3/2012

CDOT FORM # 469 INSTRUCTIONS

The Nuclear Asphalt-Density Correction form is a field work sheet used to perform the calculations necessary for the correlation of density readings from a nuclear gauge to cores. These correlations are required by specifications for Compaction Test Sections and Check Testing Programs. This is the designated form to be used with CP 82, Field Correction of the In-Place Measurement of Density of Bituminous Pavement by the Nuclear Method. Density measurements can have a profound effect on payment to the Contractor and the long-term performance of an asphalt pavement; for these reasons, it is important that all nuclear gauges used on a paving project be correlated to the same set of cores.

Gauge #1 - Owner: If the gauge belongs to the Colorado Department of Transportation, enter CDOT; however, if it belongs to a consulting engineering company, enter the name as it appears on the Radioactive Materials License.

Gauge #1 - ID# & SN: A non-CDOT ID# is that which is listed on the CDOT generated calibration table. The SN (Serial Number) is the gauge serial number, not the radioactive source serial number.

Gauge #2 - Owner: Whether the nuclear gauge is owned by the Paving contractor or by its designated agent, this name must be as it appears on the Radioactive Materials License.

Gauge #2 - ID# & SN: The ID# listed must be unique to their gauge inventory and the SN is the gauge serial number, not the radioactive source serial number.

Station & Transverse Location: Required information that must be provided.

Nuclear Gauge #2 SpG: The Contractor or the Contractor's consultant tester may pursue quality control through the use of a nuclear gauge; however, if quality control is accomplished through other means then it must be noted under the comment section.

Correction Factor: The value must be carried out to the third decimal place, just as the nuclear gauge SpG's are recorded to the third decimal place. This value will be used on CDOT Form #428.

Gauge Operator: Nuclear gauge #1 & #2, name must be entered.

Supervisor: Nuclear gauge #1 & #2, name must be entered.

Nuclear gauge #2: The make & model of the gauge must be entered between the line for company name and supervisor.

COLORADO DEPARTMENT OF TRANSPORTATION

NUCLEAR ASPHALT - DENSITY CORRECTION

Project code (SA#)	Project No.	Item	Mix design #
11925	IM 0253-151	403	142011
Date	**Proj. location**	**Job Mix - % A.C.**	**Lab SpG**
5/27/03	I25, SH 7 to WCR 16	5.9	2.441

Region	Paving Contractor	Grading	Course
4	Kiewit Western	S(75)	Top 1.5"

Gauge #1 - Owner	Gauge #1 - ID# & SN	Gauge #2 - Owner	Gauge #2 - ID# & SN
Geocal	G-1	Kiewit	K-2

Core #	Station	Transverse location	CP 44 (or CP-L 5103) (A) Oven dry wt.	CP 44 (or CP-L 5103) (B) Sat surf dry wt.	CP 44 (or CP-L 5103) (C) Immersed wt.	CP 44 (or CP-L 5103) A/(B-C) Bulk SpG	Density Bulk SpG x 62.4 lb/ft³	Nuclear Gauge #1 Wet density	Nuclear Gauge #2 Wet density
1	2536+60	10' Rt.	599.1	600.1	342.0	2.325	145.1	143.5	142.2
2	2536+60	7' Rt.	689.7	690.6	393.8	2.324	145.0	144.0	141.8
3	2537+20	9' Rt.	731.6	733.1	415.2	2.301	143.6	143.6	141.5
4	2537+20	4' Rt.	519.5	520.2	294.4	2.301	143.6	143.2	141.0
5	2539+70	11' Rt.	510.1	510.5	287.0	20282	142.4	142.1	140.3
6	2539+71	3' Rt.	698.7	699.2	394.3	2.292	143.0	143.0	141.7
7	2542+00	5' Rt.	627.3	628.1	350.8	2.262	141.1	141.7	140.4
				Totals		16.087	1003.8	1001.1	988.9
				Average (Total/7)		2.298	(E) 143.4	(F1) 143.0	(F2) 141.3
				Correction Factor (E-F)				+0.4	+2.1

Comments

Top Mat 1.5"

Nuclear gauge #1	Nuclear gauge #2
Intended gauge use ☒ QA ☐ QC	Intended gauge use ☐ QA ☒ QC
Gauge operator: D. Elsbernd	Gauge operator: H. Owens
☐ CDOT or company (name): Gecal	☐ CDOT or company (name): Kiewit
Lab tester for CP 44: D. Elsbernd	H. Owens
Supervisor: D. Scott	Supervisor: L. Krause

Previous editions are obsolete and may not be used CDOT Form #469 4/07

CDOT FORM #599 INSTRUCTIONS

The Nuclear Asphalt Content Correlation form is a field work sheet used to correlate a nuclear asphalt content gauge to the actual quantity of asphalt cement in a mix. This is one of the designated forms to be used with CP 85, Asphalt Cement Content of Asphalt Concrete Mixtures by the Nuclear Method.

Section 8 of CP 85, Correlation, describes the procedure to be followed to perform a correlation and the CDOT Form #599 guides the user in its completion by showing the relevant formulas.

The Standard Deviation, #K, is generated by the AC Gauge and displayed for each sample pan. The correlation Slope and Intercept, #M, are also generated automatically by the AC Gauge and must be appropriately recorded. The Correlation Factor must be greater than or equal to 0.9990 to be considered acceptable, and the AC Gauge also automatically generates this value.

Note: The Slope as generated by the AC Gauge is not the same value as you would determine through mathematical calculation. In the example, the Slope is 3.995; however, if you were to perform the math the slope would be .003995.

COLORADO DEPARTMENT OF TRANSPORTATION

NUCLEAR ASPHALT CONTENT CORRELATION

Aggregate source: Distel Pit	Date: 5/3/03	Correlation no.: 728.1
Asphalt: grade & source: PG 64-22 Koch	Grading: S (75)	Supplier: Kiewit
Project No.: IM 0253-151	Project code (SA#): 11925	Form 43 #: 25589
Background count Start: 1975 Finish: 1976	Gauge No.: X-2	Job mix formula % AC: 5.9

Dry Aggregate Information

A. Base weight _____ g A' Base weight (mix) 7100 g

B. Gauge count on dry aggregate _____

Correlation

		Cor. Pan 1	Cor. Pan 2	Cor. Pan 3	Cor. Pan 4
C.	Weight of dry aggregate	8000 g	8000 g	8000 g	8000 g
D.	Percent asphalt required	4.9 %	5.9 %	6.9 %	7.9 %
E.	Weight of asphalt required ($\frac{C \times D}{100 - D}$)	412.2 g	501.6 g	592.9 g	684.2 g
F.	Desired weight of mix (C + E)	8412.2 g	8501.6 g	8592.9 g	8684.2 g
G.	Actual weight of aggregate and asphalt	8412.2 g	8501.6 g	8592.9 g	8684.2 g
H.	Actual weight of asphalt in mix (G - C)	412.2 g	501.6 g	592.9 g	684.2 g
I.	Actual % of asphalt in mix ($\frac{H}{G}$ x 100)	4.9 %	5.9 %	6.9 %	7.9 %
J.	Gauge count on mix sample	2927	3200	3488	3776
K.	Deviation	-.009	+.018	-.009	-.009

L. Correlation temperature _____

M. Slope 3.995 Intercept -6.729 Correlation factor .9993

Tested by: D Elsbernd	Witnessed by: Steve Gonser
Remarks: A/C Oven is Calibrated @ 7100 grams	Check pan by: D. Elsbernd
	AC mixed at, %: 5.9
	Gauge count: 3200
	% AC by gauge: 5.91

CDOT Form #599 4/07

CDOT FORM #106 INSTRUCTIONS

The Asphalt Test form is a field work sheet used to determine apparent asphalt content and correct for moisture content, in addition to recording in one location a variety of test results. This is one of the designated forms to be used with CP 85, Asphalt Cement Content of Asphalt Concrete Mixtures by the Nuclear Method.

Section 8 of CP 85, Correlation Pan Preparation, describes the procedure to be followed to determine the asphalt content of a sample of production bituminous mixture.

The Gauge % AC and the Measure Count are shown on the scaler display. In the Moisture Correction for the Mix, divide the sample weight loss by the dry mass, and multiple by 100 to obtain the % Moisture. The Corrected % AC is the percent asphalt determined by the AC Gauge minus the percent moisture retained in the mix.

Perform the Moisture Correction for Aggregate and the Sieve Analysis as required by the Schedule for Minimum Materials Sampling, Testing, and Inspection. Testing for asphalt content and testing of aggregate gradation will often not coincide as in this example.

COLORADO DEPARTMENT OF TRANSPORTATION
ASPHALT TESTS

Gradation test #: 1
Asphalt content test #: 03

Project no.: IM 0253-151	Project code (SA#): 11925	Location: I-25, SH 7 to WCR 16	Station: 125+34
AC gauge #: 8163	Correlation #: 103341	Correlation temp: 250 F	Base weight: 6800 g
Supplier: Kiewit	Item: 403	Grading: S(100)	Course: Top
Date: 9/14/03	Time: 10:53 am	Field temp.: 260 F	Test temp.: 252 F
Background cnt.: 2085	Scale ticket #: 60831	IAT#: 1	Rep: 3rd 10k: 1st

Job Mix % AC: 5.50
Meas. count: 3075
Gauge % AC: 5.71
% Moisture: 0.12
Corr. % AC: 5.59

Sample moisture correction
Tare: 852.3
Wet wt.: 580.2
Dry wt.: 579.5
Loss: 0.7
% Moisture: 0.12

Dry aggregate count: 1993

Form #43 Max. specific gravity: 2.478

	Flask #1	Flask #2
A) Sample weight	1044.4	1070.1
B) Flask + water + lid	3275.7	3305.6
C) Sample + flask + water + lid	3898.3	3943.5
RICE (Max SpG)	2.276	2.476

RICE average 2.476 [A/(A + B - C) = Max SpG]

Fractured Faces (FF)
A) Total wt. 997.5
B) Fract. agg. 979.8
(B/A) x 100 = 98 %FF

Moisture correction for Aggregates
Tare: 632.4
Wet wt.: 1873.1
Dry wt.: 1828.7
Loss: 44.4
% Moisture: 2.4

Form #43 % Aggregate absorption: 2.30

Sampled by: D. Elsbernd
Company: Geocal
Tested by: Fidel Gonzales
Title: E/PS Tech III
Company: CDOT

Sieve analysis

[2027.2 / (100 + 2.4)] x 100 = 1979.7 Dry wt. (before wash)
Wet wt. % moisture

Sieve	Weight	% Ret.	% Pass	Specs
1				
3/4	0			100
1/2	114.6	5.9	94	90-100
3/8	410.6	21.0	79	71-83
#4	997.5	51.0	49	42-52
#8	1295.3	66.3	34	27-37
#16	1477.3	75.6	24	
#30	1625.1	83.2	17	13-21
#50	1748.1	89.5	11	
#100	1826.9	93.4	7	
#200	1867.9	95.6	4.4	3-7
-#200	86.2			
	1954.1	Total sieve wt. (TSW)		

Dry weight (after wash): 1954.8

% difference=
(Dry wt. - TSW) / Dry wt. x 100 = 0.04 %

Remarks:

CDOT Form #106 4/06