

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 030-04873/90001(DRSS)

Docket No. 030-04873

License No. 21-08678-03

Priority V

Category K

Licensee: General Motors Corporation  
Central Foundry Division  
1629 North Washington  
Saginaw, MI 48601

Inspection Conducted: July 24 and 25, 1990

Enforcement Conference Conducted: August 16, 1990

Inspector:

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*August 23, 1990*  
Date

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*August 23, 1990*  
Date

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*August 23, 1990*  
Date

Inspection Summary

Inspection conducted on July 24 and 25, 1990, (Report No. 030-04873/90001(DRSS))  
Areas Inspected: This special, announced safety inspection was performed in response to the licensee's notification to the NRC that a 17 millicurie cesium-137 level gauge was lost. The inspection included a review of the circumstances surrounding the loss of the gauge, the search for the gauge and a review of General Motors Corporation's licensed program at the Saginaw Grey Iron Plant. The review of the licensed program included: inspection history; licensee's organization; loss of the cesium-137 gauge; internal audits; training and instruction to workers; posting and labelling; instrumentation;

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receipt and transfer of radioactive material; personnel monitoring-external; radiological dose assessments; leak tests; radioactive waste disposal; notifications and reports; and confirmatory measurements.

Results: Of the areas inspected, nine apparent violations of NRC requirements were identified:

1. Failure to secure a level gauge containing 17 millicuries of cesium-137, 10 CFR 20.207 (Section 5);
2. Removal of the cesium-137 gauge from its mounted position by unauthorized personnel, License Condition No. 14 (Section 5) (This is a repeat violation from the March 1984 inspection);
3. Failure to use a survey meter when the cesium-137 gauge was removed from its mounted position, License Condition No. 18 (Section 11);
4. Failure to post shut-off procedures for radioactive level gauges, License Condition No. 18 (Section 8);
5. Failure of melting superintendent and safety director to make unannounced inspections of level gauge sites to determine compliance, License Condition No. 18 (Section 6);
6. Failure to train employees, who come in contact with the level gauges, in safety procedures, License Condition No. 18 (Section 7);
7. Failure to perform a quarterly inspection of the 17 millicurie cesium-137 gauge from December 20, 1989 to May 12, 1990, License Condition No. 18 (Section 6);
8. Failure to label a 17 millicurie cesium-137 gauge with a durable, clearly visible label identifying the radioactive contents, 10 CFR 20.203(f) (Section 8); and
9. Failure to post a warning sign that reads "Caution Radiation Sources Must Be Shutoff Before Entering Cupola", License Condition No. 18 (Section 8).

In addition to the apparent violations, the inspector identified two areas of concern:

1. Insufficient management oversight and control of the radiation safety program; and
2. The RSO identified several violations of NRC requirements to plant supervisors and prompt, effective corrective actions were not taken by the supervisors. In addition, the RSO does not have the authority to require actions by supervisors to implement the radiation safety program.

## DETAILS

### 1. Persons Contacted

- +\*George B. Mauch, Plant Manager, Saginaw Grey Iron
- \*Steve J. Toyzan, Safety Director
- \*Joseph S. Toth, Superintendent-Plant Engineering
- \*Richard J. Crosson, Environmental Engineering
- \*David Kennedy, Personnel Director
- +\*William R. Harper, Radiation Safety Officer, Radiographer, Experimental Chemist and Physicist
- \*Robert Ayala, Senior Special Tester, Radiographer
- James Martin, Maintenance General Supervisor
- James Mendyk, Maintenance Supervisor
- Fidel Ramirez, Millwright/welder
- Donald Doshone, Millwright/welder
- Richard Wilczynski, Millwright/welder
- +William J. Newsted, Administrative Engineer
- +Don A. Schiemann, Attorney
- +Patrick Frazee, Manager, GM Industrial Hygiene

\*Indicates those present at exit meeting on July 24, 1990

+Indicates those present at the Enforcement Conference on August 16, 1990

### 2. Licensed Program

Currently, General Motors Corporation (GMC) uses nine fixed level gauges in its Grey Iron Plant in Saginaw, Michigan. This foundry makes engine blocks and cylinder heads for automobiles. The gauges are mounted on melting furnaces to measure the level of charge in the furnace. The gauges contain from 250 millicuries of cesium-137 to 1.5 curies of cesium-137 each.

Eight cesium-137 level gauges, one nickel-63 gas chromatograph detector cell and one carbon-14 dust monitor are in secure storage. Arrangements are being made for their return to their manufacturers.

The quantities, kinds and use of radioactive material are as authorized on the license.

No violations of NRC requirements were identified.

### 3. Inspection History

This license was last inspected in March 1984, however, the inspection was conducted at the Nodular Iron Plant only and did not include the Grey Iron Plant. At the time of the March 1984 inspection, the Nodular Iron Plant and the Grey Iron Plant were both listed on NRC License No. 21-08678-03 as authorized places of use of byproduct material. The Nodular Iron Plant was closed in 1987, the gauges were removed from the plant and the plant was removed from the license as an authorized place of use.

A special safety inspection was conducted at the Nodular Iron Plant on March 14 through 16, 1984 to review the alleged failure to close cesium-137 level gauges attached to cupolas, prior to entry of the cupola by employees to perform repairs. The allegation was substantiated and four violations were identified:

- a. Failure to lock-out cesium-137 gauges prior to entry into cupolas;
- b. Relocation of a cesium-137 gauge by unauthorized personnel;
- c. The named radiation safety officer (RSO) was not serving as RSO;
- d. Failure to post notices in accordance with 10 CFR 19.11.

A Notice Of Violation was sent to the Nodular Iron Plant Manager and was dated May 24, 1984, requiring a written response to the above violations. The licensee responded in a letter dated July 30, 1984 stating the following corrective actions:

- a. Responsibility for lock-out of gauges was given to the repair and maintenance foreman;
- b. The license was amended to authorize certain employees of the licensee to install, relocate and remove cesium-137 gauges;
- c. The license was amended to name a new RSO; and
- d. The Notice to Employees was posted.

#### 4. Organization

This NRC license is issued to the Central Foundry Division of the General Motors Corporation. The Central Foundry Division runs the management of the foundries including the Saginaw Grey Iron Plant. Within the Central Foundry Division is the Technical Services Group. A department of this group is the Product Engineering Department under which is the Administrative Engineer, the Supervisor Jobbing Floor and the Radiation Safety Officer (RSO) in that order of supervision.

The RSO is classified as an experimental chemist/physicist and is also the one full-time industrial radiographer for another General Motors Corporation license. The RSO is not part of the Grey Iron Plant organization.

The RSO stated that he does not have the authority or the organizational position to direct supervisors who oversee the use of the radioactive material in the Saginaw Grey Iron Plant. He stated he communicates directly with plant supervisors but that he must rely on their willingness to cooperate with him. He stated that he can and does



communicate with them formally through command channels (i.e., through his supervisor). However, he stated he has experienced frustration in his attempts to achieve compliance with the NRC regulations and GMC's license.

In examination of the RSO's statements, the inspector reviewed several memoranda from the RSO to his supervisor and/or to plant supervisors in which he informed them of problems and violations within the radiation safety program. This inspection revealed that two of the RSO's identified violations were not corrected in a complete and timely manner. The RSO identified lack of audits, and incomplete training. These areas are discussed in detail in this report and were identified as apparent violations by the NRC.

In conclusion, based on the RSO's statements, and review of his memoranda described above, the NRC is concerned that the authority of the Radiation Safety Officer appears to be inadequate to assure implementation of the radiation safety program at the Saginaw Grey Iron Plant.

In addition, the NRC is concerned about the numerous violations identified which indicate an apparent lack of management oversight and control of the radiation safety program.

Two areas of concern were identified.

No violations of NRC requirements were identified.

#### 5. Incident Summary and Radiation Protection Procedures

##### a. Description of the Licensed Material Lost:

The licensed material lost was a sealed source of 17 millicuries of cesium-137 contained in a level gauge. The gauge was an Ohmart Model SHRM strip source holder containing a Model A-5771 cesium-137 sealed source. It was purchased and installed by the licensee in 1969 and its activity was originally 20 millicuries. The gauge was mounted on the side of a chute in the briquette plant located within the Grey Iron Plant to measure the level of hot metal borings inside a briquette press. The briquettes are used as part of the iron charge in the foundry's furnaces. As of August 9, 1990, the gauge had not been found and most likely was melted as scrap metal.

##### b. Description of Circumstances Under Which Loss Occurred:

On or about January 9, 1990, the gauge was removed from its mounted position in order to provide clearance to install a new chute. The gauge was set on the floor with the shutter open. A supervisor closed the shutter about two hours later.

A millwright stated to the inspector that he and another worker removed the gauge in order to provide the necessary clearance to complete the installation of the new chute. The millwright stated

that he knew the gauge was radioactive and that he asked his supervisor about removing it. He stated that the supervisor okayed taking the unit down because it was not used anymore. He recalls he and the other millwright cut the gauge off of a support beam and lowered it onto the floor below. He stated that he wrote "radioactive unit" on the device and on a nearby surface in chalk. He estimated that he worked about three feet from the gauge during the cutting operation and that it took about half an hour. (Refer to Section 12 for worker radiation dose estimates.) When questioned about the removal work, he stated that at no time did he cut into or damage the gauge. The gauge was mounted on a support beam and it was the beam that was cut. He also stated that he had never removed or worked on a radioactive source before.

License Condition No. 14 states that installation, initial radiation survey, relocation or removal from service of devices containing sealed sources shall be performed by William R. Harper or Robert Ayala or by persons specifically licensed by the Commission or an Agreement State to perform such services. Based upon statements made by the millwright who removed the gauge, the inspector determined that on January 9, 1990, a device containing 17 millicuries of cesium-137, was removed from service by persons other than Messrs. Harper and Ayala, and the millwrights were not specifically licensed by the Commission or an Agreement State to perform such service. Removal of a device containing a sealed source by a person not authorized is an apparent violation of License Condition No. 14. This is a repeat violation from the previous NRC inspection.

c. Security of Licensed Material:

The personnel interviewed each stated that the gauge sat on the floor of the Briquette Plant for several days. One employee remembers placing the gauge on a hand cart and thinks it sat there for about 1 to 3 months. Two individuals recall seeing the source on a hand cart with pieces of scrap metal in the Briquette Plant. The licensee interviewed 42 employees trying to discover the course of events. No one recalls when or by whom the gauge was removed from the hand cart. The interviews revealed that the gauge was not readily identifiable and some confusion exists for some people on what it looked like. No one knows or has acknowledged that they know the final disposition of the gauge. Scrap metal pieces were routinely being removed from this area during the repair work. The gauge was not separated from other materials and was not secured.

10 CFR 20.207 (b) states that licensed material in an unrestricted area and not in storage shall be tended under the constant surveillance and immediate control of the licensee. As defined in 10 CFR 20.3(a)(17), an unrestricted area means any area to which access is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials.

The inspector determined, through interviews of employees, that beginning on or about January 9, 1990, a nuclear gauge containing 17 millicuries of cesium-137 was in an unrestricted area, was not in storage, and was not tended under the constant surveillance and immediate control of the licensee. Failure to maintain constant surveillance and immediate control of the gauge is an apparent violation of 10 CFR 20.207(b) and appears to be the direct cause of the loss of the gauge.

The millwright's supervisor stated that he did give the okay to remove the gauge even though he knew the gauges containing radioactive material were to be removed by the RSO. He stated that he made this decision because he knew the source was a "minor source" and did not present much hazard. He also stated he was familiar with the gauge and knew how to work the shutter. He stated that about two hours after he gave the okay, he returned and found the gauge laying on the floor. He stated that at this time he scraped the control lever clean and then closed the gauge shutter. This supervisor stated that he then informed his general supervisor the next day that the gauge was radioactive and that he should take care of it. He stated that he has never removed any other gauges. He does not know when or how the gauge disappeared from the floor area after it was removed from its mounting.

During an interview with the inspector, the general supervisor stated that he does not remember the supervisor telling him that the gauge was laying on the floor but he does recall someone else mentioned it to him a few days after the chute repair was completed. At that time, he questioned a millwright/welder about where the source had been placed. This millwright told him erroneously that the unit was not a source but was the old detector and that the source had been removed years before. The general supervisor stated he went to the area where the device was laying and did not recognize the unit as being the gauge with the radioactive source in it. He stated that he was convinced that the millwright was correct about the unit being only the detector. He stated that he did not pursue the matter any further.

Based on the information gathered from the supervisor, and the RSO, the inspector determined that the unit removed was in fact the cesium-137 sealed source and not just the detector. The supervisor stated that in 1985, when he worked for the Instrument Department, he personally removed the detector portion of the gauge. He stated the detector was nonfunctional due to the 170° to 180°F temperatures in the area. He recalled that there were plans to replace the detector but due to circumstances this was never completed. In addition to the supervisor's statements, the RSO stated that he examined the source during his six month leak tests and during his quarterly inspections. He stated that the gauge had a tag on it



identifying the radionuclide, the quantity and the serial number of the sealed source. In addition, the supervisor stated that he turned the gauge off after it was removed. A detector has no shutter control to turn off and on.

d. Discovery of the Loss of the Cesium-137 Gauge:

The RSO and the radiographer who assisted him, discovered the gauge was missing on Saturday, May 12, 1990, when they were performing the required six month leak tests of all sealed sources. After a preliminary investigation and limited search of the immediate area, the RSO notified his superiors and the NRC that the gauge was missing. The inspector reviewed the licensee's compliance with the reporting requirements of 10 CFR 20.402 "Reports of Theft or Loss of Licensed Material." The inspector determined through interviews and a review of records that the licensee reported the loss immediately upon discovery and filed a complete written report within 30 days as required by this regulation. The discovery of the loss was made on May 12, 1990 and the written report was received by the NRC on June 11, 1990.

e. The Search for the Gauge:

The licensee developed an action plan on Monday, May 14, 1990. The plan included gathering information about the gauge, investigating the circumstances of its loss, notifying employees and the public, and initiating searches at the plant and at two independent scrap dealers. The licensee conducted a search of an estimated 50 to 100 tons of scrap metal in the scrap pile from May 16, 1990 to June 1, 1990 using a rented crane. Searches were conducted of charge yards and the property fence line. All searches have failed to locate the gauge. The licensee developed a three-ring binder notebook documenting their actions and findings. This notebook has been incorporated into the NRC Region III file.

f. Probable Disposition of the Gauge:

The licensee believes the source was probably placed in the scrap metal pile and then melted in one of the cupolas to produce grey iron used in engine blocks and cylinder heads. The licensee stated in their report to the NRC that the cesium-137 and the lead from the gauge would have been vaporized in the 3000°F furnace. Some material could have dissolved into the melted iron and been cast into engine blocks. Their report stated that any vapors would be condensed and collected in the furnace's scrubber emission control system. The scrubber water is handled by the plant's waste water treatment system, and most particulates are collected in settling lagoons. The licensee estimated that the dilution rate would be



greater than 10 million to one. The licensee stated that, in conclusion, the 17 millicurie source would not present a hazard in either of these situations because of the small quantity of radioactive material and the large amount of dilution that would occur. An analysis of the molten metal by the licensee in an attempt to detect an increased lead concentration was negative. No radiological analyses were performed of these materials.

Two apparent violations of NRC requirements were identified.

6. Internal Audits

Condition No. 18 of the license requires that all licensed material be possessed and used in accordance with statements, representations and procedures contained in the referenced April 11, 1989 letter. This letter requires, in Section A, Item 2, that the chief metallurgist and the plant safety director make unannounced inspections of the level gauge sites to determine compliance with safety and emergency procedures, and license conditions, and to ensure safe operation of the gauges. The plant safety director stated to the inspector that he made random checks of safety procedures about once a year. He stated that during the checks, he looked for signs, observed the gauges, and he discussed general safety procedures with supervisors, millwrights and electricians. He stated his checks were for all plant industrial safety items and did include the gauges on cupolas since they are a safety concern. However, the inspection revealed that no inspections of the level gauge sites were conducted from the inception of the requirement on May 31, 1989, through Jul. 21, 1990 by the chief metallurgist/welting superintendent or the plant safety director. Failure to make inspections to determine compliance with license conditions is an apparent violation of License Condition No. 18.

The RSO identified lack of inspections by the chief metallurgist and the safety director as a violation. In a memorandum dated May 11, 1990, to the chief metallurgist, (with copies sent to the safety director, the melting department supervisor, the superintendent of maintenance, and the RSO's supervisor) the RSO wrote that the Saginaw Grey Iron Plant was not following procedures which state management will set up records and conduct inspections of gauge level sites. No actions were taken as a result of this memorandum until the RSO and the safety director performed a complete inspection on July 21, 1990, several days before the NRC inspection. As a result of that inspection, actions were initiated to get the required signs posted. The failure of plant supervisory personnel to respond to the RSO's memorandum that a violation existed is of concern to the NRC as noted in Section 4.

In addition to the requirement for the chief metallurgist and the safety director to perform inspections, License Condition No. 18 requires in the referenced letter dated April 11, 1989, Section A, that the Radiation

Safety Officer conduct a quarterly inspection to assure the use of licensed material is in accordance with the license, Nuclear Regulatory Commission regulations, and operating and emergency procedures and to perform a maintenance check of level gauges.

During interviews with the RSO, the inspector determined, based on his statements and a review of quarterly inspection records, that the RSO failed to conduct a quarterly inspection of the cesium-137 level gauge located in the Briquette Plant from December 20, 1989 to May 12, 1990. Failure to conduct a quarterly inspection to assure the use of licensed material is in accordance with the license and regulations is an apparent violation of License Condition No. 18. A review of the audit records showed that gauge audits were conducted quarterly from March 1986 through March 1990, with the one exception of the 17 millicurie gauge in March 1990. The RSO stated that this gauge was not audited in March 1990 because he and the radiographer who assisted him spent the entire day on March 29, 1990 (their audit day) removing and storing eight cesium-137 gauges and one carbon-14 detector that were not being used. He stated they did not take time to check the one gauge because they were extremely busy that day. Had the RSO conducted the required audit on a timely basis, he would have discovered the gauge was missing two months earlier. This may have increased the chances of locating it.

Two apparent violations of NRC requirements were identified.

7. Training and Instruction to Workers

License Condition No. 18 states that the licensee shall conduct its program in accordance with statements contained in the referenced letter dated April 11, 1989. Item 8 of the letter requires that all maintenance employees and salaried personnel assigned to the Melting Department who may come in contact with the cesium-137 fixed level gauges will be instructed in the following:

- a. location of all cesium-137 level gauges;
- b. operations for shutting off level gauges;
- c. physical appearance of the different model gauges;
- d. procedures for verifying gauges are in the off position before entering cupolas; and
- e. emergency procedures and notifications.

The two millwrights who removed the gauge are maintenance employees. Each stated to the inspector, that he had not received training on the gauges. One maintenance general supervisor who was responsible for the Briquette Plant stated that he was not aware that a nuclear gauge was located in that plant and that he had not received training on the gauges nor had he provided training to his maintenance employees who could come into contact with the gauges. The inspector reviewed the licensee's Safe

Operating Procedures for maintenance employees. These safety procedures are reviewed with all maintenance employees every three months. Records are maintained of employees in attendance. A review of the procedures and records revealed that safety instructions regarding the nuclear gauges were not added until June 15, 1990. These new procedures were reviewed with all maintenance employees on July 18 and 19, 1990. However, these new procedures are incomplete in that they do not train maintenance employees, who may come into contact with the nuclear gauges, in the physical appearance of the different model gauges, on the operations for shutting off level gauges, and on the procedures to verify that the gauges are in the off position prior to entering cupolas. Failure to train maintenance personnel who may come into contact with nuclear gauges on the topics described in the license is an apparent violation of License Condition No. 18.

The RSO stated that during his quarterly inspections of the gauges, he questioned personnel about their knowledge of safety procedures. He stated that some personnel working near the gauges were adequately knowledgeable and some were not. He stated that it was his assessment that the training of personnel was lacking and that he has discussed this with the chief metallurgist, the safety director and his own supervisor. A review of the RSO's quarterly audit records showed that on two occasions he mentioned the need to improve training. In memoranda dated November 18, 1989, and May 11, 1990, to the involved supervisors, the RSO recommended more safety talks and stated that he needed copies of the discussions to keep on file for NRC inspections. The RSO stated that he received one record from the safety director that showed Melting Department personnel received minimal training on May 31, 1989. This training did not include maintenance personnel. He stated that he received no response from the other individuals as to what, if any, training was given to maintenance personnel or about any plans to improve training. The apparent lack of response by supervisors to the RSO's recommendation for more training is another example of the NRC's concern regarding the lack of authority of the RSO as discussed in Section 4.

One apparent violation of NRC requirements was identified.

8. Posting and Labelling

10 CFR 20.203(f)(1) states that except as provided in paragraph (f)(3) of this section, each container of licensed material shall bear a durable, clearly visible label identifying the radioactive contents. 10 CFR 20.203(f)(2) states that a label required pursuant to paragraph (f)(1) of this section shall bear the radiation caution symbol and the words "Caution, Radioactive Material" or "Danger, Radioactive Material". From an unknown date through the date of its loss, a level gauge containing 17 millicuries of cesium-137 (which was not excepted as provided in paragraph (f)(3)), previously used in the Briquette Plant did not bear a durable, clearly visible label showing



the radiation caution symbol and showing the words "Caution, Radioactive Material" or "Danger Radioactive Material". Failure of the licensee to maintain a clearly visible label on the cesium-137 gauge is an apparent violation of 10 CFR 20.203(f)(1).

The inspector interviewed four persons who were directly involved in the removal of the cesium-137 gauge and all four stated that they did not see a sign on the gauge identifying it as radioactive. However, the RSO stated that the gauge did have a tag on it that identified it as radioactive and that he read the tag during his quarterly audits. He also stated that the gauge was in a very harsh and dirty environment which required the tag to be cleaned to make it clearly legible. Apparently, at the time the gauge was removed, the tag was sufficiently dirty to obscure the radiation caution symbol and the words "Caution, Radioactive Material".

The RSO stated that he inspected the legibility of all "Caution, Radioactive" signs on each gauge during his quarterly inspections. A review of his inspection results showed that on November 18, 1989, he wrote a memorandum to the chief metallurgist with copies to other supervisors including the safety director stating that all level gauges needed new signs. The RSO stated to the inspector that the gauges on the cupolas did receive new signs. They were of a larger size and were hung on the gauge by a chain and were very clearly visible. However, a new sign was not installed on the 17 millicurie cesium-137 gauge mounted in the Briquette Plant. This gauge was overlooked.

During the inspection, the inspector observed several gauges mounted on cupolas and in storage and all were clearly labelled as required.

License Condition No. 18 references the procedures contained in the letter dated April 11, 1989, which requires in Item 10.5 that the shut off procedures of the cesium-137 gauges be posted so all personnel may read and refer to them. The RSO stated that these procedures were never posted and that he did not remember that the requirement was in the license. He stated that he believes that it would be very difficult to implement this requirement because signs and procedures in the foundry are frequently removed or defaced. He stated the environment is such that posting the procedures would not be effective. The inspection revealed that from the inception of the requirement on May 31, 1989 through July 25, 1990, the licensee failed to post shut-off procedures for the nuclear gauges. Failure to post the shut-off procedures so all personnel could read and refer to them is an apparent violation of License Condition No. 18.

The letter dated April 11, 1989, also requires in Section B, Item 4.B., entitled "Warning Signs", that signs be attached at the location of each cesium-137 level gauge stating "Caution Radiation Sources Must Be Shutoff Before Entering Cupola". The RSO and the safety director stated that these signs had never been installed on the cupolas in the Saginaw Grey Iron Plant. Based on these statements, the inspector

determined that from the inception of the requirement on May 31, 1989, through July 25, 1990, the warning signs were not attached at the location of the cesium-137 level gauges. Failure to post signs stating "Caution Radiation Sources Must Be Shutoff Before Entering Cupola" is an apparent violation of License Condition No. 18.

The RSO stated that he knew the signs were to be posted and had planned to have the signs made but had never gotten the work done because he had to get other persons not under his authority to do the work. He stated that he believes that he talked to the safety director about the signs and that after the source was lost he really started "pushing" to get them made.

On August 1, 1990, the safety director stated to the inspector that he knew about the license requirement to post the caution signs because he and the RSO had discussed the signs. The safety director indicated that he was involved in drafting the application for the license renewal which contained these procedures. The safety director stated that he was not aware of the license requirement to post the shut-off procedures so all personnel could read and refer to them. The safety director stated to the inspector on August 9, 1990, that the signs were now installed as required.

Three apparent violations of NRC requirements were identified.

9. Instrumentation

The survey instruments used by the licensee during the search for the missing gauge were four G-M type meters and one scintillation detector. A review of the licensee's records showed that the RSO calibrated the G-M meters every three months in accordance with the industrial radiography program requirements. The Ludlum Model 12 scintillation detector was obtained on a temporary basis from the manufacturer and has been calibrated within the last year.

No violations of NRC requirements were identified.

10. Receipt and Transfer of Radioactive Material

The licensee has established written procedures for receipt of radioactive materials in packages. However, no radioactive materials have been obtained under this license since before the last inspection in 1984.

The RSO transferred several gauges back to their manufacturer on August 8, 1988 and on April 4, 1989. Transfers are in accordance with 10 CFR 30.41. Records of transfer are maintained as required by 10 CFR 30.51 and were reviewed by the NRC inspector.

No violations of NRC requirements were identified.



## 11. Personnel Radiation Protection - External

License Condition No. 18 requires that the licensee conduct its program in accordance with statements contained in the referenced letter dated April 11, 1989. Item 10.3 of the letter requires that radiation survey meters be used when removal or relocation of sources is done. Based on information obtained from licensee representatives, the inspector determined that survey meters were not used by the two millwright/welders or their supervisor when the gauge was removed. These individuals did not have access to survey meters nor had they received any training to use them. Failure to use survey meters when the gauge was removed is an apparent violation of License Condition No. 18. Had proper surveys been performed, the supervisor or the workers may have been alerted to the fact that the gauge was in the "open" or "on" position before they began work. If the gauge had been closed prior to their work, their personnel radiation exposures would have been reduced.

The licensee provided radiation workers, (i.e., the RSO and the radiographer who assisted him) with appropriate personnel dosimetry which is supplied by a NRC approved vendor. A review of film badge records from April 1989 to June 1990 showed that exposures to these radiation workers were minimal and well below the limits set forth in 10 CFR Part 20.

One apparent violation of NRC requirements was identified.

## 12. Radiological Dose Assessment

The licensee performed a radiological dose assessment of the removal of the gauge and estimated the workers may have received about 6.5 millirem whole body dose. The inspector also performed an assessment. This assessment was based on the data obtained from the interviews described in Section 5.B. and using the gamma ray constant for cesium-137 of .33 mr/hr per millicurie at one meter. The worker removing the gauge estimated that the work took about half an hour at about 3 feet from the source. Based on this data, it is estimated that the workers could have received approximately 3 millirem during the half hour of work. This dose is based on the conservative assumption that the 17 millicurie source was unshielded (shutter open) and that the workers were directly in the beam during the entire half hour. With a dose rate of 6 millirem per hour, workers could have remained 3 feet from the source for about 84 hours before reaching or exceeding 500 millirem annual whole body dose (recommended dose limit for members of the general public, i.e., non-radiation workers). The work involved did not require this length of time to complete. Assuming, as a conservative assessment, that the worker's hands were approximately six inches from the unshielded source for half an hour, he could have received approximately 122 millirem to his hands. For purposes of comparison, this dose is well below the NRC limits for radiation worker extremities, which is 18,750 millirem per calendar quarter.



No violations of NRC requirements were identified.

13. Leak Tests

The inspector reviewed leak test records for all sealed sources possessed by the licensee. The records indicated that sealed sources have been leak tested every six months as required from May 1984 to June 13, 1990. Test samples are sent to, and analyzed by, General Motors Corporation, Industrial Hygiene Department located at the Technical Center in Warren, Michigan. All leak test results were less than 0.005 microcuries of removable contamination.

No violations of NRC requirements were identified.

14. Radioactive Waste Disposal

The licensee does not dispose of radioactive waste. All radioactive sources are returned to their manufacturers as described in Section 10.

No violations of NRC requirements were identified.

15. Confirmatory Radiation Surveys

Radiation measurements made by the NRC inspector showed radiation levels in unrestricted areas to be well below 10 CFR Part 20 limits. Ambient radiation levels in restricted areas were no greater than 2 mr/hr.

No violations of NRC requirements were identified.

16. Exit Meeting

On July 24, 1990, the inspector met with those individuals identified in Section 1 of this report. The inspector discussed the areas inspected, the apparent violations, the NRC enforcement policy, and possible escalated enforcement actions available to the NRC. The licensee indicated that no information discussed in the report is proprietary in nature.

17. Enforcement Conference

An enforcement conference was held in the NRC Region III office on August 16, 1990 with the General Motors Corporation staff members identified in Section 1 of this report. The conference included a discussion of (1) the apparent violations, their significance and causes, (2) two areas of concern about the licensee's radiation safety program, (3) the licensee's corrective actions, and (4) the NRC Enforcement Policy and enforcement options available to the NRC.

In summary, the licensee addressed the violations and acknowledged the facts were accurate as presented. However, they disagreed that the violation regarding unauthorized personnel removing gauges was a repeat violation. They stated that the violation that occurred in 1984 was very

different from the current violation. In 1984 a qualified but unauthorized person removed a gauge and all safety procedures were followed which the licensee argued, was very different from the current situation where an unqualified person removed the gauge and safety procedures were not followed. Despite the licensee's arguments, the Region III staff maintains that this was a repeat violation.

The licensee also addressed the two areas of concern and acknowledged the lack of management control. However, regarding the second concern (the RSO identified violations and no effective corrective actions were taken) they provided evidence that showed that some actions were taken to correct the violations. However, they agreed these actions were not complete nor comprehensive.

The licensee addressed the actions that have been taken and that will be taken to correct the violations and concerns and to prevent their recurrence. These actions include incorporating the radiation safety officer position into the Saginaw Grey Iron Plant organization. The RSO will now report directly to the superintendent of the Engineering Department. In addition, responsibility for control of the radiation safety program has been assigned to the Engineering Department because of their extensive experience in handling regulatory compliance issues. In addition, the licensee has developed an improved training and audit program to assure compliance with license requirements. Attached to this report are copies of slides presented by the licensee during the Enforcement Conference.

Attachment: Slides from Licensee's  
Presentation at the August 16,  
1990, Enforcement Conference

SEQUENCE OF EVENTS

SATURDAY, MAY 12, 1990:

BRIQUETTE PLANT LEVEL GAUGE WAS DETERMINED TO BE MISSING DURING THE SEMI-ANNUAL WIPE TEST.

THE NRC WAS NOTIFIED AT 3:52 P.M. OF THE MISSING LEVEL GAUGE.

VISUAL SEARCH OF THE PREMISES WAS COMPLETED.

APPROPRIATE CENTRAL FOUNDRY DIVISION PEOPLE WERE NOTIFIED.

MONDAY, MAY 14, 1990:

ACTION LIST WAS ESTABLISHED TO SET RESPONSIBILITY FOR THE CONTINUED SEARCH, NOTIFICATION OF THE WORK FORCE, AND A COMMUNICATION FOR THE MEDIA.

WEDNESDAY, MAY 16, 1990:

SEARCH OF THE SCRAP PILE WAS STARTED.

FRIDAY, MAY 18, 1990:

THE ITEMS ON THE ACTION LIST WERE COMPLETED WITH THE EXCEPTION OF SCRAP PILE SEARCH.

FRIDAY, JUNE 1, 1990:

THE SEARCH OF THE SCRAP PILE WAS COMPLETED.



ALLEGED VIOLATIONS:

1. FAILURE TO SECURE A LEVEL GAUGE CONTAINING 17 MILLICURIE CESIUM-137, 10 CFR 20.207.
2. REMOVAL OF THE CESIUM-137 GAUGE FROM ITS MOUNTED POSITION BY UNAUTHORIZED PERSONNEL, LICENSE CONDITION NO. 14. THIS IS A REPEAT VIOLATION FROM THE MARCH, 1984, INSPECTION.
3. FAILURE TO USE A SURVEY METER WHEN THE CESIUM-137 GAUGE WAS REMOVED FROM ITS MOUNTED POSITION, LICENSE CONDITION NO. 18, LETTER DATED APRIL 11, 1989, ITEM 10.3.
8. FAILURE TO LABEL A 17 MILLICURIE CESIUM-137 GAUGE WITH A DURABLE, CLEARLY VISIBLE LABEL IDENTIFYING THE RADIOACTIVE CONTENTS, 10 CFR 20.203(F).

CAUSE:

FAILED TO FOLLOW PROCEDURE IN NRC LICENSE 21-08678-03.

CORRECTIVE ACTION:

THE BRIQUETTE PLANT SOURCE WILL NOT BE REPLACED.

ALLEGED VIOLATION:

4. FAILURE TO POST SHUT-OFF PROCEDURES FOR RADIOACTIVE LEVEL GAUGES, LICENSE CONDITION NO. 18, LETTER DATED APRIL 11, 1989, ITEM 10.5.

CAUSE:

ALTHOUGH SAFE OPERATING PROCEDURES NOS. 3211-11, 3211-39, AND 3211-6 WERE POSTED IN THE MELTING AREA OFFICES AND REVIEWED WITH THE HOURLY PERSONNEL ONCE PER YEAR, ADDITIONAL ACTIONS WILL BE TAKEN TO STRENGTHEN THE SYSTEM.

CORRECTIVE ACTION:

DEVELOPED GENERAL PLANT PROCEDURE B-25 AND TRAINING MANUAL.

RADIATION SAFETY OFFICER OR SAFETY SUPERVISOR WILL INSTRUCT ALL MELTING AND MAINTENANCE SUPERVISION ON PROCEDURE B-25 BY AUGUST 31, 1990.

MELTING AND MAINTENANCE SUPERVISION WILL INSTRUCT THEIR HOURLY PERSONNEL ON PROCEDURE B-25 DURING THE MONTH OF SEPTEMBER, 1990, AND ONCE PER YEAR THEREAFTER.

ALLEGED VIOLATION:

5. FAILURE OF MELTING SUPERINTENDENT AND SAFETY DIRECTOR TO MAKE UNANNOUNCED INSPECTIONS OF LEVEL GAUGE SITES TO DETERMINE COMPLIANCE, LICENSE CONDITION NO. 18, LETTER DATED APRIL 11, 1989, SECTION A, ITEM 2.

CAUSE:

FAILED TO FOLLOW PROCEDURE IN NRC LICENSE 21-08678-03.

CORRECTIVE ACTION:

A LETTER DATED 1-12-89 IS ON FILE VERIFYING THAT AN AUDIT WAS DONE BY THE MELTING GENERAL SUPERVISOR.

ALTHOUGH THE SAFETY DIRECTOR ROUTINELY MAKES AREA SAFETY INSPECTIONS, INCLUDING ITEMS SUCH AS THE LEVEL GAUGES, ADDITIONAL ACTIONS WILL BE TAKEN TO STRENGTHEN THE SYSTEM.

ONCE PER YEAR, PREVENTATIVE MAINTENANCE CARDS WILL BE SENT TO THE PLANT SAFETY DEPARTMENT AND THE MELTING SUPERINTENDENT TO CONDUCT AN AUDIT. UPON COMPLETION OF THE AUDIT, CARDS WILL BE RETURNED TO MAINTENANCE AND RETAINED FOR TWO YEARS.



ALLEGED VIOLATION:

6. FAILURE TO TRAIN EMPLOYEES IN SAFETY PROCEDURES WHO COME IN CONTACT WITH THE LEVEL GAUGES, LICENSE CONDITION NO. 18, LETTER DATED APRIL 11, 1989, ITEM 8.

CAUSE:

DID NOT HAVE A THOROUGH TRAINING PROGRAM.

CORRECTIVE ACTION:

TRAINING OF ALL MELTING AND MAINTENANCE PERSONNEL ON PLANT PROCEDURE B-25 IN AUGUST AND SEPTEMBER, 1990, AND ONCE PER YEAR THEREAFTER.

ALLEGED VIOLATION:

7. FAILURE TO PERFORM A QUARTERLY INSPECTION OF THE 17 MILLICURIE CESIUM-137 GAUGE FROM DECEMBER 20, 1989, TO MAY 12, 1990, LICENSE CONDITION NO. 18, LETTER DATED APRIL 11, 1989, SECTION A.

CAUSE:

FAILED TO FOLLOW PROCEDURE IN NRC LICENSE 21-08678-03.

CORRECTIVE ACTION:

A QUARTERLY PREVENTATIVE MAINTENANCE CARD WILL BE SENT TO THE RADIATION OFFICER TO CONDUCT AN AUDIT. UPON COMPLETION OF THE AUDIT, CARDS WILL BE RETURNED TO MAINTENANCE AND RETAINED FOR TWO YEARS.

ALLEGED VIOLATION:

9. FAILURE TO POST A WARNING SIGN THAT READS:  
"CAUTION. RADIATION SOURCES MUST BE SHUT OFF  
BEFORE ENTERING CUPOLA", LICENSE CONDITION NO. 18,  
LETTER DATED APRIL 11, 1989, SECTION B, ITEM 4.3.

CAUSE:

FAILED TO FOLLOW PROCEDURE IN NRC LICENSE 21-08678-03.

CORRECTIVE ACTION:

SIGNS HAVE BEEN INSTALLED ON B, C, D, K, AND L CUPOLAS'  
SERVICE CAGES.

JPN JST/8-14-90



IN ADDITION TO THE ALLEGED VIOLATIONS, THE INSPECTOR IDENTIFIED TWO AREAS OF CONCERN:

ITEM:

1. INSUFFICIENT MANAGEMENT OVERSIGHT AND CONTROL OF THE RADIATION SAFETY PROGRAM.

RESPONSE:

PROPER REMOVAL OF LEVEL GAUGES WAS COMPLETED ON B CUPOLA ON 2-5-90 AND ON A, E, G, AND M CUPOLAS ON 3-29-90 AND 3-30-90.

THE LEVEL GAUGES ON B CUPOLA WERE ALSO PROPERLY REINSTALLED ON 3-29-90 DURING THE CUPOLA SHELL REPLACEMENT.

DOCUMENTATION IS AVAILABLE SHOWING ACTIONS TAKEN ON LETTERS WRITTEN BY BILL HARPER ON HIS AUDITS.

THE MANAGEMENT PLANT LEVEL RESPONSIBILITY OF THE CONTROL OF THE RADIATION SAFETY PROGRAM IS BEING ASSIGNED TO THE SAGINAW GREY IRON PLANT ENGINEERING DEPARTMENT.

AREAS OF CONCERN:

ITEM:

2. THE RADIATION SAFETY OFFICER IDENTIFIED TWO VIOLATIONS (VIOLATIONS 6 AND 8) TO SUPERVISORS PRIOR TO THE INSPECTION, AND NO EFFECTIVE CORRECTIVE ACTIONS WERE TAKEN.

RESPONSE:

ITEM #6:

ADDITIONAL DOCUMENTATION HAS BEEN OBTAINED THAT VERIFIES REVIEWS OF SAFE OPERATING PROCEDURES WERE CONDUCTED 2-28-90 ON S.O.P. 3211-11 AND 3-31-90 ON S.O.P. 3211-6. THESE SAFE OPERATING PROCEDURES INSTRUCT ON THE REQUIREMENT TO CLOSE OR DEACTIVATE THE LEVEL GAUGES BEFORE ENTERING THE CUPOLAS.

ITEM #8:

CLEARLY VISIBLE LABELS IDENTIFYING THE RADIOACTIVE CONTENTS WERE POSTED IN THE BRIQUETTE PLANT. THE HEAT AND FUMES IN THE AREA OF THE LEVEL GAUGE ABOVE THE HOT BRIQUETTING MACHINE CAUSED THE SIGNS TO BECOME ILLEGIBLE. THE LABELS HAVE NOT BEEN REPLACED, BECAUSE THE LEVEL GAUGE HAS NOT BEEN REPLACED.

IN THE FUTURE, COPIES OF THE RADIATION SAFETY OFFICER'S LETTERS WILL BE SENT TO THE SAGINAW GREY IRON PLANT PERSONNEL DIRECTOR, SAFETY DIRECTOR, AND SUPERINTENDENT OF PLANT ENGINEERING DEPARTMENT.