

Completeness of INL Chemical Processing Plant (CPP) Badges for SEC Class Definition

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Introduction

During the Advisory Board on Radiation and Worker Health (ABRWH) meeting in March 2015, several board members questioned the completeness of the dosimetry badge records to be used to identify Chemical Processing Plant (CPP) workers for inclusion in the Special Exposure Cohort (SEC) class. The proposed SEC class definition distinguishes workers for inclusion in the class based on the use of external dosimetry. Specifically, workers who (a) were monitored for external radiation at CPP with an least one film badge or TLD between January 1, 1963 and February 28, 1970 or (b) were monitored for external radiation at INL with at least one film badge or TLD between March 1, 1970 and December 31, 1974 for an aggregate of at least 250 work days. Because the class definition relies on external radiation monitoring records it is essential that the external dosimetry records are complete. NIOSH committed to evaluate the completeness of the records by comparing the total number of badges listed on CPP dosimetry records with the total number of badges listed as processed on the monthly Dosimetry Branch Activity Reports that were routinely provided to management and the Atomic Energy Commission (AEC).

During this evaluation, several additional issues were identified and resolved. The first issue was that construction trades workers at CPP were listed under a separate location designation (CX) from 1964 through 1970 although the physical location was still at CPP. As a result these records were also reviewed, the results totaled, and compared to the monthly reports which listed the number of CX dosimeters separate from CPP.

At an INL Work Group meeting on November 10, 2015, the CPP and CX dosimetry comparisons were presented and both illustrated excellent agreement between the CPP dosimetry records and the monthly Dosimetry Branch Activity Reports. At this time a new issue was raised about the completeness of the subcontractor records who were not routinely badged but listed on visitor or temporary badge reports. The issue stemmed from the following excerpt from IN-12056, A General Summary of Personnel Monitoring Systems Utilized at the National Reactor Test Site.

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If a visitor film indicates an exposure was received, this individual becomes a matter of record. The master index is checked for the presence of an assigned health physics number; if found, the necessary cards are prepared using this number and the data appears on the following regular report for the area concerned, and the exposure is added to the individual's NRTS total. If no number is found, a number is assigned to the individual and the above records prepared. Approximately 98% of the visitors receive statistically zero exposures and these data appear only on the visitor list prepared at the time of the badge servicing. These lists are retained indefinitely, as well as the film, in case any question should arise at a later date.

Figure 1: Excerpt from IN-12056 (1966) pertaining to dosimetry record keeping (SRDB 08130, page 25).

NIOSH committed to evaluating the completeness of the monitoring records, although it was pointed out that the monthly Dosimetry Activity Branch Reports available at that time only extended through 1965 so a full comparison of all years might not be possible.

In January 2016, during a follow-up data review and capture to address three open cases from the review of 881 INL claims for CPP dosimetry, NIOSH discovered that the temporary badge reports at INL were not complete after 1967 because of a practice to not include non-positive readings from visitor (temporary) badges into the worker's dosimetry records. However, the original badge inserts and results had been retained and archived. NIOSH identified the pertinent CPP visitor badge cards and scanned them during that data capture. NIOSH also met with Department of Energy Idaho Operations Office (DOE-ID) personnel and informed them that not all of the dosimetry monitoring records were being reported in current claims due to this discovery. DOE-ID committed to scanning and indexing all of the visitor cards as well as the temporary badge reports.

In March 2016, SC&A and NIOSH conducted a joint data review and capture effort. During this review, monthly Dosimetry Branch Activity reports from 1965 through 1974 were located and captured. These reports were the "missing reports" identified above that enable NIOSH to evaluate the completeness of the visitor or temporary badge reports.

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Methodology

The goal of this white paper is to address the completeness of the dosimetry records to be used to identify workers at CPP for the proposed SEC class definition. There are three important types of dosimetry records that are used to place various types of workers at CPP. The main CPP dosimetry reports, which list primarily operations workers (but construction workers are included for some years), utilized the area codes 05, 53, and 55. The CPP construction area was known and designated by the INL Dosimetry Branch as CX and utilized the area codes 11, 113, and 115. The third group of dosimetry records are the visitors and temporary badge reports. These do not have a numerical code designation; however, the area was listed as either CPP or CX on the temporary badge report or the visitor card itself.

In this evaluation NIOSH and the ORAU Team tallied the number of workers listed on the temporary badge reports and visitor cards by month for the years 1963 through 1970. These totals were compared to the total number of temporary dosimeters reported as having been processed on the corresponding monthly Dosimetry Branch Activity Reports. The monthly Dosimetry Branch Activity Reports were compiled each month to serve a summary document to senior management on the volume of work the Dosimetry Branch was conducting. The reports contained data on the total number of workers monitored by month, number of workers within reported dose ranges, total number of workers by area, and total number of temporary badges by area. These reports are considered a reasonably accurate baseline as they were written at the time of dosimetry processing. These reports were also used to benchmark the costs of dosimeter processing for budget planning purposes for each subsequent year.

Results

In this section a series of plots is presented to demonstrate the comparison results of not only temporary badges at CPP but also CPP area dosimetry, CPP area TLDs, and CX area dosimetry to the data in the monthly Dosimetry Branch Activity Reports to provide an overall perspective on the completeness of all forms of dosimetry at CPP between 1963 and 1970. Figure 2 provides the month by month comparison of the main CPP dosimetry records to the monthly report totals. Figure 3 provides the month by month comparison of CPP TLDs to the monthly report totals. Figure 4 provides the month by month comparison of the CPP construction worker (CX) dosimetry records to the monthly report totals. Please note that the CX dosimetry area code was not used from 1963 through April 1964. Figure 5 provides the month by month comparison of the CPP temporary badges to the monthly report totals.

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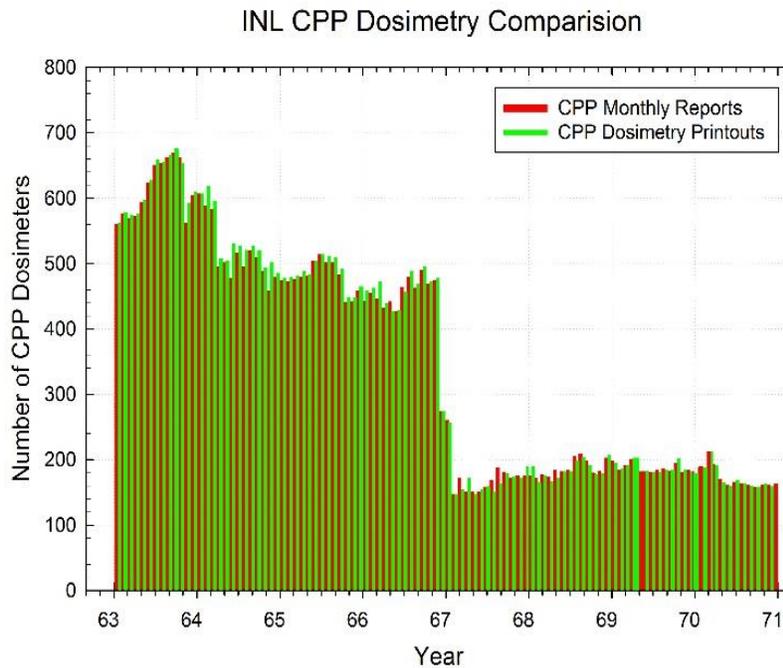


Figure 2: Comparison of CPP Area Dosimetry Reports to monthly Dosimetry Branch Activity Reports

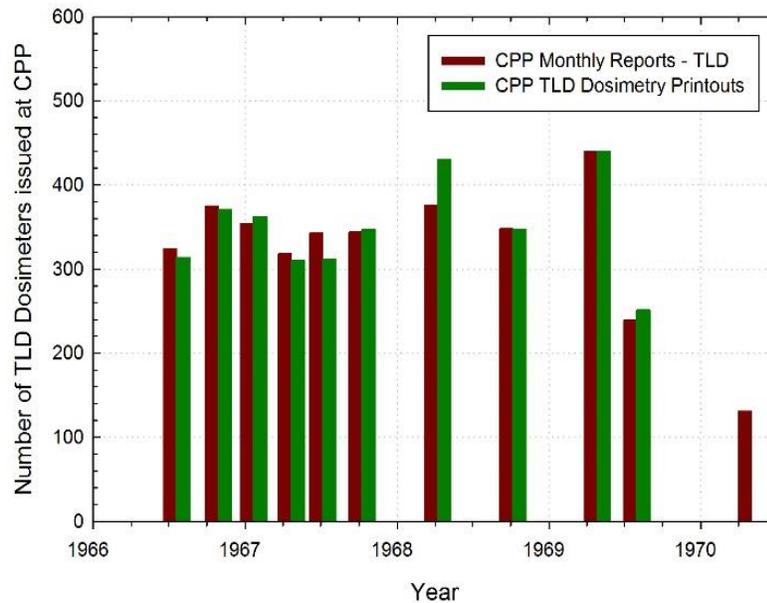


Figure 3: Comparison of CPP Area TLD Reports to monthly Dosimetry Branch Activity Reports

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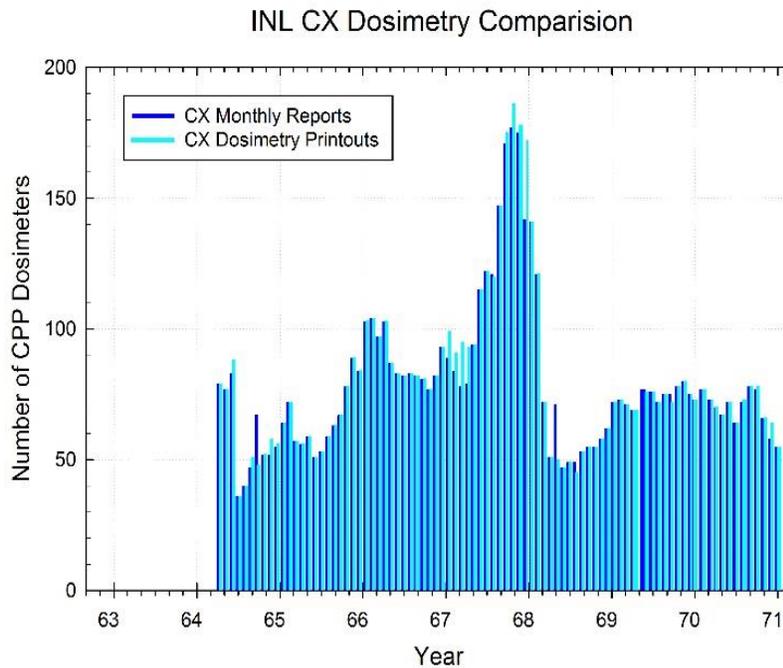


Figure 4: Comparison of CX Dosimetry Reports to monthly Dosimetry Branch Activity Reports

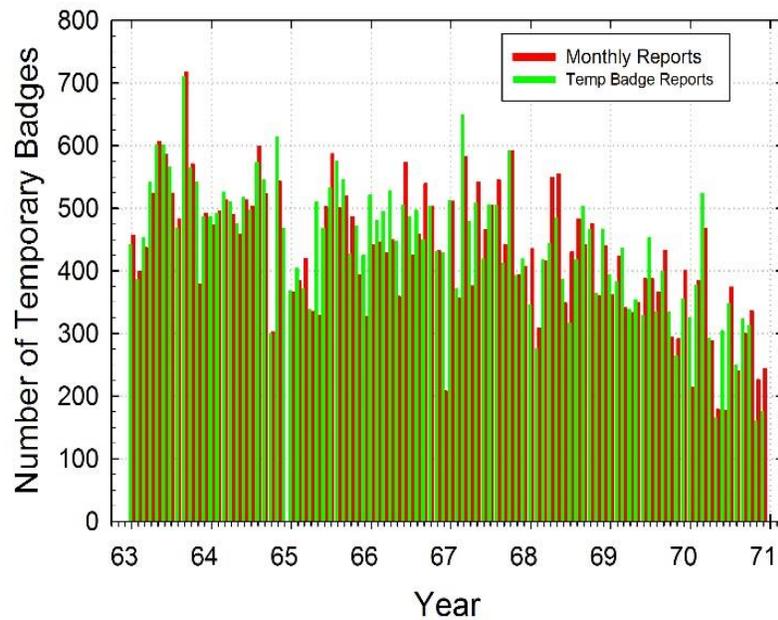


Figure 5: Comparison of CPP temporary badges to monthly Dosimetry Branch Activity Reports

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There are small monthly variations between the dosimetry reports and the Dosimetry Branch Activity Reports. The primary reason for this is believed to be either dosimeters being returned after the dedicated wear period or that dosimeters were not processed in time to be included in the monthly reports. One other confounding problem with the temporary badges is that, as previously discussed, the temporary badge reports after 1967 were not complete. Because of this, the wear period for each individual visitor card was determined from the “end date” written on the visitor card itself and not from a temporary badge report which typically used a “reported date.” To account for these variations, composite plots by year were generated to demonstrate correlation without the “noise” from the monthly comparisons. Figure 6 provides the comparison of the annual totals from the main CPP dosimetry records to the annual totals from the monthly reports. Figure 7 provides the comparison of the annual totals from the main CX dosimetry records to the annual totals from the monthly reports. Figure 8 provides the comparison of the annual totals of CPP temporary badges to the annual totals from the monthly reports.

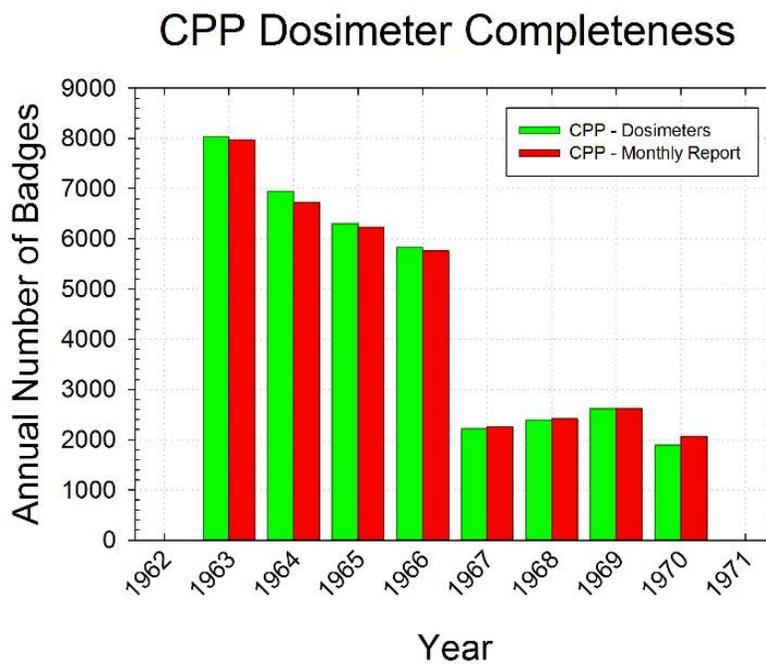


Figure 6: Comparison of CPP Area Dosimetry Reports annual totals

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CX Dosimeter Completeness

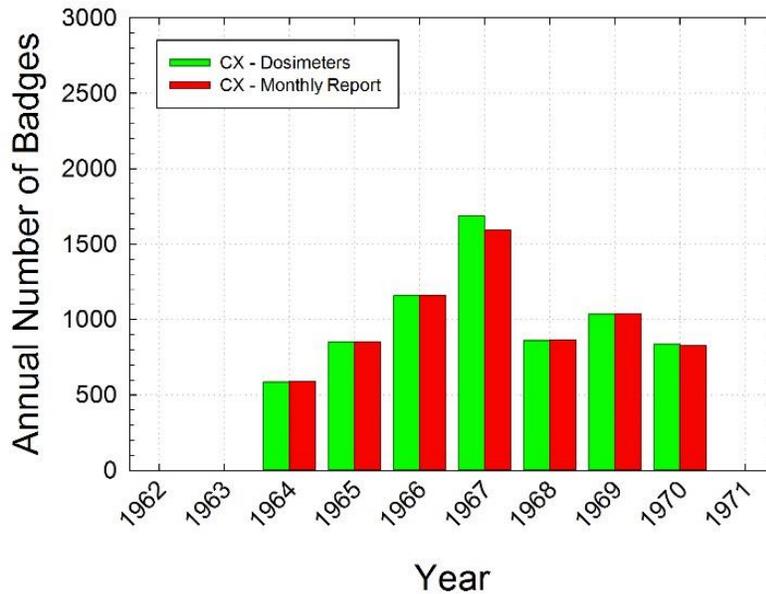


Figure 7: Comparison of CX Area Dosimetry Reports annual totals

CPP Dosimeter Completeness

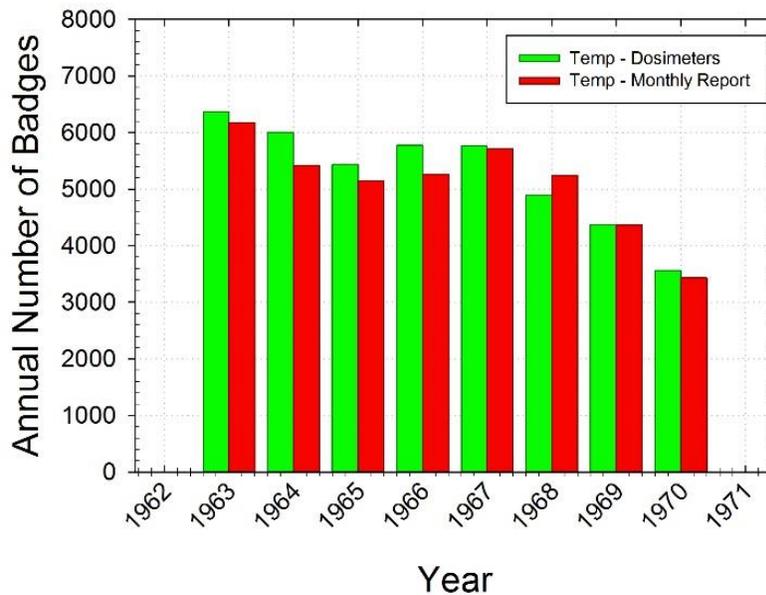


Figure 8: Comparison of CPP temporary badge annual totals

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The data used to generate the plots in Figures 6-8 are provided in the table below.

| Year | Mo Rpts CPP | Mo Rpts CX | Mo Rpts CPP Temp | Mo Rpts Totals | Dos Rpts CPP | Dos Rpts CX | Dos Rpts CPP Temp | Dos Rpts Totals |
|------------|----------------|---------------|---------------------|-------------------|-----------------|----------------|----------------------|--------------------|
| 1963 | 7966 | 0 | 6173 | 14139 | 8031 | 0 | 6364 | 14395 |
| 1964 | 6722 | 588 | 5414 | 12724 | 6943 | 585 | 6003 | 13531 |
| 1965 | 6230 | 852 | 5148 | 12230 | 6303 | 852 | 5435 | 12590 |
| 1966 | 5761 | 1157 | 5263 | 12181 | 5825 | 1157 | 5773 | 12755 |
| 1967 | 2255 | 1594 | 5714 | 9563 | 2223 | 1687 | 5767 | 9677 |
| 1968 | 2416 | 863 | 5241 | 8520 | 2394 | 859 | 4892 | 8145 |
| 1969 | 2620 | 1037 | 4364 | 8021 | 2618 | 1034 | 4373 | 8025 |
| 1970 | 2063 | 829 | 3428 | 6320 | 1891 | 837 | 3559 | 6287 |
| Sum | 36033 | 6920 | 40745 | 83698 | 36228 | 7011 | 42166 | 85405 |

Discussion

The following observations were made from the data completeness evaluation:

- There is excellent agreement on a month by month basis across CPP, CX, and CPP temporary badges.
- Overall, there are slightly more (2%) more badge results identified than reported on monthly reports.
- The longest wear period for CPP temporary badges was approximately 1 month but the vast majority range from one day to one week. Thus a minimum of 12 temporary badges would be needed to get to 250 days of exposure.
- TLDs were not issued as temporary badges during this time period, thus there was no possibility of a temporary badge being worn for a full year (250 days).

A single badge, as specified under the proposed SEC class, is considered sufficiently claimant favorable for inclusion in the class. This methodology was developed to cast the inclusion net wider to admit more claims than were exposed with the goal to prevent an inadvertent exclusion of someone with 250 days exposure at CPP. Based on this review, NIOSH believes that the temporary badge records are complete. However, if one temporary badge was missing or illegible, this should not be a significant issue since temporary badges were only worn for a maximum of one month and no annual TLDs were

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issued as temporary badges. Thus NIOSH considers the probability of missing someone with 250 days of exposure at CPP between 1963 and 1970 to be highly unlikely.

Conclusions

The ABRWH requested that an evaluation be performed on the completeness of temporary badge records for CPP for the years 1963 through 1970. NIOSH has demonstrated that it has access to all CPP dosimetry records for that time period. NIOSH has not identified any gaps that would inadvertently exclude anyone from the SEC class that had a potential for 250 days of exposure.

References

- Dosimetry Branch Activity Reports for 1963, SRDB 125924
- Dosimetry Branch Activity Reports for 1964, SRDB 124926 (Jun-Dec) and SRDB 154467 (Jan-May)
- Dosimetry Branch Activity Reports for 1965, SRDB 125927
- Dosimetry Branch Activity Reports for 1966, SRDB 125928
- Dosimetry Branch Activity Reports for 1967, SRDB 153683
- Dosimetry Branch Activity Reports for 1968, SRDB 153684
- Dosimetry Branch Activity Reports for 1969, SRDB 153686
- Dosimetry Branch Activity Reports for 1970, SRDB 153687

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