



U.S. Department of Energy  
**Office of River Protection**

P.O. Box 450, MSIN H6-60  
Richland, Washington 99352

08-WTP-146

JUL 31 2008

The Honorable A. J. Eggenberger  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, N.W., Suite 700  
Washington, D.C. 20004-2901

Dear Mr. Chairman:

THE U.S. DEPARTMENT OF ENERGY (DOE), OFFICE OF RIVER PROTECTION (ORP)  
REPORT ON STRUCTURAL STEEL FIRE PROTECTION EVALUATION AT THE WASTE  
TREATMENT AND IMMOBILIZATION PLANT (WTP)

- References:
1. ORP letter from S. J. Olinger to A. J. Eggenberger, DNFSB, "The U.S. Department of Energy (DOE), Office of River Protection (ORP) Updated Status on Structural Steel Fire Protection at the Waste Treatment and Immobilization Plant (WTP), 08-WTP-115, dated June 6, 2008.
  2. ORP letter from S. J. Olinger to A. J. Eggenberger, DNFSB, "The U.S. Department of Energy (DOE), Office of River Protection (ORP) Status of Structural Steel Fire Protection at the Waste Treatment and Immobilization Plant (WTP), 07-WTP-189, dated July 19, 2007.

The attached report titled, "Fire Resistant Design Approach for the WTP" provides a comprehensive report on the fire protection of structural steel at the Low-Activity Waste (LAW) Facility for your information, in accordance with Reference 1.

The path forward for resolving the fire protection issues with structural steel at the WTP had been identified in Reference 2, and is summarized below:

- Address the building stability in the event of a fire considering only the fireproofed primary load bearing beams and columns, and taking no structural credit for non-fireproofed structural steel members.
- Assure that the structural concrete slabs remain stable and capable of supporting prescribed loads without the support from non-fireproofed structural steel members.
- Evaluate the impacts of thermal growth of the non-fireproofed steel on the fireproofed primary structural steel members.

JUL 31 2008

Reference 1 provided the status of progress made on these three items, and noted that the first and second items had been favorably reviewed by your Staff. DOE considers these two items closed. The attached report specifically addresses the third item. Nuclear safety and confinement of nuclear materials, other than indirect impacts, were not of concern in a design fire scenario, since the primary confinement structures, hot cells, black cells, and melter caves are robust concrete walls and slabs that are self-supporting and do not rely on structural steel members (fireproofed or non-fireproofed) for support. Furthermore, as discussed in the report, the selection of fireproofing of structural steel confirmed there were no direct impacts, and identified the potential of indirect impacts on safety class and safety significant structures or equipment required to maintain confinement and nuclear safety, as part of the Integrated Safety Management (ISM) process. ISM evaluations continue to be performed, and additional secondary steel that may indirectly impact safety class and safety significant structures or equipment would be fireproofed accordingly. In addition, analyses supporting the resolution of the first two items demonstrated that complete loss of non-fireproofed structural steel does not result in loss of facility or slab stability, and does not cause progressive collapse.

The issue raised by the Defense Nuclear Facilities Safety Board staff regarding thermal growth of non-fireproofed steel focuses on continued operations of the WTP and the potential long delays in restarting facilities in the event of a catastrophic fire. The Pretreatment (PT) Facility is classified as Type IB, 2 hour rated. Even though the LAW, the Analytical Laboratory (LAB), and High-Level Waste (HLW) Facilities are classified as Type IIB construction, not rated, by the International Building Code (IBC), the fire resistance design approach of these facilities exceed Type IIB requirements, and is equivalent to Type IB, 2 hour rated. As noted in Reference 2, WTP is provided with multiple levels of defense-in-depth controls, including fire barriers, administrative procedures for control of combustible materials, trained work force, automatic sprinkler protection systems, fire alarm and detection systems, and automatic fire department notification and response. In the unlikely event that all of these controls fail, DOE recognizes that there is a possibility of fire damage to the structural steel and non-safety related equipment that could affect operation, and would require an assessment of the affected area, and subsequent repair and/or replacement prior to the restart of the plant as part of the post fire recovery action. DOE considers this small risk to be acceptable.

Structural fire protection design for the WTP facilities was based upon traditional prescriptive criteria applicable to normal industrial hazards, i.e., "Design by Qualification Testing." In 2005, American Institute of Steel Construction (AISC) Specification 360-05 introduced an alternative approach based upon performance, i.e., "Design by Engineering Analysis." In order to confirm the adequacy of the WTP design, evaluation of the effect of the thermal expansion of the non-fireproofed secondary members on the fireproofed primary steel members has been performed following the performance based criteria of AISC 360-05. A representative section of the LAW framing that was expected to result in high forces and displacements for the unmitigated design basis fire was evaluated to demonstrate that the LAW structure has adequate capacity to maintain stability. This evaluation the methodology has been reviewed by the DOE fire protection engineer and the Structural Peer Review Team.

JUL 31 2008

The evaluation concludes that in the unlikely event of an uncontrolled major fire:

- Primary fireproofed structural steel members may have some deformation, and still maintain sufficient capacity to support the facility during and after a fire, considering effect of thermal growth of non-fireproofed members.
- Potential deformation of the primary fireproofed steel members could not be mitigated by providing additional fireproofing to the secondary members. Therefore, fireproofing is not necessary on the secondary steel members and preventive and defense-in-depth measures designed in the WTP as noted above are considered to be adequate to mitigate potential damage and disruption of operation.

DOE plans to brief the Board in August 2008 at your convenience, to close this issue.

If you have any questions, please contact me, (509) 372-3062.

Sincerely,



Shirley J. Olinger, Manager  
Office of River Protection

WTP:WA

Attachment

cc w/attach:  
W. M. Linzau, DNFSB  
R. G. Quirk, DNFSB  
J. A. Rispoli, EM-1  
I. R. Triay, EM-2  
J. M. Owendoff, EM-3  
D. Y. Chung, EM-60  
R. H. Lagdon, EM-60  
K. G. Picha, EM-60  
W. G. Boyce, EM-61  
M. B. Whitaker, HS-1.1  
S. M. Hahn, RL  
BNI Correspondence