



GEOTECHNICAL ENGINEERING CORPORATION

Consulting Engineers • Soil Testing

June 21, 1988

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington D.C. 20555

As required by CFR 20.402, we have prepared a report concerning the recent incident involving a Troxler nuclear density gauge which is owned and used by Geotechnical Engineering Corporation (NRC License No. 22-20271-01). The report is attached.

Please call if you have any questions.

Respectfully submitted by,

Charles W. Bisek

Charles W. Bisek
Radiation Protection Officer
and

Robert E. Pendergast

Robert E. Pendergast, P.E.
President

CWB/REP/jw

cc: U.S. Nuclear Regulatory Commission-Region III
(Attn: Mr. Don Sreniawski)
MN Dept. of Health (Attn: Mr. Bill Breitenstein)

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GEOTECHNICAL ENGINEERING CORPORATION
5/24/88 Troxler Nuclear Density Gauge

The licensed material that was involved in the recent incident was a Troxler Model 3411B, serial #9818, nuclear density gauge containing Cesium 137 and Americium-241:Beryllium sources. The gauge is used to measure the density and moisture content of soil.

The metallic Cesium material is encapsulated in a glass bead. The glass bead is fusion welded inside a stainless steel capsule. This source capsule is fusion welded into the source rod. The source is shielded with tungsten.

The Americium-241:Beryllium material is compressed into a pellet form. The pressed pellet is fusion welded in two separate stainless steel capsules and is contained within the instrument in another stainless steel housing embedded in lead.

On May 24, 1988, Keith Roleff, a technician employed by Geotechnical Engineering Corporation (GEC) was traveling in Ramsey County from a construction site in White Bear Township to a job site in Vadnais Heights. Roleff was transporting a Troxler moisture-density gauge, Model #3411-B and Serial #9818. Roleff was driving his personal vehicle, a 1976 Chevrolet pickup truck with an uncovered cargo area. The route taken is shown on the attached map. (See Exhibit 1. The distance from the construction site to the intersection of Highway 61 and Taylor is 0.7 mile. Buffalo Street is 0.2 mile south of Taylor and 61.) Prior to leaving the site, Roleff had locked the source rod in the safe position with a padlock. (In the safe or shielded position, the source rod is in the retracted position and the source is surrounded by tungsten and radiation is reduced to safe levels.) Roleff then placed the gauge in a "pyramid" type transport case (Troxler product code #103605) which was supplied to GEC by Troxler Electronics Laboratories, Inc. at the time the gauge was purchased. The bottom and top of the case were fastened together with four latches. The cased gauge was placed in the rear corner of the cargo area on the driver's side. The tailgate was closed and latched securely. A chain was threaded through the top case handle and one of the side handles of the case and through a hasp located on the outside of the tailgate. The case was "snugged" into the corner of the cargo area by removing the slack in the chain. A padlock was used to connect the two ends of the chain together.

Roleff left the construction site at about noon and proceeded south on Portland Avenue to Taylor. At Taylor he proceeded west to Highway 61. Shortly before reaching Highway 61, he remembers driving over a rough bumpy section of road (on Taylor about 200' east of Highway 61). He recalls looking in his rear view mirror after hearing a hand auger and other cargo bouncing around. He recalls seeing a distant vehicle approaching from the rear. He does not recall the tailgate being down; i.e. he believes the tailgate was still shut at that time. Roleff recalls waiting for the car in front of him to access onto Highway 61. After waiting for clear access, he drove onto Highway 61 and headed south. Driving south on Highway 61, and approaching the Buffalo Street semaphore, Roleff heard a scraping noise, looked in his rear view mirror and noted that the tailgate was open. He immediately pulled over, went to the rear of the truck, and noticed that the top portion of the case was still chained to the tailgate. The gauge, the polyethylene block the gauge was resting on, and the bottom portion of the case were missing. Roleff unlocked the chain, put the top of the case in the cargo area, proceeded south a short distance, pulled into the center median, and drove north on Highway 61 looking for the gauge. He turned east on Taylor, parked his vehicle on the south side of Taylor immediately east of Highway 61, and checked the ditches in the area of the intersection of Highway 61 and Taylor. On Taylor Avenue, about 10' west of the stop sign and near the centerline of Taylor, Roleff found a small piece (about 2" x 4") of the bottom portion of the transport case. Roleff then proceeded east on Taylor looking into properties adjacent to both sides of the street. At Portland he proceeded north to the construction site, also checking both sides of the street. At the site he went to where he had previously cased and loaded the gauge into his vehicle. He did not find anything. He also spoke with two heavy equipment operators working at the site who told him that when he left the site at noon, they did not recall the tailgate of his pickup being open. Roleff then proceeded back on Portland to Taylor and Highway 61 to the nearest pay phone and called the GEC office and spoke with Charles Bisek (the GEC Radiation Protection Officer and Roleff's supervisor). The call was received at the GEC office at about 12:40.

Bisek immediately went to the site, arriving at the intersection of Highway 61 and Taylor and meeting Roleff at about 1:15. From there, Roleff and Bisek searched the ditches along the east and west sides of Highway 61 south of Taylor to Buffalo and north of Taylor about a block. They then proceeded searching lowlands adjacent of Taylor immediately east of Highway 61. They proceeded east to Portland, checking both north and south of Taylor. They searched the east and west sides of Portland north to the north side of the construction site. They spoke briefly to the earthwork contractor's field superintendent and then backtracked to Taylor and Highway 61. From there, Bisek went to a phone and phoned the GEC office and asked for additional personnel to come out to the site to help search for the gauge. Bisek went back to the site and spoke briefly with Roleff before leaving the site at about 2:15.

Bisek arrived back at the GEC office at about 2:45. Upon his return, Bisek called the Nuclear Regulatory Commission (NRC) and spoke with Mr. Stransky and told him what had happened. Mr. D. Sreniawski and Mr. D. Wiedeman of the NRC called back and Bisek explained the situation to them. They suggested that GEC notify the local media of the incident and to alert anyone who finds the gauge or knows of its whereabouts to contact appropriate authorities.

During this time, Bisek also contacted the Minnesota Department of Health, the Ramsey County Sheriff's office, the Minnesota State Highway Patrol, and the White Bear Lake police department and explained what had happened. Bisek also explained that if anyone recovers the gauge, they should leave the gauge as found and call GEC immediately.

Late that afternoon, Bisek also spoke with representatives of Twin Cities area television and newspaper companies. Bisek explained what had happened, the size, color, etc. of the gauge that was lost, and that if the gauge was recovered to call GEC, the State Highway Patrol or the Ramsey County Sheriff's office.

From the time the gauge was lost until about 9:00 PM Tuesday (May 24) GEC had between one and four employees present at the site walking ditches, etc., searching for the gauge.

Bisek returned to the site in the early evening after contacting the NRC, Minnesota Health Department, Sheriff's office, Minnesota Highway Patrol, local police and news media. During the course of the evening, the Ramsey County Emergency Response Unit, the Department of Transportation Hazardous Materials Unit, the Minnesota Department of Health, the Ramsey County Sheriff's Department, the Minnesota Highway Patrol, a local fire department, various Twin Cities television stations, GEC personnel, and various other personnel were at the site looking for the gauge. (It is our understanding that about 60 people were involved in the search.) Search teams were organized by the Ramsey County Emergency Response Unit. Ditches and property on both sides of Highway 61, Taylor Avenue, Portland, and the construction site were searched.

At about 8:30-9:00 PM the search was called off.

At about 9:00 PM, Bisek spoke with personnel representing the Ramsey County Emergency Response Unit, the Minnesota Department of Health, and the Department of Transportation, and offered assistance in additional or future efforts to find the gauge. At that time, Mr. Bob Metzger, who had been in charge of the evenings search efforts, told Bisek that not much more could be done at that time. Mr. Metzger suggested to wait and see if the gauge is recovered in the next day or so (since the news media had just begun broadcasting the incident that evening).

The following morning, May 25, 1988, Bisek spoke with the Ramsey County Sheriff's office. The Sheriff's office indicated that the gauge had not been recovered. Bisek asked if there was anything further that GEC could do. The Sheriff's department personnel indicated that the previous evenings search had been quite intensive and that at the present time a further search was not planned.

Bisek also notified the Minnesota Department of Health and spoke with Bill Breitenstein and offered assistance. Breitenstein indicated that three people from the Department of Health would be going to the site with survey meters (meters that were more sensitive than the meters they had used the previous evening).

Bisek also spoke with Mr. Bill Reichhold of the NRC twice that morning. Bisek told Reichhold the gauge had not yet been recovered. Bisek also asked Reichhold if the NRC had any suggestions regarding GEC offering a reward for recovery of the gauge.

In the early afternoon, Bisek spoke with a local television station and indicated that GEC was offering a \$500 reward for information regarding the recovery of the gauge. GEC also made arrangements to provide the TV station with a picture of the gauge so the TV station could include it in the evening broadcast.

At about 2:00 PM, Robert Pendergast, president of GEC, received a call from GEC's attorney. GEC's attorney was in contact with the Minnesota Department of Health when they received a call from the Sheriff's office that the gauge had been recovered.

Bisek immediately called the Minnesota Health Department and spoke with Alice Dolezal. She did not know the particulars of the recovery except that the gauge was recovered in or near SE Hugo (Hugo is in Washington county which is immediately north of Ramsey county). She said that Health Department personnel were enroute to the recovery site and suggested that we go out to the site. Apparently the gauge was recovered in a road ditch near July Avenue and 122nd Street in SE Hugo near Withrow (see Exhibit 1). Alice said that the Health Department had been contacted by the Sheriff's Department and suggested that Bisek talk to the Sheriff's Department regarding the particular circumstances.

Bisek called the Washington County Sheriff's Department. The dispatcher said the gauge was recovered at July Avenue and 122nd Street and that the recovery was being handled by Sgt. Hence of the Ramsey County Sheriff's Office.

Bisek called for Sgt. Hence. He was not in. Bisek also spoke with other Sheriff's Department personnel. However, they did not have information regarding the recovery.

Bisek went to the recovery site (the recovery site as explained by Alice Dolezal of the Health Department). No one was present at that location.

Bisek called the GEC office and spoke with Robert Pendergast. Pendergast called the Washington County Sheriff's office who referred him to the MN Highway Patrol. The Highway Patrol indicated the gauge was at or enroute to the Ramsey County Sheriff's office. Pendergast called the Ramsey County Sheriff's office and spoke with Peter Marcotte of the Department of Transportation. He had assisted in the recovery. He told Pendergast that the gauge was at the Ramsey County Sheriff's office.

Bisek stopped at the Ramsey County Sheriff's office on his way back from the recovery site and spoke with Sgt. Kell. The gauge, bottom part of the carrying case, and polyethylene block had been recovered. The padlock, which had been placed on the source rod, had been removed. Other than that, there was no evidence of any damage to the gauge, i.e. that gauge looked the same as before it was reported missing. Bisek delivered the gauge back to GEC. Upon arrival, Bisek immediately performed a leak test and then placed the gauge in the gauge storage locker. The results of the leak test have since come back indicating no leakage.

After arriving back at the office, Bisek called the local news media and informed them that the gauge had been recovered.

The following morning (May 26) Sgt. Hence of the Ramsey County Sheriff's Department returned Bisek's call from the day before. According to Sgt. Hence, at about 1:00 PM on May 25, a person driving in the area noticed the gauge, bottom of the carry case, and polyethylene block in the ditch near the stop sign at July and 122nd. He picked up the gauge, case, and block and took it to his home and notified the Washington County Sheriff's Department. The gauge, when recovered, was sitting on the polyethylene block, with the source rod in the safe position. The padlock was not on the source rod. Sgt. Hence, Peter Marcotte, and four personnel from the Health Department went to the site to recover the gauge. The gauge was transported to the Ramsey County Sheriff's Department in Peter Marcotte's vehicle. Apparently the person who recovered that gauge did not want his identity known.

Bisek spoke with Bill Breitenstein of the Health Department. Breitenstein said they had surveyed the gauge and recorded the following readings: 15 milliroentgens at the top of the gauge where the source rod goes into the gauge, 4 milliroentgens at the face, and 12 milliroentgens at the bottom of the gauge where the source rod extends through the base. He also said they surveyed the area where the gauge was recovered at the intersection of July and 122nd and measured normal background radiation. They also looked for the padlock in the area where the gauge was found, but did not find it.

Bisek also called Bill Reichhold that morning and informed Reichhold that the gauge had been recovered, where it was recovered, etc.

The gauge was recovered on May 25, 1988. Upon recovery, GEC immediately performed a visual survey of the gauge. The gauge was intact with no evidence of damage. GEC also performed a leak test that day. The results of the leak test indicated no leakage. Also, readings taken by the Minnesota Department of Health on May 25, 1988 and the NRC on June 10, 1988 indicate radioactive levels around the gauge itself were within tolerable limits.

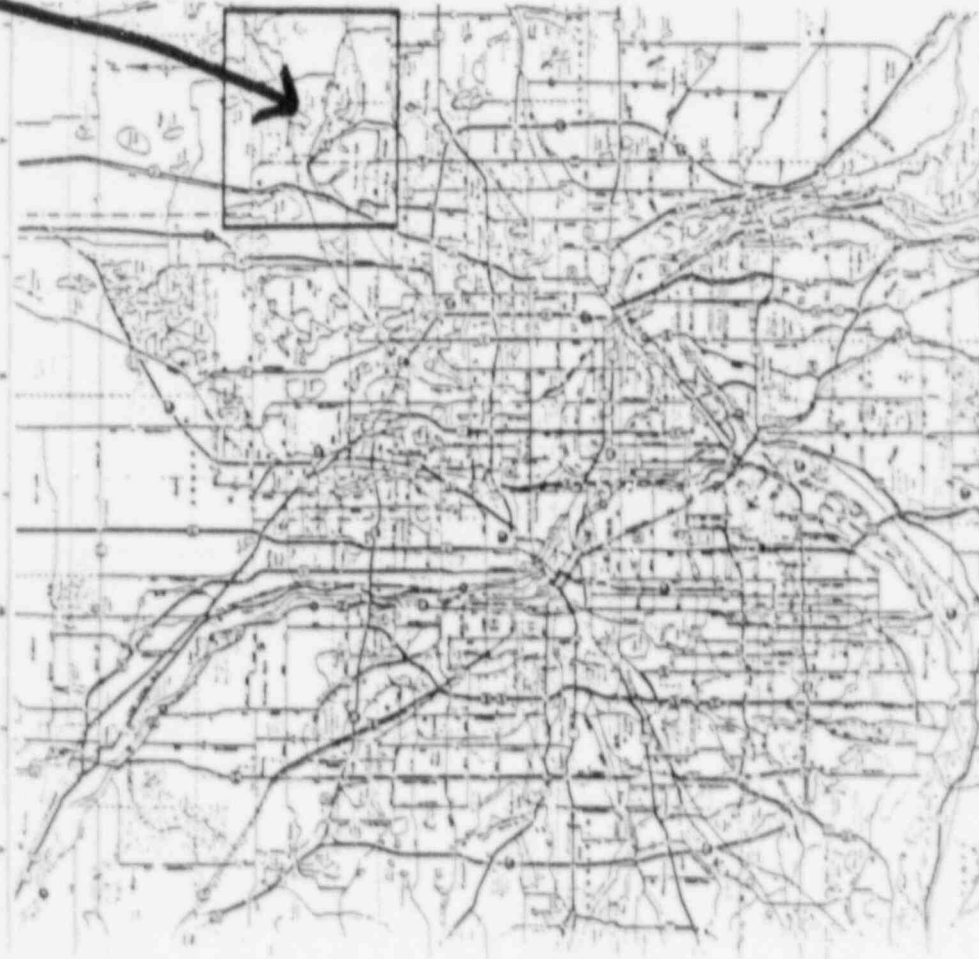
To our knowledge, no individuals were exposed to radiation during the recent incident. At the time the case and gauge were loaded into Roleff's vehicle, the source rod was locked in the safe position. It is our understanding that when the gauge was recovered, the source rod was still in the safe position.

Procedures/Methods Which GEC Will Adopt and Follow to Prevent a Recurrence
of the Recent Incident

- ° The Radiation Protection Officer will review with persons using and transporting gauges the proper way to secure the cased gauges to the transporting vehicle. This will include photographing gauges secured/locked into various transporting vehicles so in the event new people are added to the staff, etc., GEC has documentation of how the gauges are to be secured to various vehicles. GEC can show the photographs to the personnel to aid in training/instructing the correct way of securing the cases/gauges.
- ° The Radiation Protection Officer will have photographs of the nuclear density gauges and cases so in the event a gauge is lost or stolen, GEC has pictures readily available for media, searchers, etc.
- ° The Radiation Protection Officer will review previous memos with personnel using the gauges. Particular emphasis will be placed on the DOT requirement that the case with gauge must be secured against movement within the vehicle in which it is being transported under conditions normally incident to transportation. All persons transporting gauges have been given a copy of the booklet entitled "A Review of the Department of Transportation Regulations for Transportation of Radioactive Materials." (This booklet is a copy of the booklet that Bill Reichhold of the NRC provided to GEC to copy on June 10, 1988.)
- ° The Radiation Protection Officer will inform all personnel transporting radioactive cargo of the consequences of incidents/accidents involving radioactive cargo.
- ° GEC will develop a check list which will be posted on the nuclear gauge storage locker - and a copy will be included in the GEC Operations Manual - which will include the following items: has the source rod been locked; has the case been locked; is the case attached/secured to the vehicle in the proper manner; is the gauge calibration within tolerable limits; do you have the proper shipping papers for the gauge you are transporting; do you have an "emergency kit" in your vehicle; do you have the tools necessary to prepare the test site; etc.

- The Radiation Protection Officer will periodically review the methods used to secure the gauges to the vehicles and document his observations in the gauge log book.
- GEC has updated emergency numbers included in the manual that is transported with the gauges.
- The Radiation Protection Officer will maintain log book with notes and reports regarding the above matters.
- At least annually, the President and/or Corporate Safety Officer will review the log book and meet with the Radiation Protection Officer to review safety procedures.
- When using the pyramid transport case, all four latches will be secured with snap locks to prevent the locks from popping open when subjected to jolting forces.

METROPOLITAN ST PAUL - MINNEAPOLIS



Gauge Recovery Site



Piece of transport case found at this intersection

Construction Site



No Scale