Dragon, Karen E. (CDC/NIOSH/EID)

From: DanMcKeel
Sent: Tuesday, March 12, 2013 12:28 PM
To: NIOSH Docket Office (CDC)
Cc: danmckeel
Subject: Docket 140 submission: McKeel 2/21/13 annotated WG transcript
Attachments: MCKEEL_TBD6Kwg_2.21.13b.pdf

Dear NIOSH Docket 140 officer,

Attachment <MCKEEL_TBD6Kwg_2.21.13b.pdf> 2.7 MB

Please consider posting this document under Docket 140 (GSI) on the DCAS website. It is an annotated transcript of notes I made on the 2/21/13 meeting of the TBD-6000 WG. The members considered GSI SEC-105 and site-specific Appendix BB issues including a comparison of NIOSH and SC&A final dose assignments. This material will be included in a planned administrative appeal to the denial by HHS of SEC-00105 on March 6, 2013. Thank you for your consideration.

Sincerely -- Dan McKeel 3/12/13

Daniel W. McKeel, Jr., MD
GSI SEC-00105 co-petitioner

SOURCE FILE: MCKEEL_TBG6Kwg_2.21.13.pdf

TABLE OF CONTENTS OF DANIEL W. MCKEEL, JR., M.D. GSI SEC-00105 CO-PETITIONER SUBMISSION TO NIOSH AND DOCKET 140 AND THE ADVISORY BOARD ON RADIATION AND WORKER HEALTH (ABRWH)

- March 10, 2013 -

p. 80-101 1-8 **EXHIBIT 7 (part of)**
Transcript pages 1+3, 39-53, 339-340;
- McKeel ABRWH court reporter transcript text, ABRWH 9/19/12, pages 1-5 and 39-53. Original triple spaced transcript version.

p. 102-106 1-5 **EXHIBIT 7 (part of)**
Transcript pages 39-53 only;
- McKeel ABRWH court reporter transcript text, ABRWH 9/19/12, pages 1-5 and 39-53. Compacted single-spaced version.

p. 107-115 1-9 **Attachment C**
- SC&A Dr. Robert Anigstein's PDF 8 slide presentation to the TBD-6000 work group on 2/21/13.

p. 116-121 1-7 **Attachment D**
- Dave Allen, DCAS, White Paper "GSI Dose Estimation Comparison," released 2/4/13.

p. 122-134 1-13 **Attachment E**
- Robert Anigstein and John Mauro, SC&A White Paper: "Response to NIOSH Report: GSI Dose Estimation Comparison," dated 2/12/13.

-- end of document --

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FOOTNOTE: This material is to germane to fully document the General Steel Industries, Inc. the deliberations of the ABRWH, the TBD-6000 work group, NIOSH and SC&A leading to a proposed revision 1 of ("GSI") Appendix BB revision 0 (June 2007) and to the Special Exposure Cohort SEC-00105 for GSI.

The Advisory Board considered SEC on 9/19/12 and voted to deny it by a 9 to 8 final vote on December 11, 2012. NIOSH had sustained the same recommendation since 2008. SEC-00105 co-petitioner Dan McKeel's Powerpoint™ presentation on 9/19/12 and his text and a slide from his 12/11/12 presentation to the full Board are also included.

The documents herein include Dan McKeel's annotated personal transcript, with comments, of the 2/21/13 TBD-6000 work group (WG) meeting. The official court reporter transcript of this WG meeting may not be available for several more weeks. The five attachments A through C are included to encompass thirty eight McKeel 2007 to 2012 white papers and his Public Comment to the full Board made on 12/11/12.

Attachments D and E, respectively, are Dave Allen's DCAS white paper dated January 2012 and released on 2/4/13, subject "GSI Dose Estimation Comparison," and the Robert Anigstein and John Mauro SC&A response to the Allen (DCAS) white paper released on 2/12/13.

Including the DCAS and SC&A 2013 white papers is necessary to understand the most recent 5 months of Board and TBD-6000 work group deliberations on SEC-00105 and on revising Appendix BB as a basis for an appeal if HHS denies the GSI SEC.

Daniel W. McKeel, Jr., M.D.
Contemporaneous Notes Verbatim Transcription
from the 2/21/2013 Meeting of the
TBD-6000 Work Group of the ABRWH
Filename: DM-transcr_TBD6K_2.21.13r.doc
(version 1.0r, 3/4/13)

Note: Van Buren MO time, where McKeel is located, is CST and is one hour ahead of Cincinnati, OH EST where the WG meeting took place. Nine words or phrases that were personal (margin) notes made by the author are marked [REDACTED]. This is not a complete transcript. It is all the author could write down by hand during the phone call. Words and phrases of text in *italics* are commentary inserted by the author.

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9:00 Katz *roll call*: PLZ (*Paul Ziemer, chair*), Munn (*Member*), Beach (*Member*),
Katz: "Dr Poston (*Member*) a little late -- I've talked to him"
Neton, Allen, Toms, Ph: Rutherford
SC&A Bob, Mauro, Arjun - Anig/NO, Stiver
|-- (*Katz*) "not feeling well"
Fed Katz, Jenny Lin HHS
GSI McKeel, Ramspott, Jeske
Terrie Barrie

PLZ Three main sites / categories
GSI ongoing activity -- final models for DRs for both active and residual periods Baker residual SSS issues matrix
(*breaks*) Noon + mid AM
2 docs" NIOSH Allen summaries DR results for NIOSH models cf to SC&A models - what assumptions should be used for final doses. Value for Allen review highlights

Allen w/SC&A and petitioner materials. SC&A presentation (Bob Barton prepped. Mauro - Anigstein now ON. 8:08 AM

ALLEN
Lot of models & tweaking past fee yrs, last iterations. 4 photon dose tables, 2 eras, Radiographers + non radiographers. Revise Appendix and move on.

PLZ - Radiographers + others at site: Binary assignment.

(*Allen*)
Won't read whole thing -- you can see -- issues/models where we agree. Radium source scenario + layout 2 problems. SC&A added timeline. What we need to revise Appendix.

PAGE 2 of 18

ALLEN

Radium era to 1962 -- we need middle values 13.5 sec, d = 5 ft. SC&A used shorter
NIOSH divided dose -- pull back that assumption. Not always a radium helper.
5 something/yr = trying to find it.
SC&A 9.9 REM/yr. Used summary dose 1 part time radiographer
Bound.

Where do these limits come from? <-| | Av less than 25% limit is REM/yr 54-55
| Limit not an est., statement <12, <15

Where is WG comfortable, similar to Bob

PLZ Subset of larger ? sufficient accuracy. If take MAX bounds but not plausible

ALLEN

Go w/Bob 9.2 REM - 2 factors - 3.3 Ra + 2.2 SLT.

PLZ Give Betatron man layout man dose.

Bob Mutually exclusive

ALLEN

Take highest dose, assume full time that job.
That layout job was done by radiographers

BEACH

- NIOSH why they didn't do room -- existed pre-1962

ANIG

No Munn or Poston (*question or comment*); Beach "well done"

Layout Man: New Betatron source.
|- Marking casting

BOB *ANIG* Layout man marking repairs not shots

ALLEN

No, layout laid out some shots

PAGE 3 of 18

ALLEN
- lost train of thought - non radiographers + radiographers

ANIG - highest dose in 2008 to layout man - (*NO! McKeel insertion*) but this dose was low

ALLEN
- Several shooting scenarios used by DCAS - various angles + locs in shooting room. Used work schedule for workers for
  m10 REM in control room + MAX layout man (vs) SC&A
  > 10 mRem on FB - Anig disagrees

ALLEN #3
I did not mention in this paper.
"Neutron dose falls into Layout man."
"Beta dose reran etc."

ANIG Based entirely on cleared -- Just cleared .

PLZ Mail this out. Do It this moment.

ANIG Sending me, JWR Anigstein's PwrPoint over(*ly*) accommodating -- DM can't view - it's too late.

SLIDE 2: Dates, confess by calendar year. DCAS May 21, 1962; 1/1/63 StL Testing began its work.

Uran - 2 short isotopes very high beta dose. Called into ?
Badged 1953,
Rubber hits road -- SC&A position. 12 + 15 REM, Good evidence

PAGE 4 of 18

ANIG No one exceeded the dose. Real worker got 15 REM, limiting, high side.
Knoxville meeting some Brd members assumed everyone was going to get 15 REM dose, changed mind.
Model not necessarily bounding.

ANIG "More credence to dose limits" than model.
1 FB 4.5 yrs. 9.2 REM lower limit, worked whenever he could. Weekends - not clear 1 or 2 days. 45 weekdays to 90 d.
40 to 90 days. Surprised not what NIOSH did; Bob thought 12 to 15 REM would be assigned to all.

pt 12 McKeel appeal, points to make to work group from today's discussion:
[1 person FB 18 qtr Summary]
[we dispute truthfulness of license statement of never exceeding limit
[Allen misled Bob confirmed

MCKEEL (***GSI SEC-00105 Co-petitioner prepared WG statement 2/21/13, pgs.4b-4) (see pages 4b through 4e)***
[Note: There was no immediate comment from the WG following McKeel remarks except for a "Thank you, Dan," from Chairman Paul Ziemer]

OBB (up arrow) to 25 Mev

ANIG Layout neutron: limiting to Betatron
Neutron dose: NIOSH 1/3 as much

SLIDE 6 --|| Betatron 26 mRem/wk - 30 Kev to workers back - never been able to explain - dose 26 mREM to back but FB chest only 10 mREM

9:00 CST | Exp StL Test -- longest shot 180 hrs. 10 shots 6 months. 41% util same as Betatron utilization 41%. Exposed source never left unattended. GSI radiographers not involved.
2.67 R/yr.

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(McKeel SEC-00105 co-petitioner comment)

[Filename: DWM_TBD6Kwg_2.21.13b.txt]

1. The Board needed to have both the Allen 2/4/13 and SC&A Anigstein-Mauro GSI dose estimation papers BEFORE it voted 12/11/12 9 to 8 to deny GSI SEC-105. These two papers show that DCAS and SC&A are still far apart, dose estimates differing 2 to 10-fold. This is not acceptable agreement for bounding dose data.

2a. The SEC-00105 deliberations are now over except for the Administrative Appeal. The main TBD-6000 WG task for GSI is now to resolve all TBD-6000 Appendix BB remaining issues so that DCAS can revise badly outdated Rev 0. That work needs to be completed at today's meeting.

2b. NIOSH needs to acknowledge the GSI operational period HAS BEEN EXTENDED by DOE and DOL to include the October 1 through December 31, 1952 period. This time period needs to be covered by Appendix BB Rev 1.

3. Neither the Allen January 2013 GSI dose comparison paper nor the SC&A reply memo dated 2/12/13 directly address assigned doses in Appendix BB Rev 0 or in the SC&A 2008 calculations and compare them with 2012-2013 doses. This is irresponsible. The two latest 2013 papers do not reflect the fact that earlier estimates gave radiographers a 10-fold *higher dose* than other workers, whereas the reverse ratio was the result of calculations 4 years later. The full Board on 12/11/12 was not told how this magical reversal of Betatron/non-radiographer doses took place between Appendix BB and 2008 computer models and 2012-2013 dose calculations and models.

4. Mr. Allen's 12/11/12 assertion that GSI non-radiographers routinely got credit for the highest dose scenario was inaccurate. Under Appendix BB Rev 0, under which all but 4 early GSI DRs have been carried out, radiographers got the highest dose, whereas now both NIOSH and SC&A have flip-flopped and conclude the reverse is true. That is, Layout men are assigned a much higher dose than Betatron/isotope radiographers, using the same computer models and an occult film badge "normalization" process neither Dave Allen nor SC&A has described adequately enough to be properly evaluated by anyone. What, precisely, was the process of "film badge normalization?" We know that non radiographers often get assigned the Appendix BB lower dose level, contradicting what Mr. Allen told the Board.

5. Dave Allen points out in his latest paper that NIOSH did not estimate Ra-226 doses in the GSI Bldg 6 radiography room, relying instead on SC&A's dose estimate. The problem with that is who will perform the validity check on SC&A's methods -- would DCAS be evaluating SC&A science?

Page 4c of 18 (McKeel SEC-00105 co-petitioner comment)

6. Conversely, SC&A did not estimate doses for Ra-226 and check DCAS's dose estimates *outside* the Bldg 6 radiography facility. Both Co-60 and Ra-226 sources were used outside the Bldg block radiography Bldg. 6 facility, and sometimes these exposures were unattended.

7a. Where did SC&A & NIOSH get AEC limits 1954-55 (*source reference*)? No verified GSI film badge program (*with a known vendor*) before 1963 or during the period GSI VP and General Manager stated "past 20 years." *There is no proof of this last statement -- no film badges, badge reports, known badge vendor.*

7b. It was very misleading of Mr. Allen to imply on 12/11/12 to the Board that being awarded an SEC could be a bad thing for GSI claimants. The statement is false and I have data comparing 11 AWE sites with and without SECs to prove that point (PDF Attachment A). I stressed the point in my PUBLIC COMMENT on 12/11/12 after the GSI SEC session ended. I was allowed only 10 minutes to comment by Dr. Melius during the SEC session and had no further time allotted to rebut Dave Allen's several inaccurate statements made to the Board.

Dan McKeel then read into the record the four main totals from his AWE "with and without SEC" analysis (ATTACHMENT A: Excel Spreadsheet PDF file). The major results read into the record were:

• EEOICPA Part B % paid covered cases, no SEC [n=6]	**26.34% vs**
• EEOICPA Part B % paid covered cases, has SEC [n=5]	**52.43% w/SEC**

• EEOICPA Part B completed DR % paid, no SEC [n=6]	**26.20% vs**
• EEOICPA Part B completed DR % paid, no SEC [n=5]	**39.30% w/SEC**

8a. said both Co-60 and Ra-226 sources were used outside Bldg. 6 *"throughout the plant." (former worker interviewed by SC&A on the record)*

8b. There was no discussion in these two latest papers that TIB-70 does not include the cyclical pattern of usage that GSI buildings in the uranium path got because of repurposing of the facilities by multiple commercial entities during the residual period from Mid-1966 through 1992. The exact intake model that NIOSH will use for DR has not been spelled out clearly.

9. Doses were not assigned for the two GSI 250 KVP portable x-ray machines or for the GSI owned Ir-192 source in the latest Allen and SC&A papers.

Page 4d of 18 (McKeel SEC-00105 co-petitioner comment)

10. Two highly disturbing e-mail threads recently emerged in FOIA requests that were described in recent ANWAG blogs on the EECAP.org website.

(1) One of these was an e-mail exchange in 2010 in which, at DCAS's request, the DFO rank ordered various sites with pending SECs based on the degree of "political heat" that might be brought to bear on SEC decisions. Both LANL and Linde Ceramics received "high" ratings, whereas GSI received a "low rating" and Texas City Chemicals and several other sites received a "Never Mind" political heat rating by the DFO. I personally believe this is one reason that GSI SEC-00105 took so long to adjudicate.

(2) The other e-mail thread was even more disturbing. It was related to the issue of using surrogate data at the Hooker Electrochemical site and occurred during late 2009. Dave Allen outlined his "throw them a bone" strategy this way...

I quote from his e-mail dated 12/19/09 found on page 4 of the FOIA file that was obtained by the Hooker petitioner and forwarded to ANWAG and distributed it to me:

"To: "

From: David Allen

SUBJECT: Good Hooker reading

BODY OF MESSAGE: (quote) The truth is my intent is to "throw them a bone" strategy. Basically, give SC&A an obvious point to pick on so they will. Often, they stop once they find one. At that point, I walk in to a WG meeting and agree 100% with all their hits and let WG members try to figure out how they are going to make it an SEC when there is total agreement.(end quote)

I plan to include this information in my SEC-105 appeal for I believe the same deplorable tactic has been used repeatedly during the deliberations on GSI Appendix BB to TBD-6000 and during the decision process on SEC-00105." (end quote)

11. St. Louis Testing used 2 sources - Co-60 (10 Ci) + IR-192 (50 Ci) that are not separately bounded by Allen or by SC&A. [*OCAS-IG-003 used by NIOSH mandates that during the covered period, all radiation sources must be determined with sufficient accuracy; this has not been done for all sources at GSI in Appendix BB or SEC-105*].

12. a) NCC [*Nuclear Consulting Corp.*] furnished FB [who supplied them?]

b) 1 person summary 18 qtrs

c) 1953 belt object *Dr. Anigstein and SC&A state is a Landauer film badge was stated more likely to be a GSI ID badge by 5 former GSI workers who furnished an affidavit to that effect. Landauer states unequivocally in a letter to Dan McKeel that GSI film badge program #2084 started in late 1963 and not before. This directly refutes SC&A's position the photo of a belt object in 1953 was a Landauer film badge. It could not have been according to Landauer. NIOSH and SC&A and the WG accept the object is a FB and use this as part of their "good" and "clear" evidence that a film badge program existed at GSI for 20 years prior to 1963. The petitioners claim there is no solid evidence for this having happened other than VP/General Mgr. [illegible] 1962*

Page 4e of 18 (McKeel SEC-00105 co-petitioner comment)

Cobalt-60 license application with heavy input by NCC. We now know that many of the safety practices stated in the AEC license 12-8271-1 were not carried out. WE thus doubt the veracity or accuracy of the 1962 AEC GSI license absent more proof.

The logical inconsistency: If GSI was always badged 1943-1963 as the license indicates, why did NCC have to start supplying FB in 1962? - see page 4 of notes

13. I underscore that Drs. Mauro and Anigstein both acknowledged during this meeting on 2/21/13 that Mr. Allen and NIOSH/DCAS swayed the Board, and led them to vote to deny SEC-00105 on 12/11/12 in Knoxville by stating that all workers would receive 12-15 REM, *which has turned out not to be the case*.

14. I hope the Appendix BB 11/26/12 issues matrix will be resolved today. [*Note the matrix was not even discussed at the February 21, 2013, TBD-6000 work group meeting.*]

JESKE (*GSI SEC-00105 primary petitioner*)
So much emphasis put on 1 radiographer, how accurate for that.
Is amt overtime for 1 radiographer to be assigned to (*all workers?*)

[*end of McKeel comment notes*]

MCKEEL FOOTNOTE:
Although the Board and NIOSH asked McKeel no questions immediately following his presentation, Dr. Anigstein did make detailed personal replies later in the meeting. These remarks are captured in this transcript on page 7.

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ANIG SLIDE 8: diagram: Center of control Room.
NIOSH 10 mREM NOT to control badge. Betatron CTL #1 2nd hand info
1 worker handled badges, did not remember control badge.
Values not actual - differential.

Can't assume Betatron op was in control room full time

ANIG our MCNPX 8.9 Betatron
9.4

Last Slide} Layout man not on RR tracks because couldn't get RR car in out.
Getting penumbra of Betatron.

PLZ? SCA models all less than regulatory limits. One FB extrapolation model could be used as high as 20. 12-15 is a plausible upper bound 1953 --> May 1962.

ANIG presentation -- Same as in Santa Fe, if you remember.

MUNN
Can't formulate Q -- problem uncomfortable w/upper regulatory limits. Jim SLIDE 6 "never exceeded" "average is less than 25%, range 3 to 12 Allen. Anig "12 or 15," PLZ and Allen trying to beat him down.

PLZ -Radium era. Cobalt era -- model is all we have.
9.2 Layout man. Anig:

POSTON 9:15 CST 9:10 class
SKIN DOSE: Whole body + beta, add neutron. If neutron dose
dose "were important."

ARJUN
Conflicted

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PLZ Already have
"All post DR will include that -- can't remember figure"

ALLEN
"65 hours"

JWR: "Can I comment after (symbol for p with line over it) break?

PLZ: You bet

to 9:55 hrs comfort break
Login 9:53 hr CST DWM (10:52 ET) [n=16]

KATZ/PLZ back in session

RAMSPOTT:
1) Thank entire Board, esp. 9 to 8.
2) Full Board should have had both papers; doses to be assigned
What was trying to be sold.
3) SEC and App BB
(?)=> Layout man is limiting once the NBB was built
- Chainman & all others outside door.

PLZ -Layout = all other

JWR 4) GSI management, if layout got most dose - they never wore badges. Theory implausible. Never took readings from a layout person. Never was a badge outside of Betatron Bldgs./ Story is <--- JWR - ignore

John doesn't think /inconsistent<--| I said
\ Mr | sources Ra out in
\ account | plant -- Ra source
| stolen Bldg 10

ANIG Agree workers in finishing Bldgs never wore badges.

JWR basing doses on persons who never wore badges. Layout men getting scatter from Beta - 3 doses sources simultaneously. Ra and Betatron implausible. Anigstein says one or the other.

PLZ Need to focus on 2 NIOSH summaries.
- Close uncertainties.
- Dave Allen, where is there a difference?
1. Time line: Co-60 5/21/62 ship date
2.
3.

ANIG [*commenting on Dan McKeel's earlier presentation*]
June 2012 Santa Fe made to Board.
Rather strong objections to irresponsible, out of line. Limited info on Betatron Bldg. Most important we got FB - subsequently got FB records. Totally reckless. Not valid whatsoever | Normalization done by NIOSH we don't agree with that.
Ir192 makes no difference
Co-60 | 2 mr/bounding limit
NCC brought in by GSI -- Supply FB to replace, some outside vendor, had FB - that's clear. (*McKeel comment to self*) Did not answer who they were

ANIG All 1962 radium era -- modifying Jun/Jul 1962 post 1963 Betatron era

MUNN [REDACTED] OK from, "what do we know about production facilities.

POSTON
(faint) -

PLZ You will agree full 1962 Layout man 1963

ALLEN
Added Oct 1-Dec, 1952 ==> Not in SEC; App-BB

**[BLANK - There was no page 8
of McKeel 2/21/13 meeting notes]**

NETON and ALLEN
Op. period will go into all DR

PLZ We have agreement on that

ALLEN
<--one person testimony; how accurate is 15 sec?
Radium era: 3-12 REM = 3.573 REM median point fishpole
argues SC&A 9-20 REM} convincing to some people, for sure
w/Anigstein "single 9.69 REM records we don't have; made couple of
"sorry" dose data point. times. Made by: started 1953.

PLZ "never used dose limits - the letter sets a limit"

BEACH
- 9.69 | 1952->1962
REM | could be 15 to 1955; 3 REM yr / post-1955

(*McKeel*) They did not answer my question - where did they get the AEC limits?

Dan: Compare w/Passmore/Quierke Radiation limits letter

PLZ Need WG direction No comment, No answer

POSTON [REDACTED]
Legal limit (vs) calc.- on mute - Katz John Poston

ANIG Can't agree w/3.67; use 5.4; inconsistent

BEACH
Go w/12 and 15 agree SCA

MUNN
No evidence for regulatory boundaries

BEACH
Evidence could be higher

PLZ 5 ft vs 4 ft

NETON
Different opinion NIOSH 3; SCA 9
Use distribution, triangular 9-->12-->15 can put into IREP
Don't believe everyone should get that limit. --> 3.67 two radiographers

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ANIG Lower limit not less than 9.
3 should not be included.

PLZ Talking 5.4 mRem

NETON
don't know if we can flesh out the details
here [0.63 triangular]
1.86

ANIG Where did 5.41 come from? Footnote (d) + 8.68 at boundary, still divided:
5.41/2 + 8.68 (Allen nothing at bound)

POSTON
Not on line. Katz asked again - no answer.

ANIG Can use 2 Ra sources simultaneously Ra1 || Ra2

MUNN
mREM levels

Betatron era: different
Others: This era from Ra alone
/--> |--2.06 mREM
/ ALLEN says use SCA figure

ANIG ---[2.087 "very arbitrary]
25% occupancy factor. How well based I don't know. Not a strong number.
Lower than skyshine 0.72 x 3250/yr = 2.3 mR/yr or mREM/yr - old were higher
Same dose everyone gets assigns
Bob Barton looked at all claims POC < 50% to date = 1 radiographer. 5 or 6 duties unknown

(McKeel) How did Barton get these stats?

margin note: Talking about Radiographer + Betatron

ALLEN
There is no agreement about Betatron operators

PLZ Can't get Beta/radiographer -- don't know who did what. Rest of population, what is being proposed.

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Everybody else gets outside room. NIOSH 1.3
25% occupancy

Re: 2.087 MCNP model

PLZ What was dose rate at door?

ANIG 8.56 mR/hr SCA Oct 2011 "confirm by AEC"
30% duty cycle
10 exp./shift
We did not model outside; scenario implausible.

2.087 is the assigned dose for everyone

PLZ NIOSH

MUNN
More claimant favorable than I expect real life would be.

BEACH
I agree

POSTON
ON / I have a cold, on mute.

KATZ did you hear all - are you OK?

POSTON
"Yes, I am. Very claimant favorable, have another Class."

PLZ (Is) SCA OK

ANIG "NO" "25% x 30% "throw in 2 factors = 7.5% rad. thru door

MAURO
"YES" - gives me comfort
"I disagree with Bob." Applaud Neton compromise trang distrib "he should be in Congress." [REDACTED] Not in slides because I no longer agree with it.

(DWM)
No agreement: [REDACTED].

MAURO & ANIGSTEIN disagree - are arguing my own number. 25% was not (verified).
No survey of Ra facility explained by NCC (

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MUNN
[REDACTED] "Reasonable assertion."

[REDACTED]

JWR main Bldg 6 finishing room, heavily occupied. Dose rate 1 meter from wall -- how likely? JWR - Yes, people were working near the wall.

ANIG "Walls were thick" - was much thicker -- 16 to 24" thick filled -- than the door hollow 2 1/8" steel thick.

[*Dan McKeel note to self*] Number is lower

MAURO
Strategy - we are not talking - NO, NO - talking about wrong thing. I didn't hear this. All workers triangular distrib.

ANIG Not at all what talking about.

MAURO
Get me a line. I apologize.

[MCKEEL NOTE TO SELF 11:10 AM CST
- I need this part of the transcript for my appeal]

PLZ fish pole is controlling dose for radiographers + Betatron operators

ANIG report Oct 2011 Update on Sealed sources Sep/Oct. NIOSH Betron report next Jan 2012
OBB no detailed info outside "2.08 not supposed to be bounding

[*McKeel -- INCONSISTENT: John Mauro now agrees with Bob Anigstein*]

PLZ I am understanding triang. distrib. apply to everyone.

ALLEN
Credible for layout

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MAURO

Struggling 5 yrs non radiographers "off normal" conditions. All a collective picture. Very difficult to assign.. can assign 12 and 15 plausible upper bound--related to SEC decision. Now we don't know how to ID achieve this level of granularity... cannot operate. Jim (Neton) strategy can have a hard time placing doses on individuals. Assign distribution to ALL claimants -- at time of particular claimant, you can't do this.

PLZ Assume we could ID categories, But if not, Can we separate out who is a radiographer? -- Had at SRS. Many of these we don't. Know "small" group who were

ALLEN

If we don't know, do not know all radiographers to high doses. Do know if he was

BREAK 1120 AM CST
Reconvene 1:25 PM --
[Airport came on - request expedited WG 2...

KATZ & PLZ

Poston - (NO)

PLZ Can we distinguish radiographers vs non radiographers
SEC differs from DR - assigned highest dose Betatron or layout depending on the years. Appropriate to have a method for "two dose levels DR," nuclear vs office workers. Hear from SC&A on this -- possible to establsh worked where sources were.

NETON
Co-worker models
TBD-6000 / supervisors & production "precedent"
Question is: work on all sources at plant. Outside production area.

MAURO
In and around Betatron facilities. Around Betatron but office workers. Lg number may have worked in and around.

ANIG 100 odd during Radium era w/1 ID'd as radiographer. How do you parse out - John and I agree. One scenario -- What about those working

PLZ Not using radiographer + layout 1st category. Other was office.

ANIG Different from NIOSH...

PLZ May have morphed -- everybody else

ANIG Layout only applies in New Betatron Bldg. Betatron ops

KATZ Category not known to be radiographers, put in category.

ANIG (*reading from*) (*list*) - Switchman, grinder, clerk, laborer, millwright, core op, industr. eng./accountant/3rd job, furnace worker. Random order sample.

ANIG 1 worker alive and well, not sick. Can't know what they did

PLZ Ask NIOSH what is possible?

ANIG Can NIOSH parse the jobs?

ALLEN
NIOSH Radium era 10 yrs / major
Guideline --> In genl radio assign to radiographic. Include inspectors, Qual. Control. Cannot ...? Dose does not include incidents. If DR can establish, assume if survivor doesn't know.

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ANIG & MAURO
Use limiting dose: good models. 1 FB record, "evidentiary"...
mentions my (*Dan McKeel photos*) sign do not approach within 100 Feet

HAVE NOT GOTTEN TO APP-BB
ISSUES MATRIX 11/26/2012

NETON
Still feel people are Admin - 9 REM not appropriate. We do this all the time at Other sites.

• BOB BARTON
Industrial Hygienist (*McKeel note to self:*) WHO IS HE? DCAS OR SC&A

MAURO
If we had interview | How could you come up with dose for office mgr, clerk
ANIG There are nor records | Outcome will depend on dose reconstructor.
Very subjective.

MAURO
Philosophically in agreement w/what was said, <u>but</u> usually at DOE - 95%ile environmental co-worker models at DOE.
1255 CST --> No FB data troubled me at the beginning...not averse to policy -- "Haven't heard what that is"
Not 3 categories as at DOE / co-worker.

PLZ did not talk about office workers - found dose (do know who was a radiographer) for radiographers. Have 3 groups -- limited numbers doing that
- Most are not operators

MAURO
15 REM no one got it - confidence - "WHY SEC DENIED"
==========

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MAURO + ALLEN
Felt careful modeling could be bounded, did not exceed regulatory limits. There was this incident w/Co-60 sources, not in operational period. Co-60 got left out -- supervisor came & said: "something wrong with my meter. Source had been left out."

MAURO
NDT mishandling is common. 12 to 15 captures my concern about mishandling Mode is reasonable upper bound for radiographers. 15 limit only applies to badged workers...

PLZ cut him off --> Can't close that part of the loop off right now. Charge NIOSH to bound office workers. How to distinguish in DR?

ALLEN
One bound for everyone, 3 grps (up arrow) [increases] errors

NETON
Assign higher dose

ANIG Other jobs can be confusing

ALLEN
Triangular for "placing the source"
Never compared the Betatron + Ra radiographers
Not badged -- did do that

NETON
1 category, open to 2 - NON radiographers + administrative

MAURO
Comfortable clerk -- only once or twice in plant / yr.
w/2 categories. Have come to agree -- how NIOSH can bound

NETON
2nd categories. If not 2, why use CATI?

PAGE 17a of 18

Layout Man -- cobalt era

SC&A 9.2 | NIOSH 4.43 models
| No shots/L's Excel/Solver 10 mREM/wk control room
ANIG |<----------| |-> This is normalized to film badges
"Categorically disagree with that" [*emphasis added DWM Jr*]
Landauer always

ALLEN (NIOSH) arguing with SC&A ANIGSTEIN
{Badge 1 - control room badge - don't know where it was: OBB or NBB
(Badge 0 is "control badge" Zlotnicki density always diff between 0 and dose
(densitometer subtract NO Anigstein stated) Exact quote said "denied" (Allen)
|--> Not Defensible - Control room never got
NIOSH Allen "Have 'em both --> Control badge = zero except 2 in 1971
|-> Anig means below (MDL)

PLZ diff between NIOSH 4.483} Excel Solver shots in different directions match
numbers SC&A 9.2 } =be= or </Layout worker.
"shots" we normalized to 10 mREM SCA does not

BEACH
1966 value 1/2 how does that affect 4.483 dose?

PLZ Answered instead of Allen -- puts ONUS on SC&A because (Dan thiinks)
Need SC&A to write a memo

BEACH / 15 \
/ \
9 --------- "5" (or 3) ?

On Layout Man cobalt era

PLZ then we need to go back to all Matrixes issues

PAGE 17b of 18 GSI last discussion point

PLZ Did not go through residual period -- agree it could be done. Inhalation Ur agreed on source term but not model.

~~~//~~~

PLZ Have 1/2 hr left, want to move into [Baker Brothers]
No recommendation now for Board

MAURO
Whole lot of talking points "#7 issue has SEC implications" - other SP issues do not impact. (*continued below*) ...

PLZ Board took action on SEC
residual period - can't assign bounding dose for beginning then this is the rock. We all got your comments 1 day ago. Neton has looked at.

MAURO
Picked airborne dust loading 580 dpm/cm3 gross alpha
Fly in ointment - many fires on surface
1943-44: Amt Ur on surfaces may be shifted because of fires. Mechanics of assuming. Was there cleanup during op. period after fires.
-- Did look at SRDB. Tom Toms comment on fires.
(margin note: p 36 of ER)
Closing contract" collect turnings, sweepings, drumming
- It was these that caught fire and settled out.
- 1 lg fire 100 lbs of uranium. NIOSH please clarify

NETON
How many fires "several" not "many"...

BEACH
What went on 1945-->1980s: ER nothing in it -- sold + co. dissolved, no info.
SC&A calc. for air is wrong! - not asked to do anything

(*McKeel margin note to self: What is the start value airborne Uran GSI 6/30/66*)
~~~

PLZ Ask SC&A to do anything?

BEACH
Who occupied thru 1996 - any activity contractors or successors

PLZ - who can clarify

NETON
Don't know

TOMS
store motors

NETON
No radiol work

PLZ Production

NETON
Std TIB-70 Model

3. [S*imonds Saw* & Steel]

PLZ NIOSH draft matrix responses 2 weeks ago
SC&A gave responses yesterday
• Bob Barton wrote SC&A responses
Look at bounding bioassays

MAURO
We erred 10 M not 1 M/m3 - [REDACTED]

TED KATZ
What to do at March 12, 2013 Augusta mtg.

4. Next date WG: GSI "closure on models
KATZ (April 26, 2013) How much time we need: "at least a few weeks before mtg."

PLZ April, Brd teleconfer., wk 15th out

MUNN
1st wk April (4), 2013 (6 wks)][*Allen indicated 6 wks not enough for him to prepare*] [REDACTED]- May 3.6 29, 30, 1, 2 [REDACTED]

-- Adjourn: 2/21/2013 at 2:57 PM EST --

ATTACHMENT A

Dan McKeel Compensation Comparison Chart

of 11 EEOICPA AWE Sites:

6 without an SEC

5 with an awarded SEC

(from DOL website

EEOICPA Statistics by State

Daniel W. McKeel, Jr., M.D.
General Steel Industries (GSI)
SEC-00105 Co-Petitioner Comments
On Transcript of Dan McKeel Notes
On the 2/21/13 Meeting of the
TBD-6000 Work Group of the ABRWH

- March 9, 2013 -
(version 2.0)
FILENAME: Comment_McKtrTBD6K_2.21.13F.doc

• Page numbers of this document are keyed to corresponding page numbers of the McKeel transcript of the 2/21/13 TBD-6000 work group. The transcript is a verbatim version of Dan McKeel's contemporaneous hand written notes with a few added margin note redactions and inserts marked off in italics. This document will be part of the appeal to denial of SEC-00105.

Background

On December 11, 2012, the full ABRWH voted 9 Aye and 8 Nay to support NIOSH's recommendation to deny the General Steel Industries (GSI) SEC-00105. Currently, the Board has formulated its recommendation in a letter to the HHS Secretary dated 1/31/13. That letter and accompanying materials will go first to NIOSH Director John Howard, who will make a recommendation to forward to the HHS Secretary along with an informational packet of materials from the Board and NIOSH. No petitioner material are allowed to be included.

According to DFO Ted Katz, the 30 white papers submitted to the TBD-6000 work group by the SEC petitioners, and work group transcripts of the 15 WG meetings held between 2008 and 2/21/13, will not be transmitted to Dr. Howard and the HHS Secretary. **The petitioner's maintain this is a grievous and unfair procedure. The process is adverse to GSI claimant interests and to be addressed.** The 2/21/13 TBD-6000 WG meeting was held two months and 10 days after the full Board voted on 12/11/12. The ABRWH believed all SEC matters were settled and all bounding doses had been assigned as EEOICPA and the SEC rule stipulate must be done for all SEC petitions. This transcript abundantly tells a different story.

If the NIOSH Director supports, and the HHS Secretary upholds, the NIOSH and ABRWH recommendations to deny SEC-00105, then the petitioner's will have 30 days in which to file an Administrative Appeal. The appeal will be placed in the hands of a three member panel of "independent" HHS employees who are selected by the HHS Secretary. The DFO informs us that all materials may be included in the Administrative Appeal that the petitioners believe will be helpful in overturning the denial of SEC-00105. This comment will be sent to the review panel.

The Agenda of the 2/21/13 TBD-6000 work group meeting included 4 main items:

a. Summary of NIOSH approaches for final DR estimates.
b. SC&A comments.
c. Petitioner comments.
d. Matrix issues and actions.

All except the last half hour of the 2/21 meeting that lasted from 9:00 a.m. to 3:00 p.m. ET was devoted to GSI agenda items (a), (b) and (c). All final DR estimates were not agreed upon, and item (d), the resolution of Appendix BB matrix open issues necessary for Rev 1, was not done.

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Note 1: Dr. Ziemer had announced during the 2/7/13 Board teleconference work group report on TBD-6000 that a main agenda item for the 2/21/13 meeting would be resolution of Appendix BB open matrix issues. As it turned out, that goal was not addressed during this meeting.

Note 2: The entire discussion revolved around two white papers that addressed unresolved internal and external bounding doses for GSI workers during several time periods spanning Oct. 1, 1952 through December 31, 1992. There were many points of disagreement, not all of which were addressed during the meeting. At the end, Chairman Ziemer advocated NIOSH prepare another white paper, the third in this series, to address unresolved bounding doses for Layout workers and other matters:

(a) **[Attachment C]** Dave Allen and DCAS, dated 2/4/13, GSI Dose Estimation Comparison, August 2012, 7 pages. Dr. Ziemer chose not to announce this key paper to the full Board during the February 7 conference call.

(b) **[Attachment D]** Robert Anigstein and John Mauro, SC&A, Inc., dated 2/12/2013, "SC&A Response to NIOSH Report: "GSI Dose Comparison", 11 pages.

1. Member Poston has missed many TBD-6000 work group meetings and discussions of GSI matters as he did much of this one teaching two classes at Texas A&M.

2. Bob Barton from SC&A participated in this WG meeting for the first time. Dr. Anigstein from SC&A joined the discussion at 9:08 AM ET.

3. All three members of the SEC-00105 GSI team participated in this WG meeting: primary SEC petitioner , co-petitioner Dan McKeel, and main GSI site expert

4. Dr. Ziemer announced the key goals at this meeting for the GSI site would be to decide (a) "*final doses for both the "active* (i.e. operational AEC contract period) *and the residual periods*," and (b) to decide "*what assumptions should be used for final doses*." The petitioners contend these models and assumptions should have been finalized before the full Board voted 9 to 8 to deny SEC-00105 on December 11, 2012, at the Knoxville, TN, ABRWH meeting.

5. As Dr. Ziemer admitted later in the 2/21/13 WG meeting, the GSI residual period doses and assumptions were not discussed on 2/21/13, Thus, another key agenda goal was not met.

6. Dave Allen also stated a goal was to "Revise Appendix BB and move on." Yet this has not materialized 5.5 years after Appendix BB Rev 0 was released in June 2007. This transcript provides an excellent insight into why this task, to revise a 13 page document, has taken so long. There have been, and still are, many variances between NIOSH and SC&A dose assignments. Key issues are discussed over and over without being resolved systematically.

7. Even though Dr. Ziemer initially states dose assignments will be "binary, radiographers plus others at the site", he himself later introduces a third category of office workers to further complicate the task of signing three tiers of doses during two main time "era" periods.

8. Dave Allen stating "*I will not read the whole thing*," that is his 2/4/13 focus white paper, is his standard way of proceeding. He did not prepare a concise handout so his main points could be followed or tracked systematically. This leads to confusion and delays in bringing final dose decisions to closure. DCAS subtly delays, rather than expedites, the deliberative process.

1. This portion of the discussion highlights "facts" that appear to still be very contentious.

2. The fact there were two radium NDT sources at GSI was unknown to, and undiscovered by, this WG until SEC co-petitioner McKeel obtained 1,016 pages of new GSI source term data license data as NRC FOIA 2010-0012. However, beyond the fact the twin Ra-226 sources were used with the fishpole technique for GSI NDT radiography both inside and outside the 6 Bldg. roofless, concrete block radiography room, neither SC&A nor NIOSH know the strength or decay time for the Ra sources, how often they were used, what workers were exposed to them.

3. This WG continues to place great credence on a statement in the GSI 1962 AEC license application that during the past 20 years AEC dose limits had not been exceeded, and in fact averaged only 25% of the AEC limits. This statement was completely unverified and no corroborating film badge data, a film badge vendor, or any living person who can corroborate this statement with an affidavit has been established. Petitioners consider this reliance on a statement by a GSI "Vice President and General Manager" , not to be reliable. GSI 1961-63 annual reports do not list Mr. as a company Officer or Director for those 3 years. We have an e-mail from a deceased GSI supervisor to the effect that Mr. was not employed at GSI from 1955 through 1963. This casts doubt on the validity of Mr. 1962 AEC license assertion about a two decades long GSI film badge program. Where is the direct evidence of this second major film badge program at GSI 1943-1963?

4. The Allen DCAS and SC&A give and take discussion under the first "ALLEN" was difficult to listen to, with lots of talking over one another in incomplete sentences. NIOSH assigned a dose to a radium radiographer then split it in two, assuming the radiographers always had a helper. This was not true, so DCAS withdrew this assumption. The petitioners are distressed this passage deals with a single dose summary for one worker for an unverified second film badge program at GSI. And it deals with statements we do not trust from a GSI official ( ) who was not in a position to know for a significant part of the 20 year period in question. The key point is this discussion did not lead to a definite dose assignment.

5. Mr. Allen asks where is the WG comfortable, but no answer is forthcoming.

6. Dr. Ziemer acknowledges that defining sufficient accuracy, the hallmark scientific principle underlying both dose NIOSH/ORAU dose reconstructions (DR) and SEC outcomes, is still in debate, a "question." The petitioners find this fact to be utterly discouraging 12 years into full implementation of EEOICPA 2000. The term should have been defined in 2000-2001.

7. Allen recommends "go with Bob" (i.e. SC&A dose estimate), Dr. Ziemer recommends giving Betatron man the layout man dose, which is logically absurd. All Betatron operators and assistants were not Layout men and vice versa, some layout men were not radiographers. Thus, not all, only an unknown fraction, of layout men were badged. NIOSH and SC&A have no way to determine who was and was not a Layout man. Also, this "Layout man" term was viewed by some to be a generic term that fit all 2900 GSI workers who were not radiographers, who. numbered less than 100 workers during the October 1952 to mid-1966 GSI operational period.

8. Dr. Anigstein of SC&A nullifies the Allen-Ziemer points by observing their suggestions are "mutually exclusive" (and therefore poorly reasoned). This exemplifies the quality of the

Comment on page 2 of 18, continued from page 3...

8. (cont'd from previous page...) science used by Allen and the TBD-6000 work group at the GSI Illinois AWE site in deliberating both SEC-00105 and revision 1 of Appendix BB and revision 1 of TBD-6000, the parent document.

9. Allen then recommends taking "the highest dose" without stating what that dose is.

10. Allen follows with a false (untrue and inaccurate) statement that the ***"layout job was done by radiographers."*** This is a distortion of the official record. What is on the record is that some isotope and Betatron radiographers **sometimes** filled in as layout workers. There is absolutely no documentation that the layout job was done by radiographers all of the time. In fact, since 2008, SC&A and at the start of this meeting chairman Ziemer equated Layout men as all other workers at GSI. That is, "layout man" defined non radiographers. That this mix-up in jobs and terminology should occur within this key work group to this extreme extent this late in the deliberations on GSI Appendix BB is truly astounding and is not scientifically defensible.

11. Member Beach's question, which I presume was directed to Mr. Allen and DCAS, was why did NIOSH not calculate or model doses for the Bldg. 6 radiography room during the period 1952-1962 when Ra-226 sources were being used for NDT radiography in addition to the Old Betatron 24 Mev x-ray unit? This question went unanswered. Chairman Ziemer did not ask DCAS to answer the Beach question. And Ms. Beach did not press for an answer. This happens repeatedly during TBD-6000 WG meetings. The members talk past one another, questions are not answered or ignored by the chair, and decisions are therefore delayed or not made.

12. Neither Member Munn nor Member Poston joined in the preceding discussion thread.

13. The petitioner's rejoinder to Ms. Beach is that the foregoing discussion was disjointed and inconclusive, and was the opposite of "well done," scientifically speaking.

14. The next two passages are factually incorrect. Layout men operated at both the Old and New Betatron buildings on the rail tracks just outside the x-ray facilities on "rush" or "hot" castings that needed NDT inspection immediately. This need prevailed throughout the covered period at GSI that is now Oct. 1, 1952, through June 30, 1966.

15. The last two passages show that Allen and DCAS and Anigstein and SC&A could not even agree on what the layout man job entailed. Allen and NIOSH believes they laid out shots in contrast to Bob Anigstein who states layout workers marked repairs but not shots. The petitioners believe Layout men, who may not all have been men (another unknown at GSI), did *both* shot layouts and repair marking. One can observe that no real attempt was made by the Chair to resolve this central issue "on the spot."

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1. Allen admits the previous confusing discussion caused him to "lose his train of thought" about the differences between radiographers and non radiographers.

2. Co-petitioner McKeel strongly disagrees with Dr. Anigstein: In 2008 NIOSH and SC&A computer models assigned a much higher external photon dose for Betatron/isotope operator radiographers compared to Layout men, who were equated with all other plant workers. This SC&A untrue comment is a good example of how the historical records gets distorted. The petitioners believe all of the NIOSH Appendix BB and 2008 SC&A dose assignments should definitely have been reviewed with the full Board on December 11, 2012, during the SEC-00105 deliberations. The same information should have been reviewed today at the 2/21/13 TBD-6000 work group meeting to finalize GSI dose assignments, which Board members had been led to believe were "in place" by Mr. Allen before they voted on 12/11/12. Obviously, this was not true.

3. Allen's next two groups of statements listed below were not understandable for the most part because they were so truncated and not fully explained:

(a) 10 mRem in control room + MAX layout man (vs) SC&A

(b) > 10 mRem on film badge - Anigstein disagrees [***McKeel: how and why?]***

(c) I did not mention in this paper [***McKeel: what was not mentioned?]***

(d) "Neutron dose falls into Layout man." [***McKeel: what could this possibly mean?***] There was no actual neutron doses measured at GSI, all was computer models. What RBE was assigned? Relative biologic effectiveness for neutrons may vary between 2 and 20 and must be measured. GSI radiographer film badges from Landauer did not measure neutrons.

(e) Beta dose reran, etc. [***McKeel: Completely clear what this means***]

4. Dr. Anigstein prepared a PDF presentation that was projected in Cincinnati to those around the table. Bob Barton operated the projector and changed the slides. However, neither he nor Dr. Anigstein identified each and every slide being discussed. The petitioner team was e-mail the document, but McKeel had no way to view it while the WG discussion was ongoing.

5. Petitioners have submitted 5-6 worker affidavits that the "1953 object" in a photograph worn on his belt by one GSI worker is more likely a GSI identification (ID) badge rather than a Landauer type film badge as Dr. Anigstein repeatedly puts into the record. We believe this is incorrect and does not prove there was a GSI film badge program in 1953. No film badge records from this period have ever been recovered by NIOSH, the Board, or SC&A.

6. The SC&A position was clearly stated that Layout men during the radium era should have been assigned a dose of 12 to 15 REM/year, characterized by them as "good evidence." But DCAS did not accept this position.

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1. Dr. Anigstein is quoting a passage from the GSI AEC license application for two Co-60 sources. The license application was signed by · , VP and General Manager. Dr. Anigstein's statement is very important that "***at Knoxville (the 12/11/12 full Board meeting and final SEC vote) some Board members assumed everyone (emphasis added) was going to get 15 REM dose, changed mind.***" And, "***Model not bounding.***" John Mauro later in this WG meeting echoed the same sentiment that Board members had been misled into believing the 15 REM dose would be assigned to all GSI workers. Based on the activities of this meeting of the TBD-6000 WG on 2/21/13, the 15 REM dose will certainly not be assigned to everyone. In fact, in opposition Jim Neton of DCAS pushed for a two or three tier dose assignment protocol, where Layout men would get the highest assigned dose, radiographers (isotope and Betatron) would get the middle level, and a brand new category, "office workers," would get the lowest dose assignments in a revised Appendix BB. Chairman Ziemer concurred.

2a. "pt 12 McKeel appeal, ..." are notes to self regarding a possible administrative appeal to HHS if the Secretary upholds the denial of SEC-00105.

2b. Dan McKeel's prepared public comment to the WG, pages 4b-e of 18 of this paper, were read into the record and made orally following the SC&A Anigstein projected presentation.

3. Dr. Anigstein commented that the Layout man neutron dose is limiting to Betatron workers. What he does not state is the reverse was true in 2007-2008 when the Betatron radiographers class of workers were assigned the highest external photon and neutron dose compared to other non workers and layout personnel. The definition of Layout man as a surrogate changed between 2007/8 and 2012/3 between the way SC&A and NIOSH defined and used the term. "Layout man" was used variably as a job class or for all other GSI non radiographers. Again, it would have been helpful to have the exact naming conventions for non radiographers in Appendix BB redefined at the 2/21/13 WG meeting.

4. Dr. Anigstein notes the NIOSH neutron dose in his 2/12/13 paper was 1/3 as much as the SC&A dose. The table in related slide number 5, shows actual values as 0.148 rem NIOSH compared to 0.46 rem for SC&A. Relative biologic effectiveness (RBE) values are not stated.

5. Dr. Anigstein again notes that SC&A could "never explain" NIOSH consultant Jack Scheutz's measurement of 15 R/min with the Betatron power OFF. The fact is, the SC&A MCNPX and DCAS Attila computer transport codes did not confirm this effect. Therefore, illogically, both SC&A and NIOSH made the indefensible and biased scientific decision to ignore this established fact they could not explain or model. The GSI SEC petitioner team has provided several references that clearly indicate particle accelerator heads, collimators, beam spreaders and columns become chronically activated and posed a danger to personnel working around them even in the off position. DCAS and SC&A chose to ignore these valid references.

6. All "facts" SC&A cites were gleaned from one person at St. Louis Testing Laboratories. There was no attempt at confirmation by DCAS/NIOSH. SC&A research was determinative. Despite several urgings from the SEC petitioner's, neither organization obtained the AEC licenses to confirm what NDT sources St. Louis Testing Laboratories actually possessed. The license number was stated in NRC FOIA 2010-0012 obtained by Dan McKeel. The person who testified the longest shot took 180 hours and there were 10 shots in 6 months was not referring to actual shot records, merely from his memory of events that took place in 1963. The time assumptions used to derive 41% Betatron utilization and occupancy values are contested.

Pages 4b-e of 18

Summary of Key McKeel Points in His Prepared 2/21/13 TBD6K WG Remarks

1. The GSI dose data in the Allen/DCAS and SC&A papers needed to be available to the full Board prior to its vote on SEC-00105 on 12/11/13.

2a. Appendix BB open issues all need to be resolved at the 2/21/13 work group meeting.
2b. The GSI operational period start date has been changed to October 1, 1952.

3. The two papers in item #1 did not review the dose data used in APPENDIX BB for the past 5.5 years to complete more than 95% of NIOSH dose reconstructions at GSI. Those doses were remarkably different from doses in DCAS and SC&A 2013 papers.

4. Allen and DCAS made a factual error in stating that GSI claimants all received the highest dose scenario in completed DRs. In fact, external photon doses for radiographers exceeded doses for other workers by about 10-fold. Why the Betatron doses declined so precipitously from 2007/8 to 2012/13 was not adequately explained. The film badge dose "normalization" process used by NIOSH also was unclear.

5. Allen and DCAS do not explain why NIOSH failed to model Ra-226 operator doses within the Building 6 radiography room. Dr. Anigstein remarked about this on 2/21/13.

6. SC&A erred in not estimating Ra-226 doses outside the Bldg 6 radiography room because, according to Dr. Anigstein, "we didn't accept that scenario."

7a. NIOSH/SC&A need to cite a source reference for their "AEC dose limits" 1943-1962.
7b. NIOSH/Allen erred in stating that having an SEC is a bad thing for GSI claimants. McKeel data proves otherwise (see Attachment A this document, PDF file).

8a. A named radiography foreman testified Ra-226 was used "all over the plant."
8b. The two Feb. 2013 DCAS/SC&A papers did not address the inadequacy of TIB-70 to model uranium intakes during the GSI residual period with cyclical cleanup periods.

9. Doses were not assigned for two GSI 250 Kvp x-ray units or the Ir-192 GSI source.

10. E-mails were introduced that showed (a) NIOSH and the DFO prioritized sites for action on their SECs based on "political heat"; and (b) Allen used the "throw them a bone technique" (his terminology) to blunt criticism of NIOSH science by work groups.

11. Dose from the two St. Louis Testing Laboratories Co-60 and Ir-192 sources used at GSI were not bounded separately as OCAS-IG-003 mandates they must be.

12. Who was the NCC film badge vendor? It was a mistake to base dose on a summary for one part time radiographer. The 1953 belt object SC&A identified as a film badge was more likely a GSI ID badge.

13. SC&A (Drs. Anigstein and Mauro) agreed that Board members were misled on 12/11/12 by DCAS/Allen implying that all GSI workers would get 12-15 REM/yr under SEC-00105.

14. McKeel hoped all of the open Appendix BB issues would be resolved on Feb. 21. 2013.

Page 5 of 18

1. There followed a back and forth between work group members regarding the "control" film badges -- what they were and what was their significance. Virtually all of these arguments had been presented and discussed thoroughly in previous work group meetings. This was a waste of time that should have been spent deciding Appendix BB matrix issues on Feb. 21st.

2. Dr. Anigstein's assertion that Layout man was not on the railroad tracks at both Betatron Buildings because one couldn't get the RR car in and out was refuted by worker affidavits during 2012 TBD-6000 WG meetings. Different rail transfer means were used for the two Betatrons. This is an excellent example of historical revisionism to fit a particular agency scientific position.

3. Someone, probably Dr. Ziemer according to McKeel notes, comments that 12-15 (REM) is a plausible upper bound 1953 through May 1962. Then why could this dose assignment not be resolved and "set in stone" right then and there?

4. Dr. Anigstein comments his 2/21/13 PDF presentation is essentially the same as his June 2012 presentation in Santa Fe to the full Board. That is an admission that old and inaccurate data is being represented to the work group. Or alternatively, SC&A's position has not changed significantly in 8 months despite the two new February 2013 white papers.

5. Member Munn, in saying she is uncomfortable with regulatory limits, impeaches her support of citing the identical regulatory limits to prove doses could be bound and voting to deny SEC-00105 both in the work group on 11/28/12 and at the full Board final vote on 12/11/12. Such reasoning is scientifically indefensible and is very claimant adverse. In this regard, neither SC&A nor NIOSH have stated on the record where they obtained the AEC regulatory limits they espouse and support. What are the original source documents?

6. Dr. Ziemer acknowledges that computer models are the only method available to bound doses during the Radium and Cobalt eras. He doesn't note the absence of validating measured data at GSI, the lack of bioassay data or air uranium samples, etc., the scientific peer review community ordinarily demands of authors who publish a new computer data model.

7. Dr. Poston trivializes neutron dose by saying "***if it were important.***" OCAS-IG-003 mandates that all doses from all sources must be determined with sufficient accuracy. Thus, bounding the several sources of GSI neutron doses are very important.

Significantly, no discussion whatsoever took place about the facts that no measured neutron data was available, resolving the 3-fold discrepancy between DCAS and SC&A assigned neutron doses in the two Feb. 2013 papers, or what was the correct RBE (2 to 20).

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1. Dr. Ziemer says "...already have," "All post DR will include that -- can't remember figure." Allen then fills in "65 hours" decided upon at the SC&A 10/9/07 outreach as a consensus number of average hours worked per week" at GSI. NIOSH has promised this figure will be used in Appendix BB, Rev 1, when it is finally released. Rev 0 states 46 hours.

2. After a comfort break, site expert . comments the full Board needed accurate dose information, including the data in the Allen & SC&A Feb. 2013 papers, at their 12/11/12 meeting prior to the final SEC-00105 vote. "What was trying to be sold" refers to Dave Allen alleging erroneously to the Board on 12/11/12, before the GSI SEC final 9 to 8 vote to deny, that all workers would be assigned 12 to 15 REM total dose.

3. Dr. Ziemer states here that Layout man includes all other GSI workers than radiographers.

4. notes a logical absurdity -- how could the Layout men, who never wore badges, get the highest assigned dose? Dr. Anigstein agreed that "workers in finishing bldgs. (all but the two Betatron buildings) never wore badges.

5. Mr. also reiterated testimony that radium sources were used out in the plant beyond the 6 Bldg. radiography room. Mr. also noted that a radium source was stolen from 10 building.

6. Bob Anigstein noted that SC&A disregarded Mr. affidavit because it was "inconsistent" with other workers. Dr. Anigstein did not elaborate in what way the information was inconsistent, or whose information conflicted with his. For the record, Dan McKeel was a NIOSH and Board silent observer to the joint SC&A and NIOSH interview Dr. Anigstein referred to. Several added aspects of Mr. information were subsequently suppressed, including the fact that Ra-226 NDT shots outside the radiography room were often left unattended and were not necessarily always roped off.

1. Mr. noted that doses were being assigned for non monitored workers. He stated that Layout men outside the Old Betatron building could actually receive three doses simultaneously from the two Betatrons and an outside Co-60 source such as the one St. Louis Testing used. Dr. Anigstein noted this was implausible, could be exposed to one or the other source but not to both. The two Betatron buildings were 300 feet apart and an 80 Ci Co-60 was used outside of the New Betatron Bldg by StL Testing. Dr. Anigstein noted elsewhere the McKeel photographed sign on the Old Betatron Bldg that stated "Do Not Approach This Building Within 100 Feet." The petitioners thus conclude that multiple source simultaneous exposures were possible. These doses weren't measured because outside workers were never badged.

2. Dr. Ziemer tried to refocus the discussion on the two most recent DCAS and SC&A white papers and the identification of differences and the need "to close uncertainties." Unfortunately, he did not list those differences and uncertainties.

3. Dave Allen stated the time line was the main unresolved issue. This was an oversimplification. No one had yet finalized specific doses to be assigned that Dan McKeel had been able to detect.

4. Dr. Anigstein then disputed several of Dan McKeel's key points on pages 4b-e and he stated he had rather strong objections to use of the word "*irresponsible*" because Appendix BB was before SC&A and NIOSH got film badge records. Dr. Anigstein referred to McKeel's earlier remarks as "*totally reckless*." Interestingly, McKeel's prior remarks were primarily directed at NIOSH's methodology since they and the Board both recommended denying SEC-00105, and because only NIOSH can revise Appendix BB.

5. Dr. Anigstein states SC&A does "not agree with NIOSH (film badge) dose normalization methodology." He didn't explain the basis for this statement on the record as Dan McKeel had asked to be done.

6. Dr. Anigstein stated that bounding St. Louis Testing Ir-192 doses, for unexplained reasons, "makes no difference."

7. Dr. Anigstein believes Co-60 doses outside Bldg. 6 were somehow limited to 2 mR at the boundary that was roped off. There was testimony this boundary was often breached. Mr. Dell's employment spanned both the Radium and Co-60 eras in Bldg. 6 and he testified that shots were often left unattended.

8. Dr. Anigstein thought it was natural that NCC as a consultant to GSI would institute their own film badge program for 2 years (1962-63). Yet only a single NCC film badge report is known to exist. Is a single badge sufficient to verify an entire NCC badge program? I think not.

9. NIOSH and SC&A/WG agreed the "radium era" would extend from 1953 through 1962.

10. I could not understand or record the remarks by Members Munn, Poston and Ziemer.

11. Dave Allen indicated that the revised Oct. 1 through 12/31/1952 GSI covered period would be recognized in Appendix BB Rev 1, but would not be added to SEC-00105 where the covered period is established as 1/1/1953 through June 30, 1966.

Page 8 of 18 -- Page is blank (not part of McKeel 2/21/13 TBD-6000 WG notes)

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1. Dr. Neton and Dave Allen both acknowledged the extended 10/1/52 to 12/31/52 GSI covered period "will go into all DR." They did not indicate when this change will occur. Must Appendix BB be revised first? Dr. Ziemer added "We have agreement on that."

2. Dave Allen and SC&A then entered a colloquy on dose assigned to Layout personnel in the radium era. Considered were 3-12 REM = 3.573 REM median point of fishpole for the Ra-226 source. SC&A proposed 9-20 REM and Dr. Anigstein brought forth 9.69 REM. Dave Allen said "convincing to some people, for sure. Records we don't have. Made a couple of time. Made by Ripley started 1953."

3. Dr. Ziemer added "never used limits -- the letter sets limits."

4. Member Beach added ~9.69 REM 1952-1962 could be 5 to 15 to 1955; 3 REM/yr post-1953. McKeel regarded this recitation as obscure and indecisive. Was it a proposal? A bit later, she stated "Go w/12 and 15 agree with SC&A." The two statements conflict.

5. Dr. Ziemer asked "Need work group direction" a second time.

6. Member Munn added a cryptic "No evidence for regulatory boundaries."

7. Member Beach noted "evidence could be higher," which I could not fully understand.

8. Dr. Zeimer's returned to distance along the radium fish pole: "5 ft vs 4 ft."

9. Dr. Neton offered a Solomonic compromise, a triangular 9-->12-->15 dose distribution, used elsewhere by NIOSH, to resolve "different opinion 3; SC&A 9." He noted such a distribution could be input into IREP. He added he didn't believe everyone should get that (high a) limit.

10. Dr. Neton of NIOSH also alluded to "3.67" dose referred to "two radiographers" presumably sharing Ra-226 NDT duties in the Bldg. 6 radiography facility. This last point was not clear. SC&A had favored twice that dose being assigned to a single Bldg. 6 radiographer. As far as I could tell, this difference was not resolved.

1. Different dose limits within the triangular distribution were proposed: Ziemer 5.4 mREM, SC&A "***lower limit not less than 9. (The value) 3 should not be included***," disagreeing with Neton/DCAS. Dr. Neton observed "don't know if we can flesh out the details here."
   • **McKeel comment**: Once again, a final dose decision was put off and left in limbo.

2. Allen clarified a footnote (d) in one of four dosimetry tables in his 2/4/13 white paper.

3. Ted Katz inquired again whether Dr. Poston was on the line and got no answer.

4. There followed another confusing discussion of various doses including 2.06 REM, a new figure of unknown origin. Allen said "use SC&A figure" but didn't clarify the number he was referring to.

5. Dr. Anigstein tried to disavow his prior 25% occupancy number as "*How well based I don't know, Not a strong number.*" Noted the new value was lower than the old skyshine number 0.72 x 3250 hrs/yr = 2.3 mR/yr or mRem/yr. Stated "*same dose everyone gets assigned.*" I could not quite follow this discussion as it was too truncated.

6. Dr. Anigstein mentioned that "Bob Barton looked at all claims (*in the radium era, I believe*) with a POC less than 50% and found only one radiographer in the group of 100+ records (167 records was also mentioned). **McKeel wants to know the primary source for the Barton list of cases**. This list should be requested under FACA and the Board access policy, or via a FOIA request.

7. Allen importantly states: ***"There is no agreement about Betatron operators."*** (added emphasis)

8. Dr. Ziemer adds to the confusion by stating: ***"Can't get Betatron/radiographer--don't know who did what. Rest of population, what is being proposed."***

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1. This page continues the discussion of assigned doses for the radium era 1952-1962 to GSI worker classes whose activities are not clearly defined both inside and outside of the Bldg. 6 radiography room.

2. Many different doses are mentioned by all parties: NIOSH 1.3 based on 25% occupancy (that Dr. Anigstein has previously disavowed) to "everybody else gets outside the room." Dr. Ziemer asks regarding the 2.087 MCNP model, "What was the dose rate at the door?"

3. Dr. Anigstein answers (from the SC&A Oct. 2011 white paper on GSI portable radiation sources, "*8.56 mR/hr, 30% duty cycle, 10 exposures/shift.*" ... "***confirm by AEC.***" Co-petitioner McKeel did not understand this last comment, because to his knowledge the AEC didn't measure or estimate any GSI doses at any time at GSI.

4. Dr. Anigstein speaks for SC&A "We did not model outside because we thought that scenario was implausible. He adds "**2.087 is the assigned dose for everyone**."
• **McKeel note**: *Yet there has been direct interview testimony by GSI worker. given to both SC&A and to NIOSH, with McKeel as a silent observer, codified in a formal SC&A white paper, "Report on Three Interviews..." that Radium-226 NDT shots were often performed outside the Bldg. 6 radiography room "throughout the plant." Those doses needed to be bounded with sufficient accuracy and they have not yet been in the petitioner's view.*

5. Dr. Ziemer asks NIOSH to weigh in but receives no reply to my knowledge.

6. Member Munn states the 2.087 figure is "more claimant favorable than I expect real life would be," while avoiding saying directly that she agrees or disagrees with the 2.087 number.

7. Member Beach agrees with the 2.087 number.

8. DFO Ted Katz has to contact Member Poston, who replies "*...very claimant favorable*" and notes "*I have another Class,*" (He is a Professor at Texas A&M).

9. Dr. Ziemer asks whether SC&A is "OK" with the 2.087 dose assignment and Dr. Anigstein replies, **"No" adding "25% occupancy rate x 30% throw in 2 factors = 7.5 rads through the door**."
• McKeel note: I have % and rads as the unit in my notes: the "%" must be a typo. Note the SC&A dose would be 3.5 times the NIOSH assigned dose.

10. John Mauro of SC&A adds: "***Yes, gives me comfort***." Then adds emphatically: "***I disagree with Bob (Anigstein). I applaud Neton triangular distribution, saying "he should be in Congress.***" (emphasis added)

11. Summary: Dan McKeel's conclusion by end of this page is "there is no agreement," a consensus has not been achieved, with SC&A's Robert Anigstein strongly dissenting from the NIOSH and Board view (SC&A dose 3.5-fold higher than NIOSH/WG dose).

11. **(cont'd...)** and with Dr. Anigstein's SC&A colleague and co-author of the 2/12/13 white paper on GSI dose estimates, John Mauro, who is disagreeing on the record with Bob Anigstein.

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1. Member Munn notes (something unclear) is a "reasonable assertion." She may be siding with the Mauro view that Bob Anigstein is incorrect.

2. adds the main Bldg. 6 finishing room was heavily occupied. He explains in response to a previous question that a dose rate 1 meter from the wall was realistic, and that in fact ***"Yes, people were working near the wall."*** Note added by Dan McKeel: Past transcripts worker affidavits show that around 300 people worked in close proximity to the 6 Bldg. radiography room from 1953 through 1962 (the GSI radium era).

3. Dr. Anigstein notes the Bldg. 6 radiography room walls were 16-24 inches thick and filled compared to the 2 1/8th inch steel door.
   • McKeel note: *What was not mentioned was former GSI worker testimony that in the 1950s, before a source overexposure incident occurred, there was no door at all and walls were one block thick. The door was added as a result of the reportable incident.*

4. Drs. Mauro and Anigstein then have a colloquy wherein the current discussion does not involve the past discussion of a triangular dose distribution. Mauro notes "***talking about the wrong thing..., didn't hear this,,,, give me a line. I apologize***."

5. Dr. Ziemer then adds a cryptic comment that "***fish pole is controlling for radiographers and Betatron operators.***" **(That is, higher than, reverse of App-BB)**
   • McKeel comment: Dr. Ziemer perpetuates the misinformation that Dave Allen and DCAS/NIOSH provided to the full Board before they voted to deny GSI SEC-00105 on 12/11/12. The 2/21/13 WG discussion pertains only to Appendix BB that comes into play for complete and partial individual dose reconstructions only. As in Rev 0 of Appendix BB (June 2007 version), radiographers include both isotope and Betatron operators, and they receive a different dose level (~9 REM/yr) compared to Layout men and all other non radiographer personnel (0.72 REM/yr). The difference is that 2012/13 doses being discussed here for inclusion in a future Rev 1 of Appendix BB, Betatron radiographers will get assigned 10-fold **lower doses** by NIOSH compared to other workers.

6. Dr. Anigstein then notes SC&A October 2011 and NIOSH Jan 2012 white papers on Betatrons and portable GSI radiation sources "2.08 is not supposed to be bounding."

7. McKeel notes "***Inconsistent: John Mauro now agrees with Bob Anigstein*** (in opposition to the WG and NIOSH Allen and Neton).

8. Dr. Ziemer notes "I understand **the triangular distribution apply**(ies) **to everyone**."

10. Allen responds, in part: Credible for layout (McKeel note: *missed the last part of this comment.*) -- again the key issue of assigning a final dose is not concluded as it could and should have been after this lengthy a discussion between all parties.

11. Note the WG chair and members and NIOSH had only addressed one McKeel comment about the change in the start date of the GSI AEC operational period to 10/1/52.

1. John Mauro explains why his position on a GSI SEC for the first 10 years 1953-62 has changed over time. He states he has been "*struggling for 5 years about "non radiographers in "off normal" conditions.*" And further: ***"Very difficult to assign.. can assign 12 to 15 plausible upper bound--related to SEC decision."*** And further, ***"Jim Neton strategy can have a hard time placing doses on individuals. Assign distribution to ALL claimants -- at time of particular claimant, you can't do this.***
(add emphasis)
• McKeel comment: These very important sentiments should have been shared with the Board before the SEC vote on Dec. 11, 2012, at the ABRWH Knoxville meeting. The WG mission has now turned to revising Appendix BB. The remarks about the triangular distribution now supported by the WG and NIOSH are highly germane to individual DR done using a future revision of Appendix BB.
• The SEC has been denied by both NIOSH and the full Board, with the concurrence of the TBD-6000 WG and SC&A, and is now in the hands of NIOSH/HHS for a final decision. An administrative appeal after HHS reaches a final decision is the only remedy available to the petitioners to reverse this SEC denial. This work group is not able to modify its 11/28/12 vote to deny SEC-00105. The lone dissenter was Member Beach, who voted for an SEC for the first ten years 1953-1962. The WG vote was 3 to 1 against this limited SEC.

2. Dr. Ziemer's comment "can we separate out who is a radiographer?" McKeel's answer is "**no**." The chairman's assumption that one can assign job categories for all GSI workers has not been substantiated by 5 years of NIOSH and DOL completed DRs. All GSI completed DRs to date except the original 4 (see PER-24) were done with the June 2007 13 page Rev 0 of Appendix BB usng 2 dose levels, i.e., Betatron and Others.

3. Dave Allen's comment is incompletely captured and is thus not 100% interpretable. He seems to be saying, in a very circuitous way, that if we (NIOSH/DOL) cannot correctly identify which individual workers are radiographers, then it may not be possible to assign individual radiographers the highest doses.
• McKeel comment: *Dave Allen on 12/11/12 indicated to the full Board that all GSI radiographers and non radiographers were assigned the highest dose scenario, a fact we dispute under Appendix BB Rev 0 based on personal experience reviewing adjudicated GSI claims. Mr. Allen here retracts his incorrect assertion made to the ABRWH before they voted on GSI SEC-00105.*

4. There was a short break and again Dr. Poston did not answer the DFO's "are you online?" query. This indicates that Member Poston missed major parts of the TBD-6000 WG deliberations on 2/21/13.

5. Dr. Ziemer again directly asked: "Can we distinguish radiographers vs non radiographers?" Then he added: "SEC differs from DR -- assigned highest dose Betatron or layout depending on the years. Appropriate to have a method for *"two dose levels DR, nuclear vs. office workers. Hear from SC&A on this -- possible to establish who worked where sources were."*
• McKeel comment: This is a very odd suggestion, to establish a third category of GSI jobs called office workers. "Nuclear" is a new Class definition, and it is unclear who that would include except that 97% were unmonitored and only 3%, classical radiographers, were badged only between 1963 and June 1966 of the covered period and from July 1,

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5. (continued...) Dr. Ziemer's remark, McKeel comment concluded.

1966 to December 31, 1973, of the residual period when GSI ceased its corporate 1417 State Street, Granite City, IL, manufacturing operations of the Commonwealth Division.
• **The "office worker" category has never before been contemplated on the record at GSI by anyone including the TBD-6000 WG, the full Board, SC&A, or NIOSH**.

1. A discussion ensues between Dr. Ziemer, SC&A and NIOSH about who should be included in the new office worker category.
   • McKeel comment: There is no consensus reached, in fact, the issue becomes more confused as the discussion progresses.

2. Dr. Neton's comment about DOE co-worker models didn't apply to AWE GSI, and was thus off-topic. McKeel did not understand why Neton's comment about TBD-6000 supervisors and production "precedent" was germane. He is correct the difficult issue will be to define who "*works on all sources at the plant outside of the production area.*"
   • McKeel comment: ***That will be impossible***. *Deceased Betatron operator John Terry Dutko certified that most radiographers formerly held non radiographer jobs at GSI before they become isotope or Betatron operators. A significant number of radiographers later took non radiographer jobs at GSI. The CATI interviews cannot accurately depict these job transitions. There were well over a hundred job categories at GSI as was the case at all major steel companies.*

3. This WG has extensively discussed previously that GSI employees such as inspectors, clerks, and many non radiographers such as electricians worked inside and around the Betatron facilities. No one at NIOSH has defined a list of who these people were.

4. Dr. Anigstein mentions again an *ad hoc* Bob Barton study of 100 plus radium era GSI workers only one of whom was a radiographer.
   • McKeel comment: *This actually attests to the fact that NIOSH and DOL, by their own admission, cannot accurately distinguish with sufficient accuracy who held what jobs for what years at particular buildings at GSI. The data is simply not available.*

5. Dr. Anigstein comments the Ziemer job categories differ from those NIOSH proposes.

6. Dr. Anigstein's assertion that Layout only applies to the New Betatron building has been refuted by several former GSI workers (others). That is, the Old Betatron building was serviced by rail and workers frequently laid out shots outside the building while waiting for the previous Betatron job to be completed.

7. Both Dr. Ziemer and SC&A expressed doubts that NIOSH could accurately identify job categories and asked Dave Allen to clarify this point. Dave Allen's reply was difficult for Dan McKeel to understand except that he was responding to the 10 year radium era. His statement McKeel captured did not really make sense, specifically: "***Guideline: In general radiographers assigned to radiographic. Include inspectors, Quality Control. Cannot*** (missed portion)... ***Dose does not include incidents. If DR can establish, assume survivor doesn't know."***
   • McKeel comments: The answer is incomplete and vague. Of course, radiographers would be assigned to "radiographic," a newly coined odd term I have never heard used before at GSI or elsewhere. Perhaps the official 2/21/13 TBD-6000 WG transcript, that has not been released as of 3/8/13, will clarify this key point. Mr. second DR did include a new assignment of an extra 10 REM based on an incident where his pocket "pencil" dosimeter "pinned" at 10 REM and he reported this incident to his supervisor. So ***Mr. Allen is mistaken in saying that "dose does not include incidents."*** In at least one instance it did based on my own experience. I reviewed Mr. two DRs.

1. Drs. Anigstein and Mauro then make their recommendation again but express it in a qualitative rather than the needed quantitative way. That is, what is the limiting dose? The statement is: ***"Use limiting dose: good models. 1 FB record, "evidentiary."***
   • McKeel comment: This statement as captured by McKeel is not clear: My questions are:
   (a) What limit is being proposed? Is it 12 to 15 REM?
   (b) What models are good, specifically? McKeel contends none of the SC&A or NIOSH GSI computer models agree with one another between agencies or over time, and none are validated against real measured data.
   (c) A single film badge record is not representative or sufficient to bound dose for an entire SEC class. This is an example of poor practice, and is the opposite of "good evidence" that WG Member Beach previously referred to on 11/28/12 as "flimsy" and Board Member Brad Clawson characterized on 12/11/13 as NIOSH having "no significant data" for the GSI 1953-62 period.
   (d) What does the term "evidentiary" mean in this context? Clarity is obscured.

2. **McKeel notes that at this point far into the meeting allotted time, Appendix BB matrix issues have not been addressed**. Nor were they to be at this WG meeting.

3. Neton restates his view that a dose of 9 REM is "not appropriate" for "Administrative." He notes NIOSH assigns lower doses to admin personnel at other sites "all the time."
   • McKeel comment: *Then why wasn't this three tier approach used in App-BB Rev 0? NIOSH is obviously attempting to limit assigned doses to avoid the number of reworks of the 80% of denied GSI claims that will be applied for when Appendix BB Rev 1 newly emerges some uncertain time in the future. The next TBD-6000 WG meeting is 4/26/13.*

4. SC&A expresses doubts that admin/office workers can be accurately identified. Note "there are no records." Outcome of job assignment will be "very subjective." John Mauro notes 3 tiers usually at large DOE sites in conjunction with co-worker models with sufficient job data to employ a 95th percentile approach to dose assignment.

5. John Mauro of SC&A states: ***"No film badge data troubled me at the beginning..." "Not averse to policy -- haven't heard what that is."***
   • McKeel comment: *Landauer GSI film badge data applies to only 89 of 3000 workers in one job category (Betatron/isotope radiographers) at GSI 1963-1966. There is zero FB data except for 2 worker summaries for October 1, 1952 through October 1963 for any GSI worker. This fact of monitoring data at GSI being absent for all but 3 of 13 years at GSI cannot be overemphasized. At most, 3% of GSI were ever badged at all.*

6. Dr. Ziemer "did not talk about office workers" reference is unclear.

7. John Mauro makes the extremely important declaration that: ***"15 REM no one got it -- confidence that was why SEC was denied."***
   • McKeel comment: *This is a too late admission by Dr. Mauro that Dave Allen's misleading inference* ***that NIOSH would assign the 15 REM dose to everyone was the major reason GSI SEC-00105 was denied****. This observation is a great example of "**too little, too late.**" The statement had to be made before the Board voted 9 to 8 to deny GSI SEC-00105 on December 11, 2012, at the Knoxville, TN, full ABRWH meeting.*

1. John Mauro stated, again only qualitatively and vaguely, that "careful modeling could be bounded, did not exceed regulatory limits."
   • McKeel comment and questions: What models could bound what doses for what workers? The allusion is to a totally unconfirmed GSI AEC license application by GSI top management. No such film badge program or FB vendor or FB weekly/monthly data has otherwise been proven to have been in place. The 1953 belt "film badge" photo that SC&A constantly alludes to has been identified in a group affidavit by GSI radiographers as probably, and more likely, being a GSI ID badge (identification badge worn by all employees including management). SC&A keeps ignoring this on the record testimony.

2. Dr. Mauro states, ***"NDT mishandling is common,"*** a theme he echoes that was expressed on 12/11/12 to the full Board by member Brad Clawson, who stated he had been a NDT radiographer for 10 years. Mauro further argues for the 12-15 REM dose that he says ***"captures my concern about mishandling. Model is reasonable upper bound for radiographers. 15 limit only applies to badged workers..."***

3a. Dr. Ziemer interrupted and cut off Dr. Mauro, thereby suppressing the obvious fact of the dose disagreement with the Board/WG and NIOSH. In doing so, Dr. Ziemer admits the dose issue cannot be closed right now: "Can't close that part of the loop off right now."

3b. Dr. Ziemer then adds: "***Charge NIOSH to bound office workers***. How to distinguish in DR? Disproves Dr. Ziemer's contention the WG cannot and does not task NIOSH.
   • McKeel comment: *This charge by the WG chair overrules SC&A who noted severe difficulties with identifying office workers definitively. Dr. Ziemer knows this will delay getting to Appendix BB issues for many more months. The record suggests this a poorly hidden agenda of the WG chairman. Backing this up is the fact the next TBD-6000 WG meeting is not scheduled until 4/26/13.*

4. Dave Allen counters that NIOSH advocates "One bound for everyone, three group increases errors." This suggestion opposes Dr. Ziemer's "charge" (order) to NIOSH.
   • McKeel comment: *This pushback and the minimal support by other WG members on the record proves that Dr. Ziemer is primarily pushing his own individual agenda in adding a third office worker very low dose assignment category to Appendix BB Rev. 1.*

5. Thereafter are a series of very brief comments by NIOSH and SC&A going back and forth including higher dose, other jobs can be confusing, triangular for placing the dose.

6. Allen states the important admission that NIOSH ***"never compared the Betatron and Ra radiographers."***
   • McKeel comment: *This is a monumental admission at this point in the 4.5 year SEC and 5.5 year Appendix BB deliberations by this WG after 15 meetings.*

7. Neton again espouses 1 job category but is open to two: non-radiographers and administrative.

8. Mauro of SC&A is "comfortable with clerk, only once or twice in plant/year." McKeel has interviewed several former clerks, one of whom managed the film badge exchanges with Landauer. The other was promoted to a badged Betatron supervisor after being a non badged clerk. I believe Mauro's characterization of clerk exposures at GSI is incorrect..

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8. Mauro (continued...)
Mauro says he has "***come to agree -- how NIOSH can bound***"
• McKeel comment: Mauro has come to agreement with NIOSH on what specific issue or dose assignment or category or policy? Bound what, specifically? The statement is unclear as captured in McKeel notes.

9. Neton of NIOSH here advocates 2 categories. "If not," he asks, "why use CATI?"
• **McKeel summary comment**: ***This discussion of job categories up to this point has been very disorganized and inconclusive with parties constantly asking questions that are not answered clearly and with no consensus being reached. It is impossible thus far to tell anything that the Board members, NIOSH and SC&A members of the WG have agreed to up to this point.***
• McKeel footnote on the CATI: telephone interview given to all part B DR claimants by ORAU. I have asked repeatedly (beginning at a 2006 NIOSH DR workshop in Cincinnati) exactly how CATI information is factored into AWE technical documents apart from being used in the individual DR program? It appears that CATI data is mined intermittently but not thoroughly. To my knowledge, there is no DCAS comprehensive database that incorporates CATI information in specific fields. The main actual use of CATI information is by dose reconstructors for individual claims.

1. The topic turns to dose assignments for Layout man in the cobalt era.

2. **SC&A dose 9.2** (REM/yr) and **NIOSH dose 4.43** based on models using Excel Solver™ software to achieve 10 mRem/wk in control room. **This is normalized to film badges**.
   • SC&A states they "***categorically disagree with that.***"
   • McKeel comment: I do agree with SC&A that adjusting model parameters to return a desired result to match film badge readings is an inappropriate and not scientifically defensible approach. NIOSH achieves a lower, less claimant favorable number, using this badge normalization approach that SC&A objects to strenuously.

3. There follows an argument between Allen and SC&A regarding the two different types of control film badges. The two parties disagree on how film badges are read related to the actual reading and the background density treatment.

4. Dr. Ziemer comments on the different SC&A and NIOSH results and questions whether they apply to Betatron or Layout workers. The disagreement is not resolved.

5. Member Beach asks Dave Allen about the "1966 value 1/2 how does that affect 4.483 dose?"
   • McKeel comment: The meaning and intent of this comment as captured is not clear.

6. Dr. Ziemer intercepted Member Beach's question and answered for Dave Allen, an action he has taken repeatedly to control the discussion. He puts the onus on SC&A to achieve a compromise. Dr. Ziemer assumes the inappropriate role once more as NIOSH advocate.

7. Member Beach reviews again the triangular distribution parameters: 15, 9 and 5 versus 3 REM doses at the corners. McKeel thought the main point of query was whether the lower limit should be 3 or 5 REM. Again, there was no further resolution.

8. Dr. Ziemer then concluded the GSI portion by stating:
   (a) "***then we need to go back to all matrix issues***" (last item page 17a of 18).
   (b) "***Did not go through the residual period -- agree it could be done. Inhalation Ur agreed on source term but not model.***" (last discussion item page 17b of 18).
   • McKeel comment: (a) Appendix BB matrix issues were supposed to be covered at the 2/21/13 TBD-6000 WG meeting (agenda item 1d). The WG also needed to review the two February 2013 white papers by NIOSH and SC&A portions that dealt with the residual period that spans 7/1/1966 through 12/31/1992. (b) "Agree it could be done" is not an accurate statement -- where is that agreement in the record? Who agrees with whom? The starting level of airborne uranium concentration at the start of the GSI residual period has not been established. The appropriateness of using TIB-70 that has been recently revised has been raised by the petitioners but has not yet been addressed by the TBD-6000 WG. An exact method and final doses still must be determined for the GSI residual period and the many businesses that operated at the 1417 State Street location in Granite City, IL, at the "South Plant" complex between 7/1/66 and 12/31/92. The petitioners were instrumental in discovering all of these other businesses and what they did and placing this information into the Docket 140 record and in the hands of the TBD-6000 work group, NIOSH and SC&A. The GSI residual period needs more work.

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The discussion of agenda items 3, 4 and 5 -- Baker Brothers and Simonds Saw and Steel and the March 12, 2013, WG presentation at Augusta, GA, consumed the final 30 minutes of the 2/21/13 WG meeting that adjourned shortly before 3:00 PM EST.

Attachment A

McKeel Analysis of Compensation Comparing AWE Sites With And Without SECs

Attachment B

McKeel GSI White Papers " GSI C.V." list from NIOSH Public Docket 140, **Exhibit 5**, posted to DCAS website on 12/19/12, paper filename: **mckeel121412.pdf**

Attachment C

Robert Anigstein SC&A PDF 8 slide presentation to the TBD-6000 work group 2/21/2013 (slides projected at the meeting in Cincinnati by Bob Barton; Dr. Anigstein by phone)

Respectfully submitted:

Daniel W. McKeel, Jr., M.D. 3/9/13
Founding member SINEW

EEOICPA AWE COMPENSATION RATES, WITH & WITHOUT SECS, 1/8/2013 DOL STATI

SITE (SEC YES/NO)	B COV CASE	B PAID CASE	B % PAID	DR TOTAL
GSI (NO)	333	72	21.60%	288
CHAPMAN VALVE (NO)	154	46	29.90%	134
UNITED NUCLEAR (NO)	102	46	45.10%	68
BLISS-LAUGHLIN (NO)	57	16	28.10%	49
ALLIS-CHALMERS (NO)	7	0	0.00%	4
WR GRACE (NO)	6	2	33.33%	4
			26.34%	
DOW Madison (YES)	231	124	**53.68%**	182
BLOCKSON (YES)	175	129	**73.71%**	141
TEXAS CITY CHEM.(YES)	45	11	24.40%	25
BETHLEHEM STEEL (YES)	2116	1359	**64.22%**	1116
SIMONDS SAW (YES)	260	120	**46.15%**	208
			52.43%	

DR Paid last column: DR paid / DR complete x100 =% DR paid
Chapman AWE has 16 pt E claims - why?
Dow 57 in SEC class paid
Blockson 33 in SEC class paid
Texas City Chemicals 9 in SEC class paid
Bethlehem Steel 158 in SEC class paid
Simonds Saw & Steel 24 in SEC class paid

CONCLUSIONS

1. AWE sites with SECs get paid twice as much under Part B as AWEs without SECs (refutes Alle
2. AWE sites with SECs have 50% more payments for DRs compared to AWE sites without SECs

Submitted by: Daniel W. McKeel, Jr., MD, GSI SEC-00105 co-petitioner

.STICS

DR COMPLETE	DR PAID	% DR PAID
256	66	25.78%
131	46	38.02%
52	17	32.70%
42	15	35.71%
4	0	0.00%
4	1	25.00%
		26.20%
124	42	33.87%
106	59	**55.67%**
14	2	14.29%
929	470	**50.59%**
183	77	**42.08%**
		39.30%

:n 12/11/12 ABRWH testimony)
; (also refutes Allen 12/11/12)

Dragon, Karen E. (CDC/NIOSH/EID)

From: DanMcKeel
Sent: Friday, December 14, 2012 12:56 PM
To: Katz, Ted (CDC/NIOSH/OD); melius@nysliuna.org; NIOSH Docket Office (CDC)
Cc: danmckee
Subject: GSI McKeel info for ABRWH members not voting 12/19/12 & Docket 140
Attachments: MCKEEL_ToABRWH_9.14.12.pdf

Ted Katz, DFO
Dr. James Melius, Chairman, ABRWH
NIOSH Docket 140 (GSI)

Attachment: <MCKEEL_ToABRWH_9.14.12.pdf> 1.9 MB

Dear Ted and Dr. Melius,

Ted Katz, may I ask you to please ensure that all Board members, especially those who have not yet had an opportunity to vote on the GSI SEC-00105 petition, receive the attached PDF cover letter and the combined 7 Exhibits. The contents are my presentations to the full Board on 9/19/12 and 12/11/12, my testimony on 9/19/12 (pages 39-53 of the transcript), my 12/11/12 Public Comment, the external dose slide I mentioned 12/11/12 highlighting very disparate SC&A and NIOSH computer modeled doses for Betatron -*vs*- Layout workers in 2008 and 2012, and a list of my papers presented to the Board and TBD-6000 work group concerning GSI. I feel it is very important that the absent Board members on 12/11/12 get this information right away, before they cast their final votes. Thank you.

NIOSH Docket Office, may I please request you consider the attached PDF file to be posted on the DCAS website under Docket 140 (GSI). Thank you.

Sincerely,

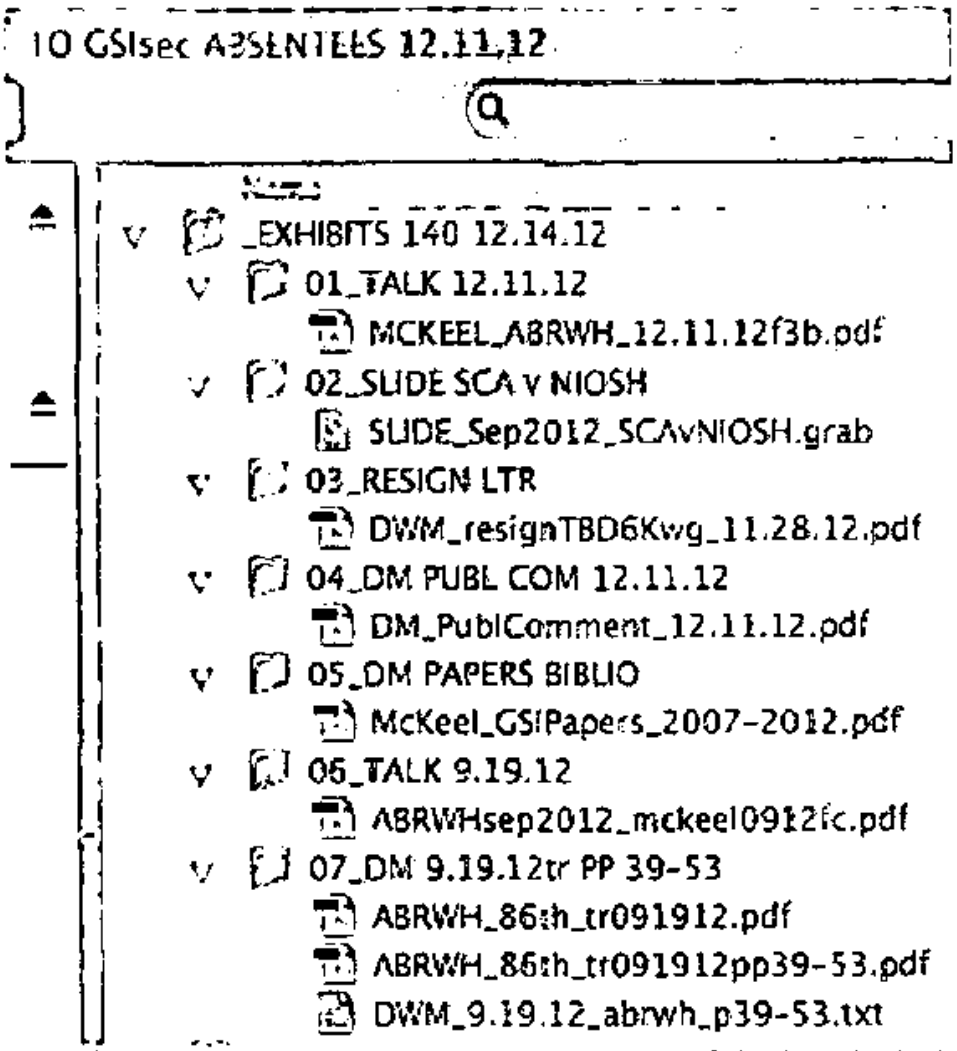
- Dan McKeel 12/14/12

Daniel W. McKeel, Jr., MD
GSI SEC-00105 Co-petitioner

Daniel W. McKeel, Jr., M.D.
GSI SEC-00105 co-petitioner

Documentation of McKeel Presentations at the September and December 2012 ABRWH Meetings 86 & 87 and the November 28, 2012, Meeting of the TBD-6000 Work Group
--December 14, 2012--

The purpose of this assemblage of 7 Dan McKeel documents is to serve as reference for those Board members who missed the GSI SEC-00105 83.13 petition vote by the full Board on September 19, 2012, in Knoxville, TN. These documents will also be submitted today to NIOSH Docket 140 (General Steel Industries AWE site) for posting on the DCAS website: **www.cdc.gov/niosh/ocas**.



The PDF files 01-07 comprise the documents in the current 9.14.12 submission in the attached file named: **McKeel_GSI_9.14.12.pdf**.

DAN MCKEEL LIST OF EXHIBITS 1-7 (December 14, 2012)

EXHIBIT 1 is Dan McKeel's verbal presentation to the ABRWH about GSI SEC-00105 on 12/11/12 when it met in Knoxville, TN. This presentation was delivered just before the full Board voted **7 aye** and **6 nay** with other members absent at the time of the final full Board vote on SEC-00105. The absent members, who include Drs. Poston (work group member), DR. Lockey, and Mike Gibson, may not get to see an official ABRWH 12/11/12 meeting transcript before they cast a final vote.

EXHIBIT 2 a PDF format slide presented 9/19/12 and 12/11/12 to the full Board that highlights large differences in GSI external dose assignments by SC&A and NIOSH computer models to Betatron operators and other workers, including layout men, comparing 2008 with 2012 results. This same slide results were also discussed in detail at the TBD-6000 work group meetings on March 15 and 28, 2012, June 2012, 8/28/12 and 11/28/12.

EXHIBIT 3 is PDF file of Dan McKeel's protest letter read into the record by DFO Ted Katz when the GSI SEC co-petitioner resigned from active participation in the TBD-6000 work group meeting held on 11/28/12. The letter states his reasons why he withdrew.

EXHIBIT 4 is a PDF file of Dan McKeel's Public Comment made on the record immediately following his presentation at the ABRWH 12/11/12 meeting in Knoxville, TN.

EXHIBIT 5 is a PDF bibliographic listing of 38 technical review and informational papers about GSI that Dan McKeel has created and delivered to the TBD-6000 work group and full ABRWH between 2007 and 2012. The active URL links and titles come directly from the DCAS website listing for Docket 140 (GSI).

EXHIBIT 6 is the Powerpoint (PDF version) presentation made to the full ABRWH on September 19, 2012, in Denver, Colorado.

EXHIBIT 7 is two PDF versions of Dan McKeel's Board testimony on pages 39-53 of the 340 page ABRWH meeting court reporter transcript for 9/19/12. One version is formatted as is the original transcript and contains the first 5 pages of the transcript and the last two as well. The second version is copy/pasted to produce a more compact new version with the exact same content. The reader may prefer whichever version is more comfortable for them to read.

Respectfully submitted,

Daniel W. McKeel, Jr., MD 12/14/2012
GSI SEC-00105 co-petitioner
Founding member SINEW

McKeel

EXHIBIT 1

GSI SEC-105 talk to ABRWH in Knoxville

12-11-2012

Daniel W. McKeel, Jr. TALK

12/11/12 ABRWH KNOXVILLE, TN

-- GSI SEC-00105 PRESENTATION --

[1] Good afternoon - Dr. Melius has again restricted me to a 10 minute presentation to highlight the 38 white papers of mine I have sent to the TBD-6000 work group and Board between 2007 and 2011. **The 38 papers total 539 pages**. I must rely on the Board having read these papers, only some of which were discussed in any detail in work group meetings. Often the WG chair simply acknowledged receipt with no further discussion of the contents. Numerous McKeel GSI Public Comments also have been added to the written record.

[2] At the September 2012 Board meeting in Denver I presented SLIDES showing that only six important pieces of real measured external or internal monitoring data have been identified for the GSI Illinois site, as follows:

- A series of 1958-66 AEC MCW purchase orders to do Betatron NDT x-ray work. No P.O.'s have yet been discovered for the 1953-early1958 period;
- A 1962 NCC limited radiologic survey of the 2 Co-60 sources in building 6;
- A 1968 radiologic survey by GSI personnel of the New Betatron building with a larger Co-60 gamma source;
- Two 1962 and 1963 NCC radiation film badge reports from two workers;
- 89 GSI radiographer Landauer film badge reports 1963-1966. These data represent only 3% of the total annual work force of about 3,000 workers, and they are **all males** doing a **single job** out of hundreds at the plant (10% of the GSI workforce was estimated to be female);
- Uranium dust concentrations were measured in and around a small industrial vacuum in 1992 in the Old Betatron facility during the DOE/FUSRAP uranium cleanup that closed the residual period;

[3] ALL of the other monitoring data at GSI is either surrogate or modeled using MCNPX. NIOSH and SC&A have no Betatron x-ray data, surrogate or measured, from

any site, to validate their computer model results. These key data seem not to exist. GSI is an absolutely unique site in this regard.

[4] A slide we showed in September showed very disparate SC&A and NIOSH computer modeling results over time, comparing 2008 with 2012 data, and between the two entities. Model agreement ranges between 2-fold and 12-fold between entities with some concerning ratio reversals. The peer review literature standard for validating computer models is that agreement with real measured data should be ± 10 to 20 percent, not 200 percent.

[5] The SC&A revised GSI SEC-00105 issues matrix I received was dated November 30, 2012, two days after the TBD-6000 work group met. Another GSI SEC matrix version dated Dec. 5th has been posted for this meeting. Those matrices have not been discussed by Dr. Ziemer's work group.

• I now address the November 28, 2012, TBD-6000 work group meeting draft transcript that DFO Ted Katz provided to me last Friday. My two GSI petitioner colleagues, and carried the ball at the Nov. 28 meeting for reasons I made clear in a protest letter Ted Katz read into the record and then circulated to all of you. **Today, I stand by every word in that letter.** ***The GSI claimants have been treated very unfairly by the TBD-6000 work group.***

[6] The SC&A August 2012 analysis of Allen's 3 NIOSH AWE surrogate sites failed to meet 4 of 5 Board surrogate data criteria. However, by some magical reasoning that baffles the GSI petitioners, on Nov 28, 2012, SC&A had reversed positions completely, so that by now 5 of the 7 Allen-DCAS sites satisfied ALL 5 Board surrogate data criteria.

I strongly support the SC&A August analysis for the following reasons:

• The Allen surrogate sites are not comparable to GSI uranium operations or the forms of uranium used. To be specific:

a) GSI used only Mallinckrodt ingots, uncropped dingots, "betatron slices," and some billets. The surrogate Allen-NIOSH sites used uranium dingots, billets, derbies and slugs but no ingots or betatron slices.

b) The surrogate sites did not perform 24-25 Mev Betatron x-ray radiography on their uranium. That is why the AEC was actively collaborating with GSI in 1952 to imporve x-ray images soon after the first Betatron was put into operation in January 1952.

c) The DCAS surrogate sites have not been "stringently justified." Allen admits this, saying he will do the justification in a revised Appendix BB at some undefined time in the future. **This is not acceptable**: NIOSH needs to be able to demonstrate stringent justification today, *before* this full Board votes on GSI SEC-00105.

[7] Six GSI SEC issues were moved to the Appendix BB issues matrix as was mentioned at the 11/28 WG meeting. Those issues were deliberately left open to be resolved and closed later in 2013. This was a poor decision, because they were still SEC issues that needed to be resolved prior to the final recommendation.

[8a] There is zero monitoring of uranium air intakes or urine uranium bioassays, or of GSI external Beta and Neutron doses, for any GSI site worker 1952-1993. SC&A and NIOSH admit this fact.

[8b] The only film badge data for GSI is for radiographers 1963-73. The Landauer GSI film badges only read photons. Radiographers only wore their badges part time. 97% of the GSI work force of 3,000 covered in the SEC-105 class were never badged. They should have been because Betatron-activated castings were all over the plant.

[9] TIB-70 surrogate data is not appropriate for modeling GSI residual period uranium intakes. The TIB is based on a known start value that steadily declines. At GSI there were periodic uranium dust resuspension cycles due to power washing both Betatron buildings, renovation construction at the New Betatron facility, and new

operations within Buildings 6 through 10. All this was presented and agreed to by all parties at the 8/28/12 TBD-6000 WG meeting. TIB-70 does not model this scenario.

[10] Petitioners have submitted three DOE documents that prove GSI Betatron AEC-MCW operations were underway during November and December 1952. Those documents have been available since 1998 in the ORO RHTG unclassified database, and on the FUSRAP website as IL.28-5, and as an ORAU data capture dated April 4-8, 2011. We circulated the key information to the Board, work group, SC&A, NIOSH, and DOE on Oct. 19th and to DOL on December 5th and 10. The 1952 GSI betatron AEC collaboration data should have resulted in changing the GSI operational period start date from Jan. 1, 1953, to Nov. 1, 1952, long ago. We hope that will be done soon.

[11] Member Beach on 11/28/12 offered a motion to recommend **approving a GSI SEC for 1953-62**. That motion died because there was no second by the other three WG members. Dr. Ziemer's slide presentation for today omitted that important fact.

In closing, The TBD-6000 work group, NIOSH and SC&A have had 5+ years since June 2007 to fully resolve all Appendix BB Rev 0 issues. The SEC-105 deliberations have taken 4+ years to come to this point. The petitioners, "the fifth vote" in this drama, from the outset have recommended this Board APPROVE an SEC for GSI from 1953 to 1993. We urge the Board to do the right thing and cast this approval vote today.

- verbal run through #1 ~10 minutes 8:57 to 9:07 CST
- text edits...
- verbal run through #2: 11 minutes
- re-edit taxt to shave 1 minute
- verbal run through #3: no time left...

McKeel

EXHIBIT 2

GSI SEC-105 talk to ABRWH in Knoxville:

==========

Slide comparing SC&A with NIOSH Modeled External Betatron & Layout Worker Doses 2008 vs 2012

12-11-2012

2008 & 2012 Models Disagree

COMPUTER MODELED ANNUAL PHOTON DOSE DURING GSI COVERED PERIOD 1953-1966 (Rem/YR)

DATA SOURCE	2008 BETATRON	2012 BETATRON
NIOSH	1.0-6.3 (App BB) ND[3] (SEC ER)	0.2-.62 var.
SC&A mcnpx	12.4 - 13.6	1.35

DATA SOURCE	2007-2008 OTHERS	2012 LAYOUT
NIOSH	1.73 (App BB) 0.417 [note 1]	1.02-2.03
SC&A mcnpx	[see note 2]	9.20

Note 1: Annual dose assigned to only 1 of 3 non-Betatron worker exposure scenarios in SEC-00105 SEC evaluation report.

Note 2: SC&A review of Appendix BB, 4/21/08 Betatron doses bounded layout men and Co-60 operators which in turn bounded chainmen and all other workers. No actual values given for this large subset of the GSI work force.

[3] ND = not done; no annual dose values given in SEC ER

McKeel

EXHIBIT 3

GSI SEC-105 talk to ABRWH in Knoxville:

==========

McKeel Letter referenced in 12.11.12 ABRWH talk:

SEC Co-petitioner Resigns from Participating in 11/28/12 TBD-6000 Work Group Meeting

12-11-2012

General Steel Industries SEC-00105 Co-petitioner
Daniel W. McKeel, Jr., M.D.
Letter to the TBD-6000 Work Group

November 28, 2012

To members of the TBD-6000 work group and staff of the ABRWH,

I am today resigning by this letter, in protest, from active participation in the further deliberations of the ABRWH TBD-6000 work group concerning GSI Appendix BB and SEC-00105. I have become persuaded that a majority of this work group, together with the DCAS and SC&A representatives, have exhibited a longstanding persistent personal bias against adequately evaluating the many substantial scientific contributions made to the ABRWH since 2005 by myself, other GSI site experts, and the GSI petitioner team. In particular, GSI claimants have been denied statutory due process under EEOICPA 2000 by not having Appendix BB to Battelle TBD-6000 revised in a timely and factually accurate manner since it was released in June 2007.

McKeel personal contributions have included: (a) in 2006, being the first person to alert the ABRWH, DCAS and SC&A to the existence of Landauer film badges for a limited number of GSI radiographers 1963-1973; (b) to clearly define all of the radiation source terms at GSI in conformance with DCAS directive OCAS-IG-003, via NRC FOIA 2010-0012, of 1,1016 pages of AEC by-product license material for GSI; and (c) most recently, via DOE ORO FOIA 2013-00013, I have shown that during November and December 1952 an active collaboration was ongoing among MCW, AEC Oak Ridge Office (ORO), and GSI personnel in developing Betatron radiography uranium imaging techniques that were applied to thin slices of MCW ingots. A special uranium shield fabricated at MCW was used to contain scattered radiation fields from the 24 Mev Betatron x-ray beam. The stated purpose was to provide higher quality x-ray images of AEC/MCW uranium products.

Furthermore, DCAS/NIOSH and SC&A and certain Board members have chosen to ignore a large fraction of the above and other numerous factual contributions, as oral and written comments and papers, by the petitioner/site expert and GSI worker/claimant team as reflected in the transcripts of TBD-6000 work group and ABRWH full Board meetings. Various HHS FOIA and DCAS personnel have made accessing crucial GSI SRDB documents especially difficult. For example, obtaining a single copy of Harris-Kingsley 1958 from the CDC/ATSDR FOIA Office took over two and a half months. Many of my e-mail requests to the TBD-6000 work group chairman go unanswered by him, except through a surrogate, the DFO or NIOSH SEC Counselor, neither of whom are the Board or work group secretary *per se*.

Finally, I am persuaded that, for GSI at least, the SC&A evaluation team has switched from strongly recommending a GSI SEC for the first 10 years in October 2010, to its present position in supporting a denial of SEC-00105. SC&A is no longer acting as an effective oversight agent for the Board, at least in the case of GSI. Rather, it and the work group chair have become stalwart scientific allies and collaborators with DCAS. The SC&A review paper released to me on November 26, 2012, at 12:30 p,m, is a prime example of the close collaboration between SC&A and DCAS. Whereas in their August 2012 paper SC&A found that use of a uranium slug facility in TBD-6000 failed to pass the 5 Board surrogate data criteria, now SC&A finds that David Allen's slug facilities meet all Board surrogate data criteria. Four Allen Aug/Nov 2012 white paper AWE sites have only 14 claims and 13 dose reconstructions between

them and no one has been compensated. Those AWE sites and the Weldon Spring DOE site are judged by SC&A and DCAS to be "stringently justified" as being comparable to GSI. This is scientifically ludicrous and offensive! It is definitely scientifically indefensible in my opinion.

Also, the authors of the November 25, 2012, SC&A review of Allen 11/6/12, continue to insist that uranium ingots and dingots sent from MCW to GSI had only a few uranium oxide flakes on their pure uranium surfaces that were easily rubbed off. The petitioners and site experts have proven beyond a reasonable doubt, using technical publications and photographs, that MCW-Destrehan Street and Weldon Spring site uranium dingots of the type sent to GSI for NDT radiography were rough surfaced and taller than they were wide before cropping. SC&A ignores the proven fact that the adherent magnesium-fluoride slag or crust of MCW uranium ingots and dingots sent to GSI 1953-1966 contained radioactive daughter products of uranium and Betatron activation products. The DCAS term "cold uranium" is inappropriate. SC&A and DCAS continue to ignore the well substantiated fact that GSI NDT Betatron radiography defined the interface between pure MCW uranium and the tightly adherent crust. Detecting structural flaws competed with this prime MCW/AEC directive. Objective science has been abandoned to the detriment of GSI claimants. Please refer to NIOSH Docket 140 for more documentation of statements in this letter.

Thank you for this added opportunity to set the record straight.

Reference: OCAS-IG-003, Rev 0, 11/05/2007, 11 pages, title: "Radiation Exposures Covered for Dose Reconstructions under Part B of the Energy Employees Occupational Illness Compensation Program Act" (Approval: James W Neton, Concurrence: LJ Elliott)

Sincerely,

Daniel W. McKeel, Jr., M.D. 11/27/12

McKeel

EXHIBIT 4

Dan McKeel
PUBLIC COMMENT to
ABRWH in Knoxville:

12-11-2012

DM_PublComment_12.11.12.rtf

PUBLIC COMMENT – DAN MCKEEL
-- 12/11/12 –

Good afternoon again.

I want to respond to several points just made in the GSI SEC session that I feel need to be corrected immediately and put on the record.

[1] David Allen and DCAS' suggestion that recommending an SEC for the early years 1953-62 might actually be a BAD THING and be "claimant unfavorable," was the way he put it, is misleading to GSI and other claimants. Larry Elliott, former DCAS director told me the same tall tale way back in 2005. Since then I have checked out this proposition that seemed incredible to me at the time and it certainly has turned out to be "not true" in practice.

Compare EEOICPA compensation history for the GSI and Dow IL "sister sites" right next to one another. GSI has twice as many claims, cases, and DR completed, yet the total Part B compensation amounts are $10 million+ dollars at GSI with no SEC and a far longer covered period, compared to $17+ million dollars at Dow with a 1957-60 SEC. I have had it confirmed by many observers that SEC sites do far better compensation-wise despite the 22 SEC cancer restrictions.

And Mr. Allen speculated on the types of cancers GSI claimants might have, a fact that he doesn't really know.

2. David Allen's answers to member Richardson's questions about non-radiographers being assigned <u>higher</u> doses that Betatron doses was not accurate or complete. In 2012 the SC&A assigned dose for GSI "layout men," a term Allen did

not use once, was 9.2 REM/year compared to 0.7 REM per year for Betatron operators. In 2008, SC&A's assigned doses for Betatron operators in the SEC ER were 10-fold higher than for other GSI workers. I have shown these comparative data to the Board in September.

3. Mr. Allen repeatedly referred to NIOSH always using the scenario that gave the highest assigned dose in their dose reconstructions. This is simply NOT TRUE based on GSI DRs I have seen. The non-radiographers often get the lower of two doses Appendix BB specifies. Everyone is NOT assigned the Betatron operator dose.

4. David Allen has replied by an e-mail I have seen to a GSI Docket 140 contributor, who I won't name because it will be redacted from the transcript, that the future Rev 1 revision of Appendix BB will result in lower assigned total dose for many claimants, so there won't be that many reopened denied claims that will be reworked and approved for compensation. Allen's reason: NIOSH will be doing far more "best estimate DRs in APPENDIX BB."

There are many other points I would like to have added to or to have rebutted, however I will reserve those for a later time.

My final comment is, it is a shame that GSI claimants have to wait perhaps weeks to learn the outcome of today's final vote. My question to Mr. Katz and the Board that maybe they can answer now, is how will GSI claimants be informed of the Board's final SEC-00105 decision? I want to sincerely thank all members who did do the right thing and vote NO to NIOSH's ill conceived recommendation to deny

GSI an SEC today.

Thank you. -- Dan McKeel 12/11/12

NOTE: Chairman Melius responded to Dan McKeel the "public process" would have to take place before claimants could be notified of the final vote tally on the GSI SEC. The claimants may not, or admittedly will not be able to learn about the final SEC-00105 vote until the next Advisory Board meeting "next year," no date mentioned. I was the only person in the ABRWH venue hotel room or on the phone to make a Public Comment this day.

McKeel

EXHIBIT 5

Dan McKeel
BIBLIOGRAPHY
of 38 Papers
submitted to the
ABRWH and the
TBD-6000 Work Group
2007-2012

12-11-2012

Daniel W. McKeel, Jr., M.D.

BIBLIOGRAPHY OF MCKEEL PAPERS
Submitted to the ABRWH

General Steel Industries (GSI)
NIOSH Docket 140

Comments Received:

- Comments from Daniel W. McKeel, Jr., M.D. regarding GSI betatron testing
  (November 19, 2012)
  PDF 2 MB (13 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding NIOSH/DCAS: Evaluation of Additional Air Sample Data Applicable to GSI
  (November 10, 2012)
  PDF 4 MB (20 pages)

  Addendum 1
  (November 10, 2012)
  PDF 1 MB (4 pages)

  Addendum 2
  (November 26, 2012)
  PDF 6 MB (9 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding his presentation at the September 19, 2012, Advisory Board meeting
  (September 21, 2012)
  PDF 3 MB (14 pages)

- Co-Petitioner Daniel W. McKeel, Jr., MD Presentation: General Steel Industries SEC Petition 105
  (September 18, 2012)
  PDF 437 KB (7 pages)

- Annotated transcribed notes submitted by Daniel W. McKeel, Jr., M.D. from the August 28, 2012, Meeting of the Advisory Board's Work Group on TBD-6000
  (September 2, 2012)
  PDF 897 KB (43 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding NIOSH: Use of Surrogate Data at GSI Response to SC&A Review Dated July 16, 2012
  (August 26, 2012)
  PDF 4 MB (16 pages)

  Addendum
  (August 26, 2012)
  PDF 1 MB (6 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding the agenda for the August 28, 2012, Meeting of the Advisory Board's Work Group on TBD 6000
  (August 21, 2012)
  PDF 54 KB (3 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding the SC&A Memo: Alternative Model for the Calculation of Uranium Intakes at GSI
  (August 5, 2012)
  PDF 9 MB (28 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding the General Steel Industries Special Exposure Cohort Petition-00105
  (July 26, 2012)
  PDF 589 KB (14 pages)

- Comments from Daniel W. McKeel, Jr., M.D. regarding the General Steel Industries *Special Exposure Cohort Petition-00105*
  (July 10, 2012)
  PDF 7 MB (24 pages)

- Comments from Daniel W. McKeel, Jr., M.D. on David Allen DCAS Memo Dated June 8, 2012 to the TBD-6000 Work Group of the ABRWH in Response to the SC&A Discussion Paper Update on GSI Intake Doses
  (June 13, 2012)
  PDF 439 KB (6 pages)

- Comments from Daniel W. McKeel, Jr., M.D. on SC&A Discussion Paper dated 5/30/12 titled "Update of "Review of 'Site Profiles for Atomic Weapons Employers That Worked Uranium and Thorium Metals - Appendix BB: General Steel Industries" Battelle-TBD-6000, Appendix BB," Occupational Internal Dose
  (June 2, 2012)
  PDF 7 MB (26 pages)

- Comments from Daniel W. McKeel, Jr., M.D. on SC&A Discussion Paper dated 5/30/12 titled "Update of "Review of 'Site Profiles for Atomic Weapons Employers That Worked Uranium and Thorium Metals - Appendix BB: General Steel Industries" Battelle-TBD-6000, Appendix BB," Occupational Internal Dose
  (June 1, 2012)
  PDF 7 MB (26 pages)

- Submission from Daniel W. McKeel, Jr., M.D. requesting that technical documents and comments he made between 2/28/12 and 3/28/12 be posted to Docket 140 and sent to the Advisory Board
  (May 21, 2012)
  PDF 3 MB (4 pages)

  - Attachment 1: Critique of the NIOSH January 2012 White Paper "Dose Estimates For Betatron Operations"
    PDF 7 MB (31 pages)

  - Attachment 2: Docket 140 General Steel Industries - Addendum #1 to 2/28/2012 Submission
    PDF 8 MB (36 pages)

  - Attachment 3: Corrected Concrete Activation Isotopes, SEC Issues 5 and 6 From the David Allen/DCAS October 2010 "Path Forward for GSI" Report
    PDF 4 MB (6 pages)

  - Attachment 4: Memo - E-mail from [redacted] to DWM 3/22/12 RE: MCNPx code
    PDF 858 KB (4 pages)

  - Attachment 5: Dan McKeel GSI-00105 Co-Petitioner Comments, Part 1, to David Allen Addendum 3 to his January 2012 Betatron Operations White Paper (via e-mail)
    PDF 9 MB (14 pages)

  - Attachment 6: Daniel McKeel GSI Co-Petitioner Comments, Part 2: David Allen January 2012 Betatron White Paper, ADDENDUM 3: New Betatron Scenario For Layout Worker Exposures; Interpretation of McKeel-Landauer Program 2084 (GSI) Film Badge Data (March 25, 2012) by Daniel W. McKeel, Jr.
    PDF 8 MB (12 pages)

  - Attachment 7: McKeel Petitioner Comments on NIOSH Allen August 2011 and January 2012 Path Forward For GSI White Papers and Addenda to Them
    PDF 4 MB (7 pages)

  - Attachment 8: E-mail from Dan McKeel to Ted Katz - Request to distribute TBD-6000 work group information to full Board
    PDF 2 MB (3 pages)

- Docket 140 (GSI) Submission from Daniel W. McKeel, Jr., M.D.; presentation to the Advisory Board's Work Group on TBD 6000 on March 15, 2012
  (March 17, 2012)
  PDF 5.3 MB (29 pages)

- Docket 140 (GSI) Submission from Daniel W. McKeel, Jr., M.D.
  (March 11, 2012)
  PDF 82 KB (1 page)

  Docket 140 General Steel Industries; Addendum 1 and 2
  PDF 4.8 MB (37 pages)

- Docket 140 (GSI) Submission from Daniel W. McKeel, Jr., M.D., regarding the NIOSH January 2012 White Paper on "Dose Estimates For Betatron Operations"
  (February 27, 2012)
  PDF 2 MB (1 page)

  Attachment: Critique of the NIOSH January 2012 White Paper "Dose Estimates For Betatron Operations"
  PDF 4.2 MB (24 pages)

- Comments from Kent Wall, in Response to the November 2, 2011, Advisory Board's Work Group Meeting on TBD 6000
  (November 4, 2011)
  PDF 1 MB (2 pages)

- Comments from Daniel W. McKeel, Jr., M.D., on a new General Steel Industries related 1978 report: OSHA Regulates Betatrons & Accelerators
  (September 6, 2011)
  PDF 97 KB (6 pages)

- Comments from Daniel W. McKeel, Jr., M.D., on the General Steel Industries SEC Petition (NIOSH SEC-00105)
  (July 22, 2011)
  PDF 203 KB (4 pages)

- Comments from Daniel W. McKeel, Jr., M.D., on the General Steel Industries SEC Petition (NIOSH SEC-00105)
  (March 12, 2011)
  PDF 3.5 MB (19 pages)

- Comments from Daniel W. McKeel, Jr., M.D., on the General Steel Industries SEC Petition (NIOSH SEC-00105)
  (February 7, 2011)
  PDF 2.7 MB (4 pages)

- Comments from Daniel W. McKeel, Jr., M.D., on the General Steel Industries SEC Petition (NIOSH SEC-00105)
  (April 26, 2010)
  PDF 163 KB (3 pages)

- Comments from Daniel W. McKeel, Jr., M.O., on the General Steel Industries SEC Petition (NIOSH SEC-00105)
  (December 12, 2009)
  PDF 7 MB (10 pages)

  Note: The documents mentioned in the above comment can be viewed on the U.S. Nuclear Regulatory Commission Web site.
  External Link: http://adamswebsearch2.nrc.gov/idmws/ViewDocBy Accession.asp?AccessionNumber=ML093510887

- Comments on the Site Profile for Atomic Weapons Employers that Worked Uranium and Thorium Metals document, Appendix BB -- General Steel Industries

  - Critique to NIOSH of Appendix BB to Battelle TBD-6000 for the General Steel Industries SEC AWE Site
    PDF 1.1 MB (23 pages)

    NIOSH written response to "Critique to NIOSH of Appendix BB to Battelle TBD-6000 for the General Steel Industries SEC AWE Site"
    PDF 1 MB (11 pages)

  - Comment and Reply Re: Appendix BB to Battelle TBD-6000 for the General Steel Industries Site. Submitted to OCAS and its Director, Larry Elliott, as a public comment to the July 17-19, 2007, ABRWH meeting and as a public docket comment to the Appendix BB for posting on the OCAS Web site.
    PDF 1.1 MB (23 pages)

    NIOSH written response to "Comment and Reply Re: Appendix BB to Battelle TBD-6000 for the General Steel Industries Site. Submitted to OCAS and its Director, Larry Elliott, as a public comment to the July 17-19, 2007, ABRWH meeting and as a public docket comment to the Appendix BB for posting on the OCAS Web site."
    PDF 1.2 MB (13 pages)

The first "**Critique to NIOSH of Appendix BB to Battelle TBD-6000 for the General Steel Industries SEC AWE Site**" document was contributed by GSI SEC-00105 co-petitioner Daniel W. McKeel, Jr. It incorporates remarks made as an ABRWH general meeting PUBLIC COMMENT. The written response by NIOSH was the first and last written response that NIOSH ever made to any of the Dan McKeel white papers that followed and are listed above in this bibliographic compilation. The other 3 documents were from [redacted] GSI site expert and from NIOSH.

Summary of McKeel Submissions (total papers = 30 + 8 attached papers)

Bibliography Pg.	No. of Papers	Total pages/ Page	Papers by Years
1	9		2012 all
2	7		2012 all
3	1 + 8 attachments		2012 all
4	11		2010/11, 2012(5)
5	2		2007, 2009

DAN MCKEEL GSI PAPER BIBLIOGRAPHY: PAGE COUNT SUMMARY 12/8/12

DOC PAGE	No. Pages	Duplicates
1	13	
1	20	
1	4	
1	9	
1	14	
1	7	
1	43	
1	16	
1	6	
2	3	
2	28	
2	14	
2	24	
2	6	
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3	4	
3	31	Attached 1
3	36	Attached 2
3	6	Attached 3
3	4	Attached 4
3	14	Attached 5
3	12	Attached 6
3	7	Attached 7
3	3	Attached 8
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4	1	
4	37	
4	1	
4	24	
4	2	
4	6	
4	4	
4	19	
4	4	
4	3	
5	10	
5	23	
TOTAL	539	**113**
Less Attached	**426**	

Page	No. Papers	No. attachments
1	9	0
2	7	0
3	1	8
4	11	0
5	2	0
	30	8

Pages per document Page	
DOC page	Pages total
1	132
2	127
3	117
4	130
5	33
	539

McKeel Papers by Year		
YEAR	PAPERS	ATTACHMENTS
2012	23	8
2011	5	0
2010	1	0
2009	1	0
2008	0	0
2007	1	0

McKeel

EXHIBIT 6

Dan McKeel
Talk to the 86th
ABRWH in Denver
September 19, 2012

12-11-2012

Daniel W. McKeel, Jr., MD

General Steel Industries (GSI)

SEC-00105 Co-petitioner

September 19, 2012

SLIDE 1

TITLE: **Real data AEC operational period 1953-June 1966**

- Landauer film badges on 89 radiographers Nov 1963-1966; 3% of workforce of 3000, one job out of hundreds, not assigned the highest external dose, not worn in plant outside OBB/NBB
- 1962 one time survey of photons in Bldg 6 radiography Co-60 by Nuclear Consulting Corp. (NCC)
- MCW Uranium Division purchase orders for Betatron NDT radiography 1958 through June 1966 (1953 through Feb 1958 missing) -- No uranium weights or information on percentage or numbers of 3300 lb dingots/ingots, billets and slices; all shipping manifests and weights and x-ray records missing

SLIDE 2

TITLE: **Real data on residual contamination period 7/1/66->1993**

- One time 1971 radiologic survey of New Betatron Building by GSI radiation safety officers using 80 Curie C0-60 source.
- Landauer film badge data on 19 additional radiographers from July 1, 1966 to close of GSI operations in 1973 (0.3% work force)
- Bechtel/ORNL/DOE uranium radiologic survey of NBB and OBB between 1988 and 1 week remediation in 1993 of uranium in Old Betatron building. Uranium alpha on floor, in vents, and in small industrial vacuum in OBB. No Ur found in NBB. **[FUSRAP program]**
- No survey ever of other GSI buildings that formed a long AEC uranium transport pathway: Weighing scales, loading dock, transfer to rail cars, RR tracks through Bldgs. 5 through 10 into OBB and NBB that formed only a tiny fraction of the air volume/space along the uranium contamination pathway (had uranium ever been surveyed there by GSI or DOE).

Slide 3

TITLE: **Key GSI events during the residual period 1966-1993**

- OBB had been power washed and cleaned in 1973 and 1984;
- NBB had been power washed/cleaned and renovated for offices in 1973, August 1978, and 1984;
- **National Steel** taught classes in the New Betatron Bldg. offices;
- Multiple companies used former GSI buildings for operations:
  a) 5 and 6 for steel "pickling" (conc. acid cleaning) rolled steel: **Granite City Pickling & Warehouse** from 1984 to present;
  b) 8, 9 and 10 for "slitting" steel rolls: **Michigan Metals Processing** (1978 through 1981) and **Affiliated Metals** (dates uncertain).
- Overhead crane w/magnet to clean dust from GSI Bldgs. 5 --> 10.
- Multiple users and intermittent operations = massive dust disturbance that make accurate modeling and bounding difficult or impossible.

Slide 4

TITLE: **Reasons GSI deserves an SEC recommendation by the Board**

Part 1

- Operational period: No MCW uranium purchase orders 1953-Feb 1968;
- Limited real data: 3 items AEC contract years; 3 items residual years;
- Nonexistent intake data sampling: breathing zone, general air, process;
- No urinary uranium bioassay for radiographers or anyone in workforce;
- Most of GSI work force should have been badged; worked on activated steel: 3% badged during 3 of 13 years of operation period; 0.7% were badged during 8 of 20 years of the residual period (99.3% no badge); 97% of GSI work force never badged 1953-1966. Not representative;
- Zero monitoring of beta or neutron doses at GSI 1953-1993;
- MCNPx models not validated by any real measurements of Betatron skyshine, activation products; results differ wildly with SC&A and over time: Betatron operators >~10-fold> Layout 2008; reverse found in 2012.
- NIOSH has not used valid models to bound all GSI sources: Ra-226 (2 sources), Co-60 (3 sources); Ir-192 (1 source); (2) 250 Kvp X-ray units.

2008 & 2012 Models Disagree

COMPUTER MODELED ANNUAL PHOTON DOSE DURING GSI COVERED PERIOD 1953-1966 (Rem/YR)

DATA SOURCE	2008 BETATRON	2012 BETATRON
NIOSH	**1.0-6.3** (App BB) **ND**[3] (SEC ER)	**0.2-.62 var.**
SC&A mcnpx	**12.4 - 13.6**	**1.35**

DATA SOURCE	2007-2008 OTHERS	2012 LAYOUT
NIOSH	**1.73** (App BB) **0.417** [note 1]	**1.02-2.03**
SC&A mcnpx	[see note 2]	**9.20**

Note 1: Annual dose assigned to only 1 of 3 non-Betatron worker exposure scenarios in SEC-00105 SEC evaluation report.

Note 2: SC&A review of Appendix BB, 4/21/08 Betatron doses bounded layout men and Co-60 operators which in turn bounded chainmen and all other workers. No actual values given for this large subset of the GSI work force.

[3] ND = not done; no annual dose values given in SEC ER

Slide 5

TITLE: **Reasons GSI deserves an SEC recommendation by the Board**

Part 2

- Rad safety program rudimentary 1953-1993. NCC license documents are inadequate based on Watertown Arsenal AEC compliance program;
- NIOSH has no valid Ur intake model 1953-1993; failed surrogate criteria; At least three previous attempts have failed to pass Board/WG scrutiny.
- NIOSH rejects SC&A alternate model that had to be withdrawn because Betatron buildings had been washed/cleaned multiple time 1973-1993.
- NIOSH "new" surrogate data not based on uranium ingots/dingots that was the product MCW primarily sent to GSI for betatron NDT radiography. NIOSH "better" surrogate sites were not stringently justified: 2 slug and 1 billet facilities proposed; no dingot facilities similar to MCW-GSI;
- NIOSH has never recovered from Mallinckrodt the multitude of Betatron NDT related records (shot logs, x-ray reports, shipping manifests, etc.) from GSI generated over 13 years of the AEC uranium NDT contract (only purchase orders February 1958-June 1966).

McKeel

EXHIBIT 7

Dan McKeel
Talk to the 86th
ABRWH in Denver
September 19, 2012
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Transcript Pages 39-53
(original + condensed)

12-11-2012

UNITED STATES OF AMERICA

CENTERS FOR DISEASE CONTROL

+ + + + +

NATIONAL INSTITUTE FOR
OCCUPATIONAL SAFETY AND HEALTH

+ + + + +

ADVISORY BOARD ON RADIATION AND
WORKER HEALTH

+ + + + +

86th MEETING

+ + + + +

WEDNESDAY
SEPTEMBER 19, 2012

+ + + + +

The meeting convened at 8:30 a.m., Mountain Daylight Time, in the Denver Marriott Tech Center, 4900 South Syracuse, Denver, Colorado, James M. Melius, Chairman, presiding.

PRESENT:

JAMES M. MELIUS, Chairman
HENRY ANDERSON, Member
JOSIE M. BEACH, Member
BRADLEY P. CLAWSON, Member
R. WILLIAM FIELD, Member
DAVID KOTELCHUCK, Member
RICHARD LEMEN, Member
JAMES E. LOCKEY, Member
WANDA I. MUNN, Member

DAVID B. RICHARDSON, Member

PRESENT: (CONT.)

GENEVIEVE S. ROESSLER, Member
PHILLIP SCHOFIELD, Member
PAUL L. ZIEMER, Member
THEODORE M. KATZ, Designated Federal Official

REGISTERED AND/OR PUBLIC COMMENT PARTICIPANTS:

ADAMS, NANCY, NIOSH Contractor
ALEXANDER, TERRY
ALLEN, DAVE, DCAS
BARRIE, TERRIE
BROCK, DENISE, DCAS
BURGOS, ZAIDA, NIOSH
CARROLL, STEPHANIE
DOBROVOLNY, MARK
EATON, CLARISSA*
EVASKOVICH, ANDREW
FITZGERALD, JOE, SC&A
GALLAGHER, DEE
GLOVER, SAM, DCAS
HINNEFELD, STU, DCAS
JERISON, DEB
JESKE, PATRICIA*
KENNEY, CECELIA, DOE
KINMAN, JOSH, DCAS
KOTSCH, JEFF, DOL
LEWIS, GREG, DOE
LIN, JENNY, HHS
MAKHIJANI, ARJUN, SC&A
MAURO, JOHN, SC&A*
MAUSER, TERRIE*
MCCFEE, MATTHEW, ORAU Team
MCKEEL, DAN*
NETON, JIM, DCAS
RAY, SARAH*
RUTHERFORD, LaVON, DCAS
STIVER, JOHN, SC&A
TAULBEE, TIM, DCAS

*Participating via telephone.

TABLE OF CONTENTS

that's why I was asking how many samples there were -- the highest was 11 dpm per cubic meter, which sort of falls into the same range of the limited samples from Leblond and I would think also reflects a low-exposure situation based on the job task.

CHAIRMAN MELIUS: Any other comments or questions at this point?

(No response.)

CHAIRMAN MELIUS: Okay. Let's hear from the petitioner, see if we have any questions for them. I'm not sure if it's one or two people speaking. And then we will come back and have further discussion. So don't go too far away, Dave.

DR. McKEEL: Hello, Dr. Melius. This is Dan McKeel. Can you hear me?

CHAIRMAN MELIUS: Yes, we can. Go ahead, Dan.

DR. McKEEL: Thank you. Are my slides ready to go?

CHAIRMAN MELIUS: Hold a second.

DR. McKEEL: Okay.

CHAIRMAN MELIUS: Stu is getting them.

DR. McKEEL: Okay.

CHAIRMAN MELIUS: I will let you know when. Here we go. Okay. Your title slide is up now.

DR. McKEEL: Okay. Well, let me just make a short introduction and to thank the Board for being so generous with letting me submit materials to them on GSI. In the next ten minutes or so, I will try to cover the highlights. But I do want to comment while it's fresh in mind for everybody on a couple of things that just came up in the preceding presentations by Dr. Ziemer and by Dave Allen.

The first thing is that the ingots and the dingots from Mallinckrodt, the size is very well known. And basically they were

3,300-pound objects. So they definitely needed to be picked up with a crane and a chain.

The other two types of metals we know are billets, uranium billets. We do not know the size of those. I don't think anybody does. And it was commented by Dave Allen, I think, that a betatron slice, which is described in one of the six Site Profile documents for Mallinckrodt, was just the crop. I think that is definitely not true because the Mallinckrodt document describes quite clearly that a person spent long amounts of time, at first at least, hand-sawing uranium ingots to get a slice. And SC&A has estimated they were maybe 4 inches thick, 18 inches in diameter, 12 to 18 inches in diameter.

Nobody really knows is the answer. And nobody knows the size of the billets. And nobody knows what mixture was sent to Mallinckrodt, although I did introduce a

letter from the AEC that said the primary product sent from Mallinckrodt to GSI was dingots. And that would be the 3,300-pound metal.

Anyway, the first thing I wanted to do in the first two slides is to review the real data that is available right now for the AEC operational period at GSI from 1953 to June 1966.

And it really comes down to three data pieces. The first was there were Landauer film badges on 89 radiographers between November 1963 and 1966, June. This represents only 3 percent of the workforce of 3,000 people, represents 1 job out of hundreds. The radiographers did not wear their badges outside the betatron buildings. As a matter of fact, in the 2012 modeling of betatron doses, they were not even assigned the highest external doses. And so that's point one, very limited and nonrepresentative

film badge data by radiographers only during the entire period from 1953 to 1966, in June.

In 1962, there was a one-time survey by GSI personnel of photons in the building 6 radiography room from a cobalt-60 source. I'm sorry. The 1962 survey was by not by GSI personnel but by the Nuclear Consulting Corporation.

And then the third piece of real data they had in the operational period is they have a series of purchase orders from Mallinckrodt for uranium that extended from March 1958 through June 1966. There were no purchase orders found for 1953 through February 1958. So there was no real data on the uranium source term for those years of the covered period. There was only an extrapolation, back extrapolation, from 1958 forward as to what might have been present.

I need to comment that there was a comment made by Dave Allen in Appendix BB and

today that GSI did not analyze the reports they made on the uranium. And that really goes against what we know about those operations. They, in fact, did send with every item radiographed with the betatrons a checklist of findings.

Now, that's not the final report. Mallinckrodt may well have analyzed that further, and I'm sure they did. But the point is that all of the Mallinckrodt GSI contract work records, which must be voluminous, every one of those has been lost. We don't have any shipping manifestations -- manifests. We don't have any weights. We don't have any X-ray records. So that's the operational period real data.

Now, on slide 2, I review the real data on residuals contamination period between July 1, '66 and 1993. And, again, that boils down to three items, three first bullets, and the comments by me. They had a one-time 1971

radiologic survey of the new betatron building. That was done by the GSI radiation safety people and they used an 80-curie cobalt-60 source, where the main work done in that building, of course, was with a 24 or -5 MeV betatron. So the source they used to model the building was not the source that was primarily used in that building.

Then they also had additional Landauer film badge data on 19 radiographers during that period from July 1, 1966 to 1973 late or early '74, when GSI ceased operations. And, of course, that was a much smaller percent of the workforce.

And, then finally, the data that they had that Dr. Ziemer mentioned was when Bechtel came in and did a radiologic survey of the old and new betatron buildings. And ORNL surveilled that. And this was done for DOE under the FUSRAP program. They only surveyed the new and old betatron buildings, did not

survey the rest of the plant at all.

The remediation took a week. And they found uranium and cleaned it up in the old betatron building only. No uranium is found in the new betatron building. They found some alpha uranium activity on the floors, which they had to chip out, in the vents and in the small industrial vacuum. And it's that piece of data that the washings relate to. And I'll mention a little bit more of that in a few minutes. But we do know of one additional set of washings, power washings, that was done in both the old and new betatron buildings in 1973, just at the time of plant closure. And this was an eyewitness account by a worker who is very well-known to this Board. So there were multiple power washings of the old and the new betatron buildings that we have I think well documented.

A point that is really overlooked

here for the residual period, I think, is that the residual period applies to everybody in the workforce. And most of the people in the workforce worked in other buildings than the betatron buildings. And workers there were also exposed to uranium along the whole long uranium pathway whereby it was transported from the weighing scales.

We know that everything was weighed that went into and out of the plant. Inspectors had to look under the tarps to make sure what was on those transport vehicles. We have operations at the loading dock. We have a transfer to rail cars. We have transport along the rail tracks through buildings 5, through 10. And then the railroad tracks ran into the old and new betatron buildings so that the actual areas that were surveyed for uranium were a tiny fraction of the whole area that formed the volume and the space along the uranium transport pathway. And, as David

said, there had never been any general air sampling, breathing zone samples, process sampling for uranium ever at GSI or by DOE until that 1993 survey.

Okay. If I could go to the slide 3?

CHAIRMAN MELIUS: And, Dan, I'll ask you to please move it along.

DR. McKEEL: I will.

CHAIRMAN MELIUS: We have something else scheduled at this time.

DR. McKEEL: Okay. Thank you, Jim. I don't think I've used my ten minutes, but I was trying to address questions --

CHAIRMAN MELIUS: Yes, you have.

DR. McKEEL: -- that weren't answered by anybody during the discussion period. So the key events during the residual period I would like to point out were the power washings for the old and new betatron buildings and that multiple steel companies

had done work within buildings 5 and 6 and 7 through 10, but they required an overhead crane with a magnet to clean the dust from the GSI building. So there was lots of it there and that all of these multiple users in intermittent operations during the residual period meant that it would be very difficult to model and bound residual contamination.

Slide 4 and slide 5. I go over my reasons why I believe sufficient information has been presented to vote for the SEC at this point and that I hope very much the Board might consider that done.

And I think I have been over the work that was the real data that was there during the operational and the limited periods. I've been over the fact that most of the workforce, which should have been badged because of their exposure to activated steel had not been badged.

The slide you see after four shows

that the models that GSI --- for the GSI betatron and layout workers that SC&A and NIOSH had generated in 2008-2012 didn't agree with each other at those times, and they flip-flopped.

Whereas in 2012, the layout workers had a low dose assigned by SC&A, by 2012, the SC&A layout dose had gone to 9.2 and the NIOSH layout dose was only 1.02 to 2. So they didn't agree with each other at that time.

And, finally, you can see in slide 5 -- I apologize. I am going to go to slide 6. I am going to go to slide 5, finish this up quickly.

It is often said there was a robust, relatively robust, radiation safety program between 1963 and 1966 and during part of the residual period at GSI. And we have just given you evidence now that I don't think that was true compared to other sites. I sent

you the radiation safety program at the Watertown Arsenal, which also was in compliance with AEC regulations in about the same time period as GSI's operational period. And they were far more extensive than anything that was done at GSI.

I have pointed out that NIOSH has no valid uranium intake model for the whole operation and residual periods. NIOSH didn't want to use SC&A's alternate model. In my opinion, the new surrogate data that NIOSH has proposed really would probably not pass the surrogate data criteria for the same reasons. There were two slug facilities and one billet facility. And there were no dingot facilities similar to GSI and the use of Mallinckrodt uranium.

And the other thing is none of the relevant records that would contribute to the accurate bounding have been recovered from Mallinckrodt on the work done at GSI.

So, in summary, then, I think that NIOSH has made a lot of errors of fact in Appendix BB that still need to be addressed. I believe that the NIOSH betatron, the steel casting activation, and the uranium intake models are not valid for reasons I have put forward and, therefore, not bounding. There has been extreme underestimation of the exotic mixed activation fission radionuclides that were discussed prominently at Rocky Flats yesterday that were caused by a bombardment of uranium and the steel castings for the betatrons. At those high MeV, both things occur.

And NIOSH used only iron-59 as an activation product, where we sent you literature documenting that there are at least 30 different radionuclides, some with half-lives that were days and weeks and much longer than they assigned for Fe-59.

And, finally, with respect to

handling being a relatively low-dose exposure scenario, I will point out that one of the main references cited by NIOSH and SC&A from TBD-6000 is that by Adley, et al., for the Hanford melt plant in 1952. And that showed that uranium rod handling caused intake doses, I quote, intake doses 2.5-fold higher than the permitted limits. So they may have been relatively low, but they were two and a half times what radiation safety limits at the time would permit.

So I thank you and appreciate your attention.

CHAIRMAN MELIUS: Is the co-petitioner on the line and wish to comment?

MS. JESKE: This is Patricia Jeske. And no, I don't have any comments. I do agree with Dr. McKeel. And I do hope that we can reach a vote and put closure to this for all of our Class Members. I appreciate everybody's help. Thank you so much.

Labor because it would really help to have some place to go. Please, if there was any way we could get that to happen, it would be wonderful.

And, lastly, I would like to add great appreciation to Terrie Barrie and [identifying information redacted] for all the work that they put in, you know, another two people that they don't get any financial gain from this. And they put in hours and hours of work and dedication and love into this. And I just want to thank them for all their work.

So thank you. And thank you to you.

CHAIRMAN MELIUS: Thanks. Okay.

Anybody else in the room wish to make public comments?

(No response.)

CHAIRMAN MELIUS: Okay. If not, thank you for attending. And we will be following up. And we will reconvene tomorrow

morning around 8:30.

(Whereupon, the above-entitled matter went off the record at 6:26 p.m.)

DWM_9.19.12_abrwh_p39-53.txt

INTRODUCTION:

Daniel W. McKeel, Jr., M.D., the GSI SEC-00105 co-petitioner, addressed the ABRWH 86th meeting in Denver, Colorado, on September 19, 2012. Here is his testimony that runs from page 39 line 7 to p55 line 13. There was an accompanying slide presentation that is attached to this transcript excerpt.

TESTIMONY OF DR. MCKEEL, PAGES 39-53:

(QUOTE)

p.39
1 were -- the highest was 11 dpm per cubic 2 meter, which sort of falls into the same range 3 of the limited samples from Leblond and I 4 would think also reflects a low-exposure 5 situation based on the job task. 6 CHAIRMAN MELIUS: Any other 7 comments or questions at this point? 8 (No response.) 9 CHAIRMAN MELIUS: Okay. Let's 10 hear from the petitioner, see if we have any 11 questions for them. I'm not sure if it's one 12 or two people speaking. And then we will come 13 back and have further discussion. So don't go 14 too far away, Dave. 15 DR. McKEEL: Hello, Dr. Melius. 16 This is Dan McKeel. Can you hear me? 17 CHAIRMAN MELIUS: Yes, we can. Go 18 ahead, Dan. 19 DR. McKEEL: Thank you. Are my 20 slides ready to go?

p40
1 DR. McKEEL: Okay. 2 CHAIRMAN MELIUS: Stu is getting 3 them. 4 DR. McKEEL: Okay. 5 CHAIRMAN MELIUS: I will let you 6 know when. Here we go. Okay. Your title 7 slide is up now. 8 DR. McKEEL: Okay. Well, let me 9 just make a short introduction and to thank 10 the Board for being so generous with letting 11 me submit materials to them on GSI. In the 12 next ten minutes or so, I will try to cover 13 the highlights. But I do want to comment 14 while it's fresh in mind for everybody on a 15 couple of things that just came up in the 16 preceding presentations by Dr. Ziemer and by 17 Dave Allen. 18 The first thing is that the ingots 19 and the dingots from Mallinckrodt, the size is 20 very well known. And basically they were

p41
1 needed to be picked up with a crane and a 2 chain. 3 The other two types of metals we 4 know are billets, uranium billets. We do not 5 know the size of those. I don't think anybody 6 does. And it was commented by Dave Allen, I 7 think, that a betatron slice, which is 8 described in one of the six Site Profile 9 documents for Mallinckrodt, was just the crop. 10 I think that is definitely not true because 11 the Mallinckrodt document describes quite 12 clearly that a person spent long amounts of 13 time, at first at least, hand-sawing uranium 14 ingots to get a slice. And SC&A has estimated 15 they were maybe 4 inches thick, 18 inches in 16 diameter, 12 to 18 inches in diameter. 17 Nobody really knows is the answer. 18 And nobody knows the size of the billets.

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p42
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p43
1 the entire period from 1953 to 1966, in June. 2
In 1962, there was a one-time 3 survey by GSI personnel of photons in the 4 building 6 radiography room from a cobalt-60 5 source. I'm sorry. The 1962 survey was by 6 not by GSI personnel but by the Nuclear 7 Consulting Corporation. 8
And then the third piece of real 9 data they had in the operational period is 10 they have a series of purchase orders from 11 Mallinckrodt for uranium that extended from 12 March 1958 through June 1966. There were no 13 purchase orders found for 1953 through 14 February 1958. So there was no real data on 15 the uranium source term for those years of the 16 covered period. There was only an 17 extrapolation, back extrapolation, from 1958 18 forward as to what might have been present. 19
I need to comment that there was a 20 comment made by Dave Allen in Appendix BB and

p44
1 they made on the uranium: And that really 2 goes against what we know about those 3 operations. They, in fact, did send with 4 every item radiographed with the betatrons a 5 checklist of findings. 6
Now, that's not the final report. 7 Mallinckrodt may well have analyzed that 8 further, and I'm sure they did. But the point 9 is that all of the Mallinckrodt GSI contract 10 work records, which must be voluminous, every 11 one of those has been lost. We don't have any 12 shipping manifestations -- manifests. We 13 don't have any weights. We don't have any 14 X-ray records. So that's the operational 15 period real data. 16
Now, on slide 2, I review the real 17 data on residuals contamination period between 18 July 1, '66 and 1993. And, again, that boils 19 down to three items, three first bullets, and 20 the comments by me. They had a one-time 1971

p45

1 building. That was done by the GSI radiation 2 safety people and they used an 80-curie 3 cobalt-60 source, where the main work done in 4 that building, of course, was with a 24 or -5 5 MeV betatron. So the source they used to 6 model the building was not the source that was 7 primarily used in that building. 8 Then they also had additional 9 Landauer film badge data on 19 radiographers 10 during that period from July 1, 1966 to 1973 11 late or early '74, when GSI ceased operations. 12 And, of course, that was a much smaller 13 percent of the workforce. 14
And, then finally, the data that 15 they had that Dr. Ziemer mentioned was when 16 Bechtel came in and did a radiologic survey of 17 the old and new betatron buildings. And ORNL 18 surveilled that. And this was done for DOE 19 under the FUSRAP program. They only surveyed 20 the new and old betatron buildings, did not

p46
1
The remediation took a week. And 2 they found uranium and cleaned it up in the 3 old betatron building only. No uranium is 4 found in the new betatron building. They 5 found some alpha uranium activity on the 6 floors, which they had to chip out, in the 7 vents and in the small industrial vacuum. And 8 it's that piece of data that the washings 9 relate to. And I'll mention a little bit more 10 of that in a few minutes. But we do know of 11 one additional set of washings, power 12 washings, that was done in both the old and 13 new betatron buildings in 1973, just at the 14 time of plant closure. And this was an 15 eyewitness account by a worker who is very 16 well-known to this Board. So there were 17 multiple power washings of the old and the new 18 betatron buildings that we have I think well 19 documented. 20
A point that is really overlooked

p47
1 the residual period applies to everybody in 2 the workforce. And most of the people in the 3 workforce worked in other buildings than the 4 betatron buildings. And workers there were 5 also exposed to uranium along the whole long 6 uranium pathway whereby it was transported 7 from the weighing scales. 8
We know that everything was 9 weighed that went into and out of the plant. 10 Inspectors had to look under the tarps to make 11 sure what was on those transport vehicles. We 12 have operations at the loading dock. We have 13 a transfer to rail cars. We have transport 14 along the rail tracks through buildings 5, 15 through 10. And then the railroad tracks ran 16 into the old and new betatron buildings so 17 that the actual areas that were surveyed for 18 uranium were a tiny fraction of the whole area 19 that formed the volume and the space along the 20 uranium transport pathway. And, as David

p48
1 sampling, breathing zone samples, process 2 sampling for uranium ever at GSI or by DOE 3 until that 1993 survey. 4
Okay. If I could go to the slide 5 3? 6
CHAIRMAN MELIUS: And, Dan, I'll 7 ask you to please move it along. 8

DR. McKEEL: I will. 9
CHAIRMAN MELIUS: We have 10 something else scheduled at this time. 11
DR. McKEEL: Okay. Thank you, 12 Jim. I don't think I've used my ten minutes, 13 but I was trying to address questions -- 14
CHAIRMAN MELIUS: Yes, you have. 15
DR. McKEEL: -- that weren't 16 answered by anybody during the discussion 17 period. So the key events during the residual 18 period I would like to point out were the 19 power washings for the old and new betatron 20 buildings and that multiple steel companies

p49
1 through 10, but they required an overhead 2 crane with a magnet to clean the dust from the 3 GSI building. So there was lots of it there 4 and that all of these multiple users in 5 intermittent operations during the residual 6 period meant that it would be very difficult 7 to model and bound residual contamination. 8
Slide 4 and slide 5. I go over my 9 reasons why I believe sufficient information 10 has been presented to vote for the SEC at this 11 point and that I hope very much the Board 12 might consider that done. 13
And I think I have been over the 14 work that was the real data that was there 15 during the operational and the limited 16 periods. I've been over the fact that most of 17 the workforce, which should have been badged 18 because of their exposure to activated steel 19 had not been badged. 20
The slide you see after four shows

p50
1 betatron and layout workers that SC&A and 2 NIOSH had generated in 2008-2012 didn't agree 3 with each other at those times, and they 4 flip-flopped. 5
Whereas in 2012, the layout 6 workers had a low dose assigned by SC&A, by 7 2012, the SC&A layout dose had gone to 9.2 and 8 the NIOSH layout dose was only 1.02 to 2. So 9 they didn't agree with each other at that 10 time. 11
And, finally, you can see in slide 12 5 -- I apologize. I am going to go to slide 13 6. I am going to go to slide 5, finish this 14 up quickly. 15
It is often said there was a 16 robust, relatively robust, radiation safety 17 program between 1963 and 1966 and during part 18 of the residual period at GSI. And we have 19 just given you evidence now that I don't think 20 that was true compared to other sites. I sent

p51
1 Watertown Arsenal, which also was in 2 compliance with AEC regulations in about the 3 same time period as GSI's operational period. 4 And they were far more extensive than anything 5 that was done at GSI. 6
I have pointed out that NIOSH has 7 no valid uranium intake model for the whole 8 operation and residual periods. NIOSH didn't 9 want to use SC&A's alternate model. In my 10 opinion, the new surrogate data that NIOSH has 11 proposed really would probably not pass the 12 surrogate data criteria for the same reasons. 13 There were two slug facilities and one billet 14 facility. And there were no dingot facilities 15 similar to GSI and the use of Mallinckrodt 16

uranium. 17
And the other thing is none of the 18 relevant records that would contribute to the 19 accurate bounding have been recovered from 20 Mallinckrodt on the work done at GSI.

p52
1 NIOSH has made a lot of errors of fact in 2 Appendix BB that still need to be addressed. I 3 believe that the NIOSH betatron, the steel 4 casting activation, and the uranium intake 5 models are not valid for reasons I have put 6 forward and, therefore, not bounding. There 7 has been extreme underestimation of the exotic 8 mixed activation fission radionuclides that 9 were discussed prominently at Rocky Flats 10 yesterday that were caused by a bombardment of 11 uranium and the steel castings for the 12 betatrons. At those high MeV, both things 13 occur. 14
And NIOSH used only iron-59 as an 15 activation product, where we sent you 16 literature documenting that there are at least 17 30 different radionuclides, some with 18 half-lives that were days and weeks and much 19 longer than they assigned for Fe-59. 20
And, finally, with respect to

p53
1 scenario, I will point out that one of the 2 main references cited by NIOSH and SC&A from 3 TBD-6000 is that by Adley, et al., for the 4 Hanford melt plant in 1952. And that showed 5 that uranium rod handling caused intake doses, 6 I quote, intake doses 2.5-fold higher than the 7 permitted limits. So they may have been 8 relatively low, but they were two and a half 9 times what radiation safety limits at the time 10 would permit. 11
So I thank you and appreciate your 12 attention. 13
CHAIRMAN MELIUS: Is the 14 co-petitioner on the line and wish to comment? 15
MS. [redacted]: This is [redacted] 16 And no, I don't have any comments. I 17 do agree with Dr. McKeel. And I do hope that 18 we can reach a vote and put closure to this 19 for all of our Class Members. I appreciate 20 everybody's help. Thank you so much.

(END QUOTE)

The TRANSCRIPT ENDS ON PAGE 340 with the adjournment being at 6:26 PM Denver Mountain time.

Comparison of NIOSH and SC&A External Exposure Assessments at GSI

Robert Anigstein

S. Cohen & Associates

February 21, 2013

PERIODS OF SITE OPERATIONS, DIVIDED ACCORDING TO LIMITING EXPOSURE SCENARIOS

January 1, 1953: Start of covered operations under EEOICPA

- Two 500-mCi ^{226}Ra sources used for radiography, in addition to 24-MeV betatron ("Old Betatron")

May 21, 1962: GSI acquires two ^{60}Co sources (260 and 280 mCi) to replace ^{226}Ra

January 1, 1963: Assumed date St. Louis Testing Laboratories (SLTL) began radiography at GSI site, using 10-Ci ^{60}Co and 50-Ci ^{192}Ir sources

- October 1, 1963: Assumed date "New Betatron" began operation at Commonwealth foundry in Granite City; Old Betatron upgraded to 25 MeV

June 30, 1966: End date of last MCW purchase order—beginning of residual period

SOURCES OF EXTERNAL RADIATION EXPOSURE AT GSI

(Entire period of AEC operations, unless otherwise noted)

Exposure to direct penetrating radiation (photons) from betatron operations

- Stray radiation during betatron operation
- Delayed radiation from activated metals

Exposure to sealed radiography sources

- ^{226}Ra—2 sources, 500 mCi ea: 1953–May 21, 1962
- ^{60}Co—260 & 280 mCi (initial activities): May 21, 1962–June 30, 1966
- ^{60}Co—10 Ci, employed by SLTL: from January 1, 1963
- ^{192}Ir—50 Ci, occasionally employed by SLTL: from January 1, 1963

Exposure of skin to non-penetrating (beta) radiation

- Natural uranium and photoactivated uranium isotopes
- Activated steel

BOUNDING ANNUAL EXPOSURES TO PENETRATING (PHOTON) RADIATION

Years	SC&A—applied to all employees		NIOSH		
	Bounding scenario	Dose/exposure	Source	Radiographers	Others
1953–1954	Radiographer—Ra-226	15 rem	Ra-226	3.573 R	2.087 R
1955–5/21/62		12 rem			
5/22/62–12/31/62	Betatron operator	1.35 rem*	Co-60—GSI	1.17 R	1.348 R
1/1/63–9/30/63	SLTL Co-60 source	2.669 R	Co-60—SLTL	2.671 R	
9/30/63–6/30/66	Layout man	9.2 R	Betatron	4.483 R	

* Note change of units from previous reports

BOUNDING SCENARIOS FOR NEUTRON AND BETA EXPOSURES

Apply to All Employees

Year	Neutron dose (rem/y)		β dose to skin—betatron operator (rads/y)			
	SC&A Betatron operator	NIOSH Layout man	Hands & forearms		Other skin	
			SC&A	NIOSH	SC&A	NIOSH
1953-1957	0.48	0.148	33.4	25.9	6.27	2.27
1958	0.48		32.1	25.9	6.22	2.27
1959-1960	0.48		30.9	25.9	6.18	2.27
1961	0.48		34.2	29.5	6.30	2.47
1962	0.48		27.2	21.8	6.04	2.04
1963	0.47		13.9	7.0	5.56	1.23
1964	0.46		10.7	3.5	5.45	1.03
1965	0.46		10.2	3.0	5.43	1.00
1966[a]	0.23	0.072	4.8	2.4[b]	2.71	0.97[b]

[a] Doses prorated to first 6 months, except as noted

[b] Doses should be prorated to first 6 months

DETAILED DISCUSSION OF BOUNDING SCENARIOS

Radiographer Using ^{226}Ra: 1953-May 21, 1962

"During this period [1953–1962] the exposure limits published by the A.E.C. at the applicable time were followed. They were never exceeded and averaged under 25%." (GSI AEC license application)

AEC Form 4: Occupational External Exposure History of GSI worker

- 18 quarters (July 1, 1957–December 31, 1961)
- 9.1 rem total, 2.02 rem/y
- Worker performed radiography on weekends
  - 1–2 shifts, 80%–90% of the time
  - 40–90 shifts/y: 22–50 mrem/shift
- Extrapolate dose to full-time radiographer, 65 h/wk: 9–20 rem/y
- Worker testified he wore film badge while performing radiography

MCNPX and exposure rate analysis, based on worker's account of radiographic practices: ~10 R/y (~11 rem/y)

Betatron Operator

Maximum dose of 26 mrem/week, due to hypothetical 30 keV radiation from behind, film badge partially shielded by operator's body

Exposure to SLTL Sources

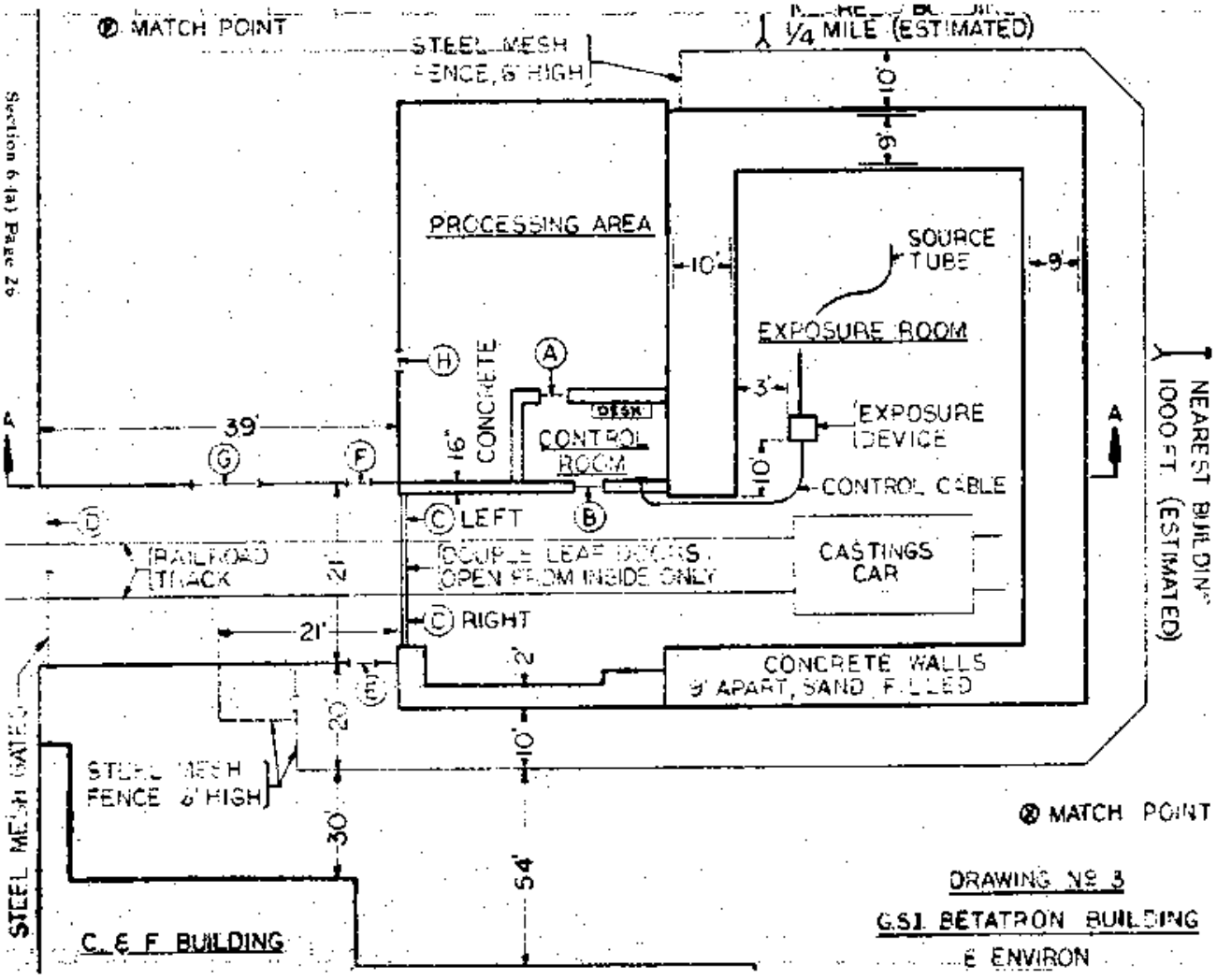
Maximum exposure duration:

- 180 h longest shot
- 10 shots during 6-month period
- Maximum fraction of time: 180 h × 10 shots × 6 mo ÷ 12 mo/y = 3,600 h/y ÷ 8760 h/y = 41%

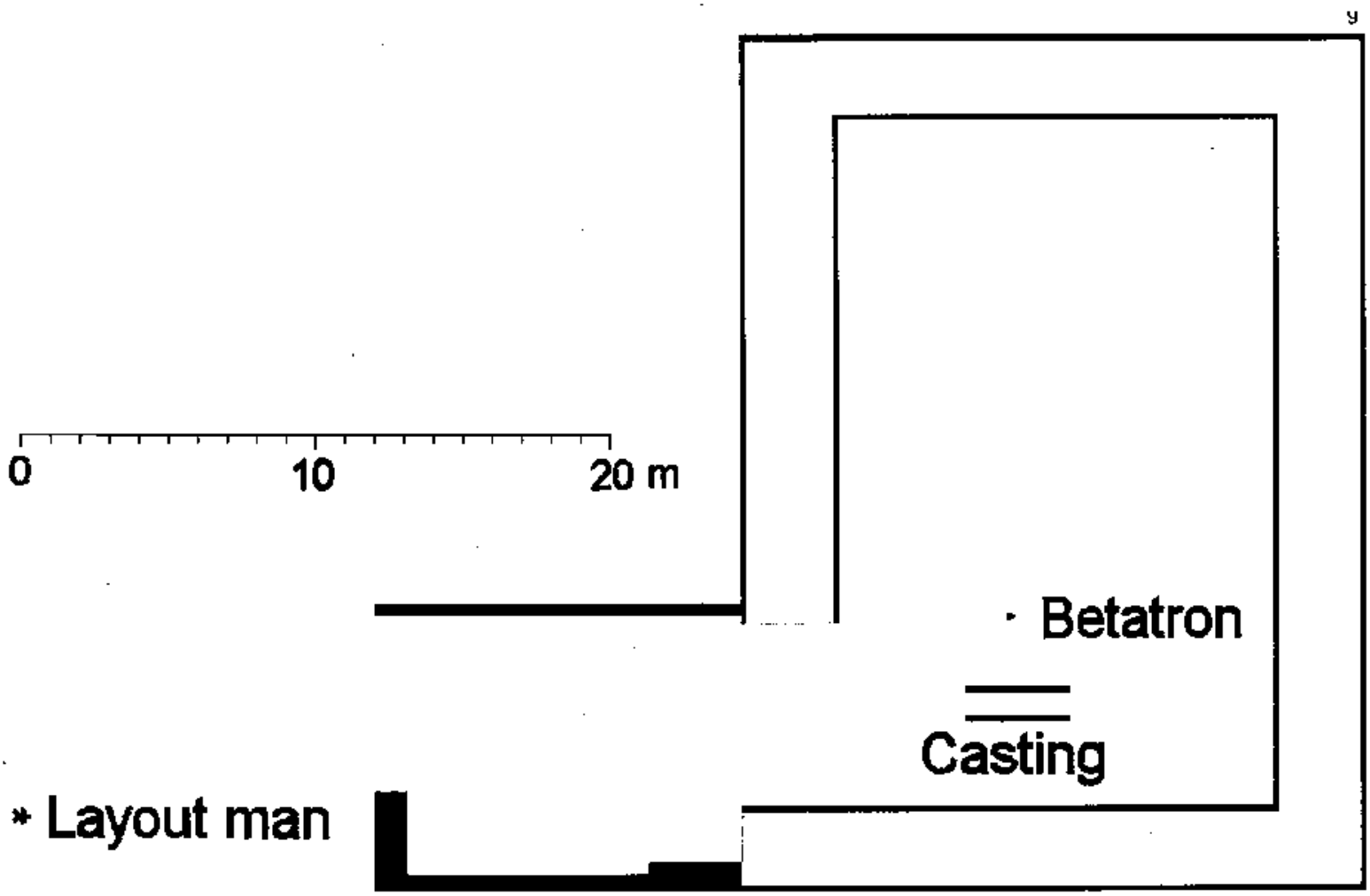
Exposure rate at exclusion area boundary: 2 mR/h

- Maximum exposure of worker at boundary: 2 mR/h × 3250 h/y × 0.41 = 2.67 R/y

Layout Man—1963–1966



New Betatron Building (A.E.C. license application)



MCNPX Model of Exposure Geometry of Layout Man

GSI Dose Estimation Comparison

Prepared by Dave Allen, DCAS

January 2013

The following comparisons of NIOSH and SC&A dose estimates for workers at GSI was assembled from a review of various white papers and matrix notes, starting with the latest and working backwards in time. Based on this review, a summary of the latest modeled doses proposed by NIOSH and SC&A for various exposure scenarios is provided. It does not include some additional exposure scenarios that were evaluated and not used (i.e, they were determined not to represent the limiting source of exposure). The summary is categorized by time frame (Radium Era and Cobalt Era) as well as by worker category (Radiographer and Other) so that four exposure categories were established.

Photon Dose

Radiographers – Radium Era

	SC&A	NIOSH
Ra-226 sources in radiography room	9.69 R/yr [a]	N/A [b]
Ra-226 source outside radiography room	9.39 R/yr [c]	3.573 R/yr [d]
St. Louis Testing sources	2.771 R/yr [e]	2.671 R/yr [f]
Betatron Operator	1.35 R/yr [g]	0.620 R/yr [h]
Layout Man	N/A [i]	4.483 R/yr [j]

a) 9.39 R/yr from the "fishing pole technique" estimate plus 0.296 R/yr during the shot (Ref. 1, page 7. Fishing pole technique estimate ref. 2 pg 6 & 7)
b) NIOSH did not develop an estimate of Ra sources inside the radiography room
c) 9.39 R/yr from the "fishing pole technique" only. SC&A did not develop a dose estimate specifically for the use of Ra-226 sources outside the radiography room (ref. 2 pg 6 & 7) Using other methods, SC&A bound the dose between 9 and 20 R/yr. Matrix recommends using 12 R/yr based on AEC limit.
d) 5.411 R/yr for the fishing pole technique divided between 2 radiographers plus 0.868 R/yr at the boundary (ref 3 pg 15 & 16)
e) Full time next to boundary plus one incursion of the boundary per shift (ref 2 pg 10)
f) Full time next to boundary Ref 3 pg 22

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g) (Ref 6 pg 3)
h) Value varies by year (ref 5 pg 28)
i) SC&A indicated bounding dose would be from radium source work (ref. 6 page 2 & 3)
j) New Betatron building estimate used for all years except half the value for 1966 (ref 4 pg 5)

Others – Radium Era

	SC&A	NIOSH
Ra-226 sources in radiography room	2.087 R/yr [a]	N/A [b]
Ra-226 source outside radiography room	1.978 R/yr [c]	1.353 R/yr [d]
St. Louis Testing sources	2.771 R/yr [e]	1.336 R/yr [f]
Betatron Operator	1.35 R/yr [g]	0.620 R/yr [h]
Layout Man	N/A [i]	4.483 R/yr [j]

a) 25% of time near door of radiography room (ref 1 pg 7)
b) NIOSH did not develop an estimate of Ra sources inside the radiography room
c) Inferred from 0.07 mR/shift for an incursion plus 2 mR/hr at boundary (ref. 1 pg 6)
d) 0.567 R/yr walking through area plus 0.786 R/yr at the boundary (ref. 3 pg 16 & 17)
e) Assumes full time next to boundary for all workers (Ref 2 pg 10)
f) Assumes half time next to boundary for non-radiographers (Ref 3 pg 22)
g) Assuming dose for operator may be applicable to others (Ref 6 pg 3)
h) Value varies by year (ref 5 pg 28). Value intended for those routinely working in betatron building.
i) SC&A indicated bounding dose would be from radium source work (ref. 6 page 2 & 3)
j) New Betatron building estimate used for all years except half the value for 1966 (ref 4 pg 5)

Radiographers – Cobalt Era

	SC&A	NIOSH
Co-60 sources in radiography room	1.170 R/yr [a]	1.170 R/yr [b]
Co-60 source outside radiography room	N/A [c]	0.868 [d]
St. Louis Testing sources	2.771 R/yr [e]	2.671 R/yr [f]
Betatron Operator	1.35 R/yr [g]	0.557 R/yr [h]

Layout Man	9.2 R/yr [i]	4.483 R/yr [j]

a) Agreement with NIOSH (ref 1 pg 9)
b) Full time at maximum survey location (ref. 3 pg. 18)
c) SC&A indicated this scenario was rare (ref. 1 pg 9)
d) (ref. 3, pg 20)
e) Full time next to boundary plus one incursion of the boundary per shift (ref 2 pg 10)
f) Full time next to boundary Ref 3 pg 22
g) (Ref 6 pg 3)
h) Value varies by year (ref 5 pg 28).
i) Layout man dose applicable only to new betatron building (Ref 6 pg 3)
j) New Betatron building estimate used for all years except half the value for 1966 (ref 4 pg 5)

Others – Cobalt Era

	SC&A	NIOSH
Co-60 sources in radiography room	1.170 R/yr [a]	1.170 R/yr [b]
Co-60 source outside radiography room	N/A [c]	1.348 R/yr [d]
St. Louis Testing sources	2.771 R/yr [e]	1.336 R/yr [f]
Betatron Operator	1.35 R/yr [g]	0.557 R/yr [h]
Layout Man	9.2 R/yr [i]	4.483 R/yr [j]

a) Agreement with NIOSH (ref 1 pg 9)
b) Full time at maximum survey location (ref. 3 pg. 18)
c) SC&A indicated this scenario was rare (ref. 1 pg 9)
d) 0.562 R/yr walking through area plus 0.786 R/yr at the boundary (ref. 3 pg 21)
e) Assumes full time next to boundary for all workers (Ref 2 pg 10)
f) Assumes half time next to boundary for non-radiographers (Ref 3 pg 22)
g) Assuming dose for operator may be applicable to others (Ref 6 pg 3)
h) Value varies by year (ref 5 pg 28). Value intended for those routinely working in betatron building.
i) Layout man dose applicable only to new betatron building (Ref 6 pg 3)
j) New Betatron building estimate used for all years except half the value for 1966 (ref 4 pg 5)

Neutron Dose

The source of neutron exposure is from the operation of the betatron. Thus, neutron doses are included in the betatron operator dose estimate (which includes others working in the betatron building) and the layout man dose estimate. The estimates are based on the same models and results used in the photon analysis.

Beta Dose

Sources of beta radiation are from exposure to uranium metal (both irradiated and intrinsic) and from the irradiated steel.

The uranium beta dose modeled by NIOSH utilized the SC&A model from its original Appendix BB review. Therefore, there appears to be agreement on this approach.

NIOHS estimates of beta doses from exposure to irradiated steel rely on the SC&A model that was included in their initial Appendix BB review. In their last white paper review, SC&A pointed out that the MCNPX version used (version 26e) was an early version of the applicable capability and the latest (version 27e) provided different results. There is no disagreement from NIOSH.

Agreement

- Both SC&A and NIOSH appear to agree that the dose to the layout man is the bounding exposure scenario during the cobalt era, even though current estimates differ. This bounding scenario is true for both radiographers and others categories.

- In the last SC&A review, SC&A pointed out that the layout man estimate used by NIOSH for all years was only really applicable to the new betatron which was not built until 1963. NIOSH agrees with this. Because NIOSH and SC&A agree on this point, radium radiography becomes the bounding exposure scenario in the radium era. This is true of radiographers but unclear for others.

Unresolved Issues

NIOSH and SC&A have different exposure models for the two bounding scenarios discussed below. The differences exist primarily in the input parameters or assumptions used.

Layout man scenario

For the layout man scenario, NIOSH estimated doses at various locations in and around the new betatron building from a variety of betatron shot scenarios. These scenarios were then combined with the work scenario developed by SC&A (using worker input) to produce the highest dose rate at the layout man location while producing 10 mrem per week at the film badge rack.

SC&A believed that many of the shot scenarios developed by NIOHS were unrealistic. They also commented that it was not appropriate to normalize the dose rates to 10 mrem per week at the badge rack location. Instead, SC&A's estimate of dose to the layout man was based on 100% of the shots being the same as that used in their original Appendix BB review. This scenario is listed as RR_ST_No in Table 3 of the January 2012 NIOSH white paper. That table provides dose rates in the control room for that shot scenario as 1.42 mr/hr at the door, 0.41 mr/hr at the desk, and 0.65 mr/hr in the center of the room. With the betatron operating 41% of the time, a 65 hr work week would produce more than 10 mrem on a film badge worn by an operator in the control room, even at the lowest dose rate location. Since the badge would also receive some amount of exposure while in the badge rack and also while the operator was exposed to irradiated steel, the scenario appears to be unrealistic. If the three control room dose rates were averaged, and the time spent utilizing this shooting scenario were adjusted to 10 mrem/week in the control room (based on the average dose rate), the SC&A layout man dose estimate would be reduced to less than 4.2 R/yr. This is reasonably close to the NIOSH dose estimate of 4.48 R/yr. It does not appear there will be significant differences in the layout man dose if the betatron operator badge is limited to 10 mrem/yr.

Radium Source Scenario

After interviewing workers, SC&A concluded that most radium radiography occurred in the radiography room of the 6 building. NIOSH agrees with this. SC&A developed a model for inside the radiography room, while NIOSH developed a model for outside the room (radiography in the other areas of the facility). The primary dose to radiographers in both models is that received while using the "fishing pole technique" to place and retrieve the source. SC&A developed a dose of 9.39 R/yr from this technique, utilizing the worst case parameters provided by a former worker. NIOSH used the midpoint of the ranges and assumed at least two radiographers shared the duties (thus divided this dose by 2). SC&A

also reviewed dose records from an individual part time radiographer and prorated it to full time. Based on the assumptions used for prorating the dose, the range developed was approximately 9 R/yr to 20 R/yr. Lastly, for most of this the time period under evaluation, the regulatory dose limit was 3 rem per calendar quarter or essentially 12 rem per yr. Based on a statement GSI made to the AEC that no one had exceeded the annual limit and the average was below 25% of that limit, the maximum dose can be established as falling between 3 R/yr and 12 R/yr.

If the NIOSH model is revised to assume one radiographer received the entire dose from the "fishing pole technique" and the SC&A estimate of the exposure during the shot in the radiography room was added, the new estimate would be 5.707 R/yr.

The dose estimate for other workers from radium radiography inside the radiography room was developed by SC&A. The result (2.09 R/yr) is bounding compared to estimates for radiography outside the room (1.98 R/yr inferred from SC&A review, 1.35 R/yr NIOSH). NIOSH did not develop an estimate for radium radiography inside the room. NIOSH agrees with the SC&A estimate for exposure to non-radiographers from radium radiography.

NIOSH developed an exposure estimate for others from St. Louis Testing radiography. The estimate was 1.34 R/yr which would not be the bounding scenario given 2.09 R/yr exposures from radium radiography. However, the NIOSH estimate was based on assuming the individual was near the boundary only 50% of his workday. SC&A disagreed with applying that factor. If 100% occupancy is to be applied, the St. Louis Testing exposure estimate becomes the bounding dose at 2.77 R/yr in the radium era. However, during the interview with the former Administrator of St. Louis Testing, the Administrator indicated this work occurred in the mid or early 1960s. He then recalled that it started while they were working on the St. Louis Arch. SC&A noted that construction of the Arch began in 1963 which would be during the cobalt era.

REFERENCES

1) SC&A, October 2011, *Update of the Use of Sealed Radioactive Sources at General Steel Industries*, SC&A draft white paper

2) SC&A, September 2011, *Review of NIOSH Report on Portable Radiography Sources at GSI*, SC&A draft white paper

3) NIOSH, August 2011, *Battelle-TBD-6000 Appendix BB General Steel Industries Dose Estimates for Portable Radiography Sources*, NIOSH white paper

4) NIOSH, March 2012, *Addendum to Dose Estimates for Betatron Operations*, NIOSH white paper

5) NIOSH, January 2012, *Response to Battelle-TBD-6000 Appendix BB General Steel Industries: Dose Estimate for Betatron Operations*, NIOSH white paper.

6) SC&A, March 25, 2012, *Review of NIOSH Report: Addendum to Dose Estimates for Betatron Operations*, SC&A memo

7) SC&A, March 2012, *Response to Battelle-TBD-6000 Appendix BB General Steel Industries: Dose Estimate for Betatron Operations*, SC&A draft white paper

sc&a, inc.

TO: Advisory Board on Radiation and Worker Health Work Group on TBD-6000
FROM: Robert Anigstein and John Mauro, SC&A
SUBJECT: Response to NIOSH Report: "GSI Dose Estimation Comparison"
DATE: February 12, 2013

SC&A Response to NIOSH Report: "GSI Dose Estimation Comparison"

On February 4, 2013, Dave Allen (2013) transmitted a report comparing NIOSH and SC&A dose estimates for General Steel Industries (GSI). The same day, Paul Ziemer (2013), Chairman of the ABRWH Work Group on TBD-6000, sent an e-mail message asking if SC&A will be able to provide responses to this and another document in time for the February 21 meeting. This memo is our response to Allen's report. The following discussion is keyed to Allen (2013) and follows the same sequence as Allen. Allen's intent was to present a historical account of the development of the dose estimates—we will bring the SC&A dose estimates up to date while reviewing Allen's presentation, thus deviating somewhat from Allen's framework.

1 Exposures During "Radium Era": 1953–May 21, 1962

In a table on p. 1, Allen (2013) lists estimated exposures of radiographers during the "Radium Era" (i.e., 1953–May 21, 1962 [date when GSI procured ^{60}Co radiography sources to replace ^{226}Ra]). The table compares the NIOSH results to the SC&A ^{226}Ra exposure estimate that we derived from first principles. However, this was but one of three exposure estimates that we developed for radiographers during the Radium Era, which are listed below:

1. Time and motion study of a radiographer handling the ^{226}Ra sources and staying in the radiographer's office inside the concrete block radiographic facility in the No. 6 Building during radiographic exposures, which yielded an exposure rate of 9.69/y (listed in Allen's table);

2. Extrapolation of radiation exposure records for [redacted]—who performed radiography part-time on weekends—to a full-time radiographer. Mr. [redacted] received a dose of 9.1 rem during 18 calendar quarters. An estimated range of work shifts that he spent performing radiography over the course of a year yielded a range of 9.1–20.5 rem/y to a full-time radiographer (a rounded range is cited in a footnote to Allen's table).

3. The statement on the AEC license application that the *applicable* AEC dose limits for each time period were never exceeded (NRC 2009a, p. 26), which implies that the dose rates could have been as high as 15 rem/y in 1953–1954, and 12 rem/y in 1955–1962 (only the latter value is cited in Allen's footnote).

Allen (2013) next compared SC&A and NIOSH estimates of exposures to sources used by St. Louis Testing Laboratories (SLTL) on the GSI site. The SC&A value was presented by Anigstein (2011a), who assigned an annual exposure of 2.669 R to a GSI worker remaining at

the boundary of the exclusion zone set up by SLTL. An additional exposure of 133 mR was assigned, based on an excursion into the exclusion zone while the radiographer was assumed to take breaks. However, we later learned from [redacted], a former administrator of SLTL, that the source was retracted into its shield whenever the radiographer left the area (Anigstein 2011b). Therefore, the limiting exposure should be 2.669 R/y.[1] At the same time, we learned that the SLTL activities at GSI did not begin until 1963, past the end of the Radium Era. Consequently, these exposures, although presented during an earlier phase of our studies, should not be included in exposure assessments during this period. Later in his report, Allen took note of this last observation.

By the same token, the exposures of the layout man resulted from the operation of the New Betatron, which was not installed until late 1963, and should likewise not be included in the Radium Era assessments. This is also noted in a later part of Allen's report.

Allen (2013) next presented a table entitled "Others – Radium Era." The table correctly cites the SC&A assessment of exposures outside the radiographic facility in No. 6 Building; however, we disagree with Allen's derivation of an annual exposure from ^{226}Ra radiography outside the facility that he ascribed to SC&A. That value is based on all of the ^{226}Ra radiography being performed in an open area, which we do not believe was the case. The same comment on the previous table with respect to the SLTL sources applies here. Finally, we note that the table includes the betatron operator and the layout man, who are also listed in the previous table.

2 Exposures Following the Radium Era

Allen (2013) designated the period from the end of the Radium Era until the end of AEC operations as the "Cobalt Era." This era needs to be subdivided, since it comprises three distinct periods—pre-SLTL operations, SLTL operations prior to the New Betatron, and New Betatron operations—each of which experienced significantly different limiting exposures. Allen lists exposures from the GSI-owned ^{60}Co sources—we agreed with the exposures calculated on the basis of the survey of the radiographic facility performed by the Nuclear Consultants Corp., but disagreed with the exposures from performing ^{60}Co radiography in open areas, since this was an infrequent scenario that should not be used to calculate annual exposures.

2.1 Period Preceding SLTL Operations: May 22—December 31, 1962

During the period after the Radium Era but prior to SLTL operations—May 22 to December 31, 1962—SC&A recommended that the limiting exposure be that of the betatron operator—1.35 R/y—as listed by Allen in each of his four tables.

[1] Allen (2013) erroneously ascribed a rate of 2.771 R/y to SC&A—in fact, Anigstein (2011a) cited this value (in units of "mrem") but ascribed it to Allen (2011). In the subsequent discussion, whenever a time period encompasses a fraction of a calendar year, the recommended annual exposures should be prorated to the actual period of exposure.

2.2 Exposures from SLTL Sources: January 1–September 30, 1963

The highest exposures during the period January 1–September 30, 1963, were from the high-activity ^{60}Co and ^{192}Ir sources by SLTL to perform radiography at GSI. As discussed in section 1, above, the limiting exposure in this scenario should be 2.669 R/y. As stated earlier, the SLTL work did not begin until 1963. Since we do not know the exact date, the claimant-favorable assumption is that it began on January 1, this limiting exposure rate should be assigned to all GSI workers during the period January 1–September 30, 1963.

2.3 Exposures from New Betatron: October 1, 1963–June 30, 1966

The next period for which doses or exposures need to be assigned is from the installation of the New Betatron in late 1963 until the end of the covered period. The September 1963 edition of *GSI General Steel Industries Magazine* shows a photograph of the New Betatron Building under construction (SC&A 2008). Presumably, this issue was prepared in August or later. It is unlikely that the New Betatron was put in service before October 1, 1963, which would be a claimant-favorable date for the start of operations. Further indirect evidence for this starting date is the summary record of external exposure of [redacted] for 1963 (Attachment 1). During the first 3 calendar quarters, his quarterly doses ranged from 0–15 mrem. Since he performed radiography only on a part-time, weekend basis, it was likely that he did little radiography during this period. However, in the 4th quarter, which began on October 1, the dose jumped to 100 mrem, which suggests a marked increase in his radiographic activities.

Further information on radiographic activities in the 4th quarter can be inferred from the film badge dosimetry data that NIOSH obtained from Landauer, the vendor who supplied and processed the film badges. The first weekly report included in these records, which is for the week starting Monday, January 6, 1964, lists doses to Mr. [redacted] and to 17 other GSI workers. The report states that there were seven reports to date for each of these workers, implying that they had been issued six film badges prior to the ones listed in that report. We thus infer that the Landauer dosimetry program began during the week of November 25, 1963. Since Mr. [redacted]' cumulative dose is left blank in the report, we can infer that each of these six previous badge reports had readings below the MDL, which was 10 mrem for the Landauer badges. Thus, to accumulate 100 mrem during the 4th quarter, [redacted] would have to have had at least one film badge prior to the Landauer dosimetry program. This increase in his work schedule would indicate an increase in radiographic operations at GSI, which, according to the accounts of former workers, occurred when the New Betatron was put into service.

From the assumed date of installation of the New Betatron until the end of the covered period—October 1, 1963–June 30, 1966—the limiting exposure rate should be 9.20 R/y. We calculated this rate for the layout man working in No. 10 Building, just outside the New Betatron Building (Anigstein and Olsher 2012). This value was cited by Allen (2013), first under "Radiographers – Cobalt Era," then again under "Others – Cobalt Era." The following tables summarize the differences between the NIOSH and SC&A estimates of limiting exposures connected with betatron operations.

Table 1. Annual Doses to Betatron Operators

Year	Exposure (R)		Neutron dose (rem)		Beta dose to skin (rads)			
					Hands and forearms		Other skin	
	SC&A[a]	DCAS	SC&A	DCAS	SC&A	DCAS	SC&A	DCAS
1953-1957	1.35	0.734	0.48	0.050	33.4	25.9	6.27	2.27
1958	1.35	0.734	0.48	0.050	32.1	25.9	6.22	2.27
1959-1960	1.35	0.734	0.48	0.050	30.9	25.9	6.18	2.27
1961	1.35	0.763	0.48	0.056	34.2	29.5	6.30	2.47
1962	1.35	0.702	0.48	0.043	27.2	21.8	6.04	2.04
1963	1.35	0.586	0.47	0.019	13.9	7.0	5.56	1.23
1964	1.35	0.558	0.46	0.013	10.7	3.5	5.45	1.03
1965	1.35	0.554	0.46	0.012	10.2	3.0	5.43	1.00
1966[b]	0.68	0.275	0.23	0.006	4.8	2.4[c]	2.71	0.97[c]

Source: Anigstein and Mauro (2012)

Note: SC&A values from Anigstein and Olsher (2012)

[a] Maximum exposure, assuming hypothetical 30-keV residual radiation from betatron behind operator's back

[b] During contract period: January 1–June 30

[c] As listed by Allen (2012)—should be prorated for 6-months of exposure in 1966 for consistency with exposure to photons and doses from neutrons

Table 2. Annual Doses to Layout Men

Exposure (R)		Neutron dose (rem)		Beta dose to skin (rads)			
				Hands and forearms		Other skin	
SC&A	DCAS	SC&A	DCAS	SC&A	DCAS	SC&A	DCAS
9.20	4.483	0.46	0.148	4.20	1.02	2.45	0.54

Source: Anigstein and Mauro (2012)

Note: SC&A values from Anigstein and Olsher (2012). See text for applicable periods.

We note that Allen (2013) agreed to accept the SC&A estimates of doses to the skin. However, there is disagreement on photon and neutron doses.

3 Areas of Agreement

NIOSH and SC&A agree that the layout man represents the bounding scenario during the operation of the New Betatron (not during the entire "Cobalt Era," as stated by Allen, 2013). As Allen points out, both groups agree that radium radiography constitutes the bounding scenario to radiographers during the Radium Era.

4 Unresolved Issues

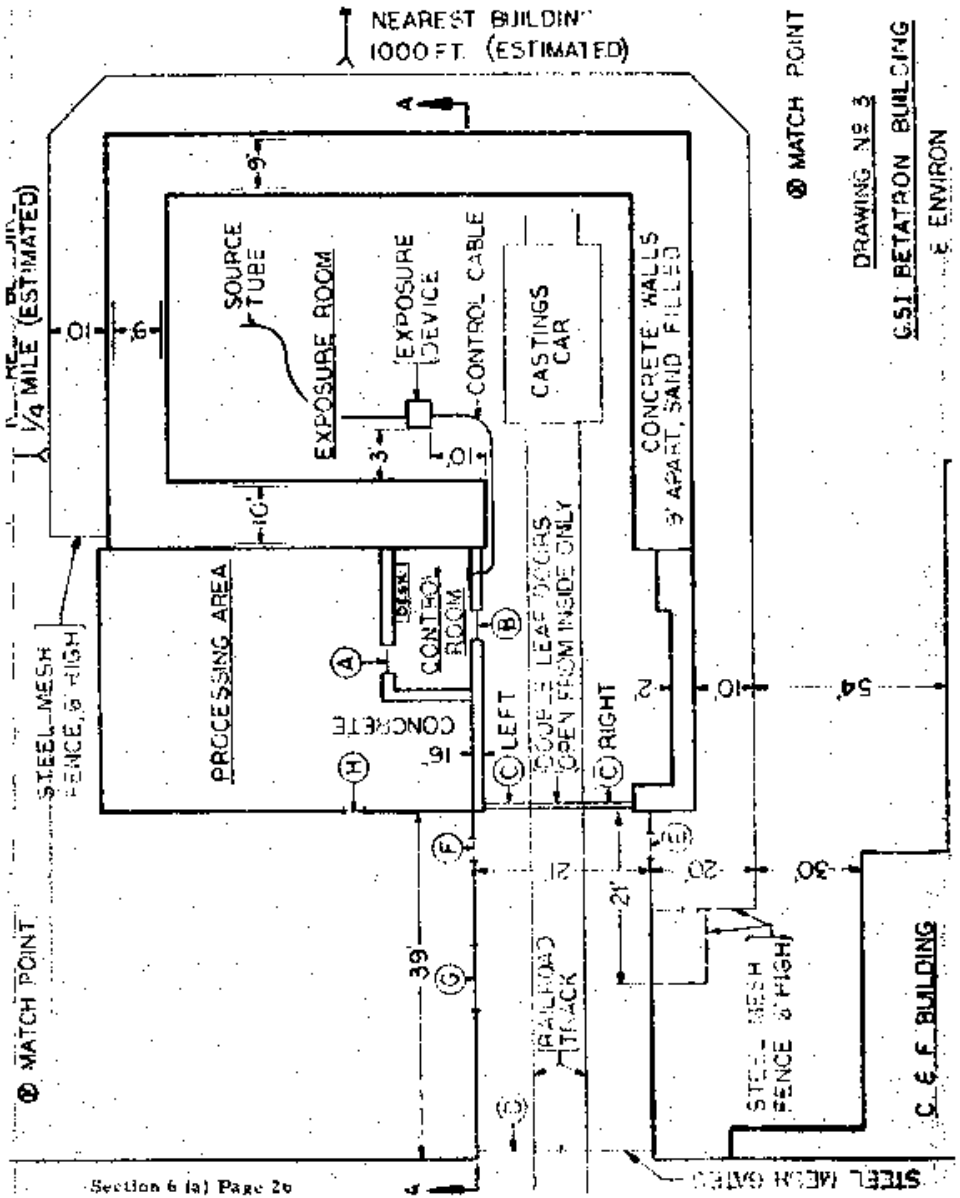
4.1 Layout Man

As shown in Table 2, the SC&A estimate of the exposure of the layout man is more than twice the NIOSH estimate, while our estimate of the neutron dose is more than three times that of NIOSH. Allen (2013) disagrees with our calculations, claiming that our betatron shot scenario would have led to exposures in the control room that would exceed the film badge dosimetry records of the betatron operators. That conclusion is inconsistent with our analysis and with observations regarding film badge dosimetry for the reasons discussed below.

> [Allen (2013) fails] to account for the unnumbered control badge (not Badge No. 001: Betatron Ctl) that was included with each batch of film badges sent to GSI by Landauer. As an integral part of any personal dosimetry program, the control badge is stored in the same location as the film badges of off-duty workers. It is returned to Landauer along with each batch of film badge dosimeters, where all the films are developed in a single batch and read with an optical densitometer. The control badge determines the background—in the terminology of an analytical laboratory, it constitutes a blank. According to [redacted] CHP (former Landauer official, currently a member of the SC&A staff), "The assigned dose is determined by subtracting two numbers that are derived from the density on the user film and the density on the background or 'blank.' . . . Thus, any doses in the film badge dosimetry report represent the doses received by the worker while wearing the badge, not while it was stored in the rack." (Anigstein and Olsher 2012)

Therefore, Allen's (2013) assumption that the film badge dosimetry reports include the exposure of the film badge while it was stored in the rack is incorrect. To the extent that the control badge might have been exposed to stray betatron radiation while the operator was wearing his badge, the dosimetry records might actually understate the doses to the workers.

Our calculation of the exposure of the layout man comprises 22.11 mR per 8-h shift from betatron radiation and 0.53 mR from the activated steel. This yields an annual exposure of 8.98 R from stray radiation from the betatron and an additional 0.22 R from activated steel. With the same shot geometry, we calculated an exposure rate of 0.339 mR/h at the operator's desk in the control room. This results in an annual exposure of the betatron operator of 0.46 R, assuming he sat at the desk in the control room during the entire part of his shift that the betatron was in operation. Thus, his weekly exposure, averaged over 50 weeks, would be 9.2 mR, less than the MDL of the film badge. In reality, especially during the "long shots," he may have left the control room through a back door. Such a scenario is plausible if we note that the operator was a member of the betatron team that was also responsible for processing the exposed films, and that the room directly behind the control room is marked "Processing Area" on the floor plan in Figure 1. This is consistent with the account of the late [redacted] a GSI betatron operator, who said the exposed films were processed in the betatron building. Thus, the operator may have spent part of the time during betatron exposures away from the control room.



Section 6 (a) Page 2b

Figure 1. Drawing of New Betatron Building Showing Desk in Control Room (NRC 2009b)

We therefore believe that our estimated exposure of the layout man of 9.2 R/y is a realistic and claimant-favorable bounding value. This value was presented to the Advisory Board at the June 20, 2012, meeting in Santa Fe, New Mexico.

4.2 Radium Radiography

Allen (2013) correctly summarizes the SC&A exposure analysis of the radiographer using ^{226}Ra sources described in paragraph 1 of section 1 of this memo. We would rephrase his reference to our use of "worst case" parameters: we would characterize the parameters as being claimant favorable yet realistic, the regulatory requirement for assumptions used in dose reconstructions. However, our exposure analysis based on time and distance, as well as the one based on extrapolating the doses of a part-time radiographer to one occupied full time with such work, serve only to buttress our recommendation that the bounding exposures should be equal to the AEC limits. These limits were 15 rem/y prior to 1955 (which Allen failed to mention) and 12 rem/y in 1955 and subsequent years—up to the end of the Radium Era. We disagree with Allen's assertion that "Based on a statement GSI made to the AEC that no one had exceeded the annual limit and the average was below 25% of that limit, the maximum dose can be established as falling between 3 R/yr and 12 R/yr." We interpret GSI's statement that no one exceeded the annual limit to imply that someone's dose might have been at the limit. Since there is no way of knowing who that person was, the AEC limit represents the bounding value. The average dose is immaterial—the decision to compensate a claimant must be based on the real individual, not an imaginary statistical average individual.

We further disagree with NIOSH's adopting our calculated exposures of workers outside the radiography room as a basis for dose reconstructions. Anigstein (2011b) calculated doses outside the steel door to the radiography room to check limiting doses to nonradiographers calculated by Allen (2011). It was not our intention to endorse the assignment of different doses to different classes of GSI workers, although we admit that citing that calculation in that report may have implied as much. From the time of our earliest review of the GSI site profile (SC&A 2008), we have questioned the division of GSI workers into two categories by NIOSH. We believe that the limiting exposures of 15 rem/y in 1953–1954, and 12 rem/y in 1955–1962 should be assigned to all GSI workers. This is the SC&A position that was presented to the Advisory Board on June 20, 2012 and reiterated in response to questions from board members at its meeting in Knoxville, Tennessee, on December 11, 2012. This position is confirmed in the following excerpt from Issue 11 of the Appendix BB issues matrix:

> [NIOSH] 1/13/12: Allen [(2012)] stated that, in assessing doses from betatron operations, dose reconstructors will choose the most favorable exposure scenario (i.e., betatron operator or layout man) in each case.
>
> SC&A Response (7/28/12): We agree that the most favorable exposure scenario should be applied in all dose reconstructions. *The same procedure should be extended to reconstructing the doses from external exposure to sealed sources.* If

such instructions are included in the revised Appendix BB, we will recommend that this issue be closed. [Italics added]

Since these are the only exposures for which there is a factual basis, it is SC&A's position that doses derived from these exposures should be assigned to all workers, not just known or presumed radiographers. This was the basis on which we supported NIOSH's assertion that they can reconstruct doses to all workers during this period.

Otherwise, NIOSH would need to track each worker's job assignment and activities. For instance, was he the one who was taking measurements inside a tank hull while it was being radiographed with a betatron, as recounted by the late [redacted]? Was he the draftsman (not likely to be considered a radiographer by dose reconstructors) who was in the betatron shooting room during a radiographic exposure? Such incidents would most likely be bounded by the 12–15 R/y limiting exposures, but not necessarily by exposures from other scenarios. Likewise, how can NIOSH assign any doses to workers whose job assignments placed them in locations that were not in the proximity of the radium sources? Since the New Betatron Building was not erected until after the Radium Era, the scenario in which workers in No. 10 Building were exposed to stray betatron radiation is not applicable. Since not many workers would have reason to be in or in the proximity of the Old Betatron Building, which was about 250 ft from the nearest other building, stray betatron radiation from the old betatron is likewise not a basis for assigning doses to such workers.

Discussions among Advisory Board members during the Knoxville meeting indicated that at least some believed that the limiting doses would be assigned to all workers during the Radium Era, not just to the small number of known radiographers. Furthermore, using different exposure scenarios in dose reconstructions of different workers is inconsistent with the policy enunciated by Allen (2012), who stated,

> Betatron operator dose is intended to apply to anyone working in the betatron building. Because little information is available for the location of most workers, these doses will apply to *all* workers at GSI. For the same reason, the layout worker dose is intended to apply to *all* workers. . . . Dose reconstructors will choose the most favorable set of doses for the given case. [Italics added]

There is no reason why workers employed during the Radium Era should be treated differently from those employed during the period when the New Betatron was in operation.

4.3 Exposure to SLTL Sources

It is our position that an exposure of 2.67 R/y from SLTL radiography should be assigned to all GSI workers from January 1 to September 30, 1963, whereas NIOSH would assign this exposure only to GSI radiographers, assigning approximately one-half this value to other workers. Since there was no need for GSI radiographers to be involved in this operation, there is no reason they would have a higher exposure than other workers. GSI employees that were most likely to remain in the vicinity of these operations would have been those involved in the production and

testing of the castings—supervisors, metallurgists, layout men, etc.—and perhaps chippers, grinders, and welders who repaired any defects uncovered by the radiographs. Since the identities and even the categories of these workers are unknown, all workers should be assigned this exposure.

5 Summary and Conclusions

NIOSH and SC&A agree on who are the maximally exposed individuals during each era. There is, however, substantial disagreement on the doses to be assigned to GSI workers. SC&A believes that all workers should be assigned the same doses in a given era. NIOSH is inconsistent in this respect, assigning lower doses to nonradiographers prior to New Betatron operations, but the maximum doses—either those modeled for the layout man or the betatron operator, whichever is the most claimant-favorable—during New Betatron operations.

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Attachment 1

20

U.S. Atomic Energy Commission

CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

Identification

Name (Print--Last, first, and middle)	2. Social Security No.
[redacted]	[redacted]
Date of Birth (Month, day, year)	4. Age in Full Years (N)
[redacted]	32

Occupational Exposure

Dose Recorded For (Specify: Whole body; skin of whole body; or hands and forearms, feet and ankles.)	6. Permissible Dose at Beginning of Period Covered by This Sheet	7. Method of Monitoring (e.g., Film Badge--FB; Pocket Chamber--PC; Calculation--Calc.)
Whole Body	48.26 REM	Gamma FB Beta Neutrons

Period of Exposure (From--to)		Dose for the Period (rem) MREM				13. Running Total for Calender Quarter (rem)
		9. Gamma	10. Beta	11. Neutron	12. Total	
1963						
1-1 To 3-31	Total	15				.015
4-1 To 6-30	Total	0				.015
7-1 To 9-30	Total	5				.020
10-1 To 12-31	Total	100				.120
Grand Total		120				.120

Lifetime Accumulated Dose

14. Previous Total	15. Total Dose Recorded on This Sheet	16. Total Accumulated Dose	17. Perm. Acc. Dose	18. Permissible Dose
16.74 rem	.12 rem	16.86 rem	Σ(N--18)= 70.0 rem	53.14 rem

). Name of Licensee

GENERAL STEEL INDUSTRIES, INC.
COMMONWEALTH DIVISION