CONTENTS

PURPOSE .................................................. 1

EXECUTIVE SUMMARY ................................. 1

SITE VISITED ............................................. 2
  General Atomics (GA) ................................. 2
  Massachusetts Institute of Technology (MIT) .... 5
  Princeton Plasma Physics Laboratory (PPPL) .... 7
  University of Wisconsin (WI) ....................... 9

ACKNOWLEDGEMENTS ................................. 16

APPENDIX ................................................. 17
Report on the 13th Meeting of the Joint Working Group of the U.S-Japan Coordinating Committee of Fusion Energy on Safety in Inter-Institutional Collaborations (U.S.-Japan Safety Monitoring Program)  
February 22-25, 2010

PURPOSE
The purpose of the 13th meeting of the U.S.-Japan Safety Monitor Joint Working Group was to informally evaluate the programmatic aspects of environmental, health and safety (ESH) programs in U.S. fusion research facilities by touring laboratory areas and meeting with researchers and safety professionals. Based in these interactions, the U.S.-Japan delegation was able to share information and provide suggestions in an effort to reduce the likelihood of bodily injury and/or property damage. In addition, good approaches and practices developed at different institutions should be utilized to improve environmental, health and safety programs at other institutions.

EXECUTIVE SUMMARY
The Japanese delegation to the 13th meeting of the U.S.-Japan Safety Monitor Joint Working Group consisted of the following individuals:

Kiyohiko Nishimura  Director, Safety & Environmental Research Center  NIFS  
Yuichi Takase  Professor, Graduate School of Frontier Sciences  Univ. of Tokyo  
Atsuhiko M. Supekawa  Manager, JT-60 Safety Assessment Group  JAEA  
Tetsuo Seki  Associate Professor, LHD project  NIFS

The main U.S. Participants were:
Keith Rule, Senior Program Engineer, Princeton Plasma Physics Lab  
Richard Savercool, Safety Engineer, General Atomics

Three members (Professor Nishimura of NIFS, Associate Professor Seki of NIFS, and Dr. Supekawa of JAEA) of the Japanese delegation participated for the first time in the Japan-US Safety Monitoring Joint Working Group. The Japanese delegation was greatly impressed by high attention to the ES&H and established safety organization. At most institutions, ES&H policies are based on the concept of Integrated Safety Management (ISM). DOE provides the basic guidelines of ISM, but its implementation is performed by discretion of each
Each institution has a comprehensive training program which has been useful in deepening the awareness of hazards and reducing the number of accidents/incidents. At many institutions ES&H related information is readily available electronically, and it is possible to make an application for training program online. In some institutions, a personal attendance history of a necessary training program is managed online, and suitable measures such as prohibition of entrance are taken automatically for a person who does not take necessary lectures. The overall evaluation of the 2009 site visits by the JWG is highly satisfactory. In particular, understanding of differences in safety culture between the two countries and between the different states in USA is worthy of note. At institutes with many visiting scientists or workers from outside, it is extremely important for everyone to have enough knowledge of safety. Therefore, Japanese visitors were able to recognize the importance of safety education based on a difference in safety standards in various countries.

SITES VISITED

General Atomics - Monday, February 22, 2010
Personal contacted:

Rick Savercool  Safety Engineer
Mark Foster  DOE Field Program Manager / Site Representative at GA
Peter Petersen  DIII-D Assistant Program Manager
Bill Cary  Manager, Electrical Systems Engineering
Peter Taylor  Manager, Radiation Safety & Measurement
Randy Kuhn  Assistant Fusion Safety Manager
Rick Lee  Chief Operator, DIII-D Operations Manager, Fusion Education
Jessica Mann

- Peter Petersen : DIII-D Program Overview
- Bill Cary : Heating & Current Drive Activities focused on Safety
- Peter Taylor : Radiation Management, Safety and Past Levels
- Rick Lee : Fusion Education Program w/demos
- Jessica Mann : Corporate Safety Program and Support
- Rick Savercool : Fusion Safety Program - Rick Savercool
- Tour of DIII-D

Issues called to the attention to the lab staff:

The accumulated dose limits for workers in GA and for site boundary have been eased in January 2010. There was no information the dose limit for living space (non restricted area)
in GA. The DIII-D has been operated within a limitation of the amount of the neutron emission until now. (A.S.)
Totally, radiation seems to be well controlled.

The JT-60 had the interlock system related to the amount of the neutron emission. Although the DIII-D doesn't have such interlock system, total amount of the neutron is controlled by the operation of the NB injector (input). (A.S.)

Near the Li-Pellets diagnostics system in the restricted area, a worker is working without a mask. Please consider to wear a mask during work in the restricted area to prevent an internal exposure by the radioactive dusts (Fig. 1). (A.S.)

Monitoring system by the warning light (the difference of the color) is good (Fig. 2). (A.S., K.N.)

Wiring in the Gyrotron room is good. We could not found the wiring without support. Most of cables were wired in the space under the floor. It is very good design from the view points of safety and handling (Fig. 3). (T.S.)
The entrance of the room in which the high voltage is used is restricted severely and the information of this room condition is displayed in front of the room (Fig. 4). (T.S.)

Entering the experimental hall is controlled by the key control system (KIRK Key) (Fig. 5). (T.S.)

![Fig. 4. Warning light.](image1)

![Fig. 5. KIRK Key.](image2)

The security of the computer system is still under consideration, because it must be paid attention to the ease of use and the safety control. They have specially paid attention to the arc-flash during the handling of the high voltage, for example, wearing a protection glasses. Totally, we felt the careful attentions to the safety. (T.S.)

The capacitors were placed near the wall. Some terminals were grounded, and the others were not grounded. To prevent an electric shock, capacitor terminal should be terminated when they do not in use (Fig. 6). (K.N.)

![Fig. 6. Capacitors without termination.](image3)

The indication of “EXIT” on the floor is good idea. If it was made by the fluorescent material, it can be seen during a power failure (Fig. 7). (K.N.)

![Fig. 7 “EXIT” sign on the floor.](image4)
MIT - Tuesday, February 23, 2010

Personal contacted:

- Richard Temkin, PSFC Associate Director
- Matthew Fulton, Facilities & Safety Manager
- Catherine Fiore, Head, PSFC Office of ES&H
- Andrew Kalil, MIT EHS

- Catherine Fiore: The PSFC and the PSFC Environmental, Health and Safety Program
- Catherine Fiore and Andrew Kalil: The MIT Environmental, Health and Safety Program
- Facility Tour
- Closing Comments and Discussion

Issues called to the attention to the lab staff:

“Roles and Responsibilities for EHS”, “Design of the EHS system for Alcator C-Mod and the PSFC” and “PSFC ES&H program” are helpful for us to improve the ES&H system in Japan. (A.S.)

Since there are many earthquakes in Japan, Japanese regulation does not allow stacking heavy things on a tall shelf without measures to prevent a falling accident. In MIT, their regulation does not forbid to stack heavy equipments on a tall shelf. Such difference is based on a safety standard between Japan and the east coast in Unite States. (A.S., K.N.)

A stepladder and a gas cylinder on a carrier were stayed on the passage sometimes prevent a safety walking. They should be kept at prescribed places (Fig. 8). (T.S.)

The electric saw has some emergency stop equipments such as “SAW STOP” (Fig. 9). It is good for the worker’s safety. (T.S.)

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Fig. 8. A stepladder and a gas cylinder on a carrier are kept on a passage.

Fig. 9. An electric saw.
The current terminals of high voltage or high current should be covered with protecting cover to prevent an accident of electric shock (Fig. 10). (K.N.)

A block of lead was put on the floor without any coatings. Powder of lead and lead oxide give damage to the health. To keep lead without coating is forbid in Japan (Fig. 11). (K.N.)

Local air exhauster was set in the machining area. It is good for worker’s S&H (Fig. 12). (K.N.)

Each user can search the information of hazards, their positions and their seriousness, and required protections on the web site. PSFC in MIT is carrying out the safety training and keeping safety activity according to the S&E program. Each work has many training terms. Personal data of his completed training programs is controlled on the web site. People can find on the web the kinds of hazards and requested trainings. And people can request the training on the web.
Personal contacted:

Keith Rule Senior Project Engineer
Adam Cohen Deputy Lab Director for Operations
Stewart Prager Director
A. vonHalle NSTX Engineering Head
J. Levine Head, ES&H
P. Efthimion Head, Plasma Science & Technology
M. Williams Head, PPPL Engineering

- Stewart Prager : PPPL Overview – Current & Future Research –
- A. vonHalle : NSTX Overview – Plans for Upgrade –
- J. Levine : PPPL Safety Program
- K. Nishimura : Safety Management in NIFS
- A.M. Sukegawa : Safety Administration and activities at JAEA
- P. Efthimion : tour of PPPL research and operations
  – Lab Wing, LTX, MRX –
- M. Williams, A. vonHalle : tour of PPPL research and operations
  – NSTX, MOCK-UP, NB AREAS, TFTR Test Cell –

Issues called to the attention to the lab staff:

Since there are many earthquakes in Japan, gas cylinder must be fixed by two binders with non flammable wires. It is understood as the difference of safety standards between Japan and the east coast in Unite States. However, the cause of falling down of cylinder is not the earthquake only. For example, accidental hard hit of carrying cart may cause falling down. Especially, one loose binding is dangerous. Most cylinders in the laboratories are fixed by one binding and some bindings are loose (Fig. 13). (T.S. & K.N.) It is better to fix cylinder at two positions.

Fig. 13. Gas cylinders with one loose binding.
Cablings on the floor should be limited the temporally usage (Fig. 14). (T.S. & K.N.) If it needs to keep them permanently, it must be protected with suitable coverings.

The indication of “KEEP AREA CLEAN” on the floor is good idea. If it was made by the fluorescent material, it can be seen during a power failure (Fig. 15). (K.N.)

**TFTR**

The vinyl curtain is set in front of the big door of TFTR Hall to prevent pollution (Fig. 16). (A.S.) It is very good.

The experimental hall of TFTR is still keeping as a restricted area. Indication of “Restricted Area” is put up on the entrance door. The entrance in the hall is controlled by keys (Fig. 17).
In the large projects such as TFTR and NSTX, safety program is working effectively. PPPL has own safety program. However, PPPL keeps contact with Princeton University and DOE, and renews information frequently. (T.S.)

**Univ. of Wisconsin - Thursday, February 25, 2010**

Personal contacted:

- J.A. Goetz Senior Scientist
- P.J. Weix Senior instrument Specialist
- David T. Anderson Electrical & Computer Engineering Director
- B. Kujak-Ford Research Specialist

- J. Goetz : overview of MST program and safety
- P. Weix and J. Goetz : tour of MST facility, discussion
- D. Anderson : overview of HSX program and tour
- B. Kujak-Ford: overview of Pegasus program
  - tour of Pegasus
  - discussion

**Issues called to the attention to the lab staff:**

**MST**

Door access is controlled by using the various keys and it is linked to the interlock system (Fig. 18). It is simple and effective. (A.S., T.S. & K.N.)

Information of hazard by colored warning light is convenient and effective. Similar system is applied in GA and NIFS (Fig. 19). (A.S. & K.N.)

![Fig. 18. Keys for door interlock.](image1)

![Fig. 19. Information of warning lights.](image2)
Partitioning off the front area of the power supply board by taping is effective to keep clean there. If the tape was made by the fluorescent material, it can be seen during a power failure (Fig. 20). (T.S. & K.N.)

Tools, grounded rod, safety equipments and medical equipments are provided near the entrance of the gate (Fig. 21). (T.S. & K.N.)

Fig. 20. Partitioning off the front area of the power supply board.

Fig. 21. Tools, grounded rod, safety equipments and medical equipments near the entrance gate.
Switching of the current terminals is controlled by the keys (Fig. 22). Key system is very good, but the terminals should be covered completely to prevent the electric shock. (T.S. & K.N.)

Fig. 22. Switching of the current terminal is controlled by the key.

Most cylinders in the laboratories are fixed by one binding (Fig. 23). (T.S. & K.N.) Such things have been seen in the laboratories in the East side of the US. It is understood as the difference of safety standards between Japan and the east coast in Unite States. Since there are many earthquakes in Japan, gas cylinder must be fixed by two binders with non flammable wires. However, the cause of falling down of cylinder is not the earthquake only. For example, accidental hard hit of carrying cart may cause falling down. Especially, one loose binding is dangerous. It is better to fix cylinder at two positions.

Fig. 23. Gas cylinders with one binding.
The rest parts of bundling wires may wound eyes of workers. It should be cut or treated safely (Fig. 24). (K.N.)

The edge of stage at the capacitor bank area has no toe-boards (Fig. 25). (T.S.) Please consider installing them to prevent the accidental falls of equipments.

![Fig. 24. The rest parts of bundling wires.](image)

![Fig. 25. Stage at the capacitor bank area.](image)

Pathway in the capacitor bank area is narrow. To prevent an accidental electric shock in case of emergency, the terminals of capacitors should be covered (Fig. 26). (T.S.)

Blocks of lead were put on the stage without any coatings. Powder of lead and lead oxide may give damage to the health. To keep lead without coating is forbid in Japan (Fig. 27). (K.N.)

![Fig. 26. Narrow passage in the capacitor bank area.](image)

![Fig. 27. blocks of lead on stage without coating.](image)
HSX

Door access is controlled by using the keys and it is linked to the interlock system (Fig. 28). It is simple and effective. (K.N.)

Information of machine status by colored lights is convenient and effective. Similar system is used in GA and NIFS (Fig. 29). (A.S., T.S. & K.N.)

Please take care of the injury of researcher by projecting things around the machine, and projecting things itself may suffer serious damage by accidental hit (Fig. 30). (A.S. & K.N.) Especially the damage to eye by the rest part of the bundling wire is serious. (K.N.)

Please consider installing additional toe-boards at the periphery of underground pit (Fig. 31). (T.S.) It is useful to prevent the injury by the accidental falls of equipments. (K.N.)

Blocks of lead were put on the stage without any coatings. Powder of lead and lead oxide may give damage to the health. To keep lead without coating is forbid in Japan (Fig. 32). (T.S. & K.N.)
A knockdown fence, a stepladder and a bloom are stood against a wall (Fig. 33). Since there are many earthquakes in Japan, most equipments must be took the action of preventing from falling down. However, the cause of falling down of equipments is not the earthquake only. For example, accidental hard hit of carrying cart may cause falling down. Such falling down may give the secondary damage to the other equipments or a man. From the view point of preventing falling down, stacking goods at high position needs to pay same attention (Fig. 34). (A.S. & K.N.)

Although Japanese participants can understand that such difference of safety standards between Japan and the east coast in Unite States is based on a geographical environment, we recommend to the US safety staff to consider the things mentioned above. (A.S. & K.N.)
Information of machine status by colored lights is convenient and effective (Fig. 35). (T.S.)

Door access is controlled by using the keys and it is linked to the interlock system (Fig. 36). It is simple and effective.

Partitioning off the front area of the power supply board by taping is effective to keep clean there. If the tape was made by the fluorescent material, it can be seen during a power failure (Fig. 37). (T.S. & K.N.)

The rest parts of bundling wires may wound eyes of workers. It should be cut or treated safely (Fig. 38). (K.N.)
The current terminals of power line should be covered with protecting cover to prevent an accident of electric shock (Fig. 39). (K.N.)

In University of Wisconsin, the safety measures for the individual machines as well as the general safety measurements and the required trainings are performed. It is common to the sites where we visited in this program.

ACKNOWLEDGEMENTS
The US-Japan Safety Monitor Joint Working Group members would like to thank all the individuals who participated in the facility tours. The Japanese delegation is grateful to the hosting institutions for sharing their experience and for their gracious hospitality, and to Keith Rule of PPPL for making detailed arrangements and for his generous hospitality throughout the trip.
APPENDIX

Itinerary and Meeting Agenda for 2010 Site Visits of the US-Japan Safety Monitoring Joint Working Group
February 22-25, 2010

Sunday, February 21, 2010
Japanese delegates arrive in U.S.

GA - Monday, February 22, 2010
0830  Depart hotel with luggage
0845  Arrive DIII-D reception area and receive badges
0900  Agenda review and changes if necessary - Rick Savercool
0905  Welcome to GA and the Fusion Group - Mark Foster
0910  DIII-D Program Overview - Peter Petersen
0930  Heating & Current Drive Activities focused on Safety - Bill Cary
0950  Radiation Management, Safety and Past Levels - Peter Taylor
1015  Break - Randy Kuhn
1025  Fusion Education Program w/demos - Rick Lee
1045  Corporate Safety Program and Support - Jessica Mann
1100  Fusion Safety Program - Rick Savercool
1130  Discussion
1145  Depart for private Cafeteria for lunch
1200  Lunch
1315  Tour of DIII-D
1400  Close-out meeting and final discussion
1500  Depart for Hotel
1945  Arrive San Diego Airport
2145  Depart San Diego for Boston

MIT - Tuesday, February 23, 2010
0830  Continental Breakfast
0900  Welcome - Dr. Richard Temkin, PSFC Associate Director
0915  The PSFC and the PSFC Environmental, Health and Safety Program
      -- Dr. Catherine Fiore, Head, PSFC Office of ES&H
1015  Break

17
1030  The MIT Environmental, Health and Safety Program - Catherine Fiore and Andrew Kalil, MIT EHS
1115  Facility Tour
1230  Lunch
1330  Closing Comments and Discussion
1400  Close

**PPPL - Wednesday, February 24, 2010**
0845  Welcome – Adam Cohen (Deputy Lab Director for Operations)
0905  PPPL Overview – Current & Future Research – Stewart Prager (Director)
0935  NSTX Overview – Plans for Upgrade – A. vonHalle (NSTX Eng. Head)
1005  Break
1015  PPPL Safety Program – J. Levine
1045  Safety Management in NIFS – K. Nishimura
1100  Safety Administration and activities at JAEA – A.M. Sukegawa
1115  Tour of PPPL research and operations – Lab Wing, LTX, MRX, – P. Efthimion
1200  Lunch
1300  Tour of PPPL research and operations – NSTX, MOCK-UP, NB AREAS, TFTR Test Cell, – M. Williams, A. vonHalle
1400  Discussion
1430  Departure

**Univ. of Wisconsin - Thursday, February 25, 2010**
0900  depart hotel for Chamberlin Hall
0930  overview of MST program and safety [J. Goetz]
1000  tour of MST facility, discussion [P. Weix, J. Goetz]
1130  lunch break (Memorial Union)
1300  overview of HSX program and tour [D. Anderson]
1430  overview of Pegasus program and tour [B. Kujak-Ford]
1600  discussion
1700  Departure

**Friday, February 26, 2010**
Japanese delegates depart U.S.