UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

EMPLOYEE CONCERN 22800 UNISTRUT SUPPORT DESIGN

TENNESSEE VALLEY AUTHORITY

DOCKET NOS. 50-259, 50-260 AND 50-296

1.0 STATEMENT OF EMPLOYEE CONCERNS

The concerns address the acceptability of using Unistrut members as seismic Category I supports for instruments, pipes, conduits, control stations and panels, lighting, etc. such that the supported items will not fail or become missiles to damage other safety-related equipment.

2.0 SUMMARY AND EVALUATION

The issues are: (a) Unistrut is unacceptable for use as seismic Category I supports for instruments, pipes, conduits, control stations, panels lighting, etc.; (b) items so supported by Unistrut may become missiles and endanger other safety-related equipment if the support fails.

3.0 EVALUATION

Unistrut members are cold-formed steel channels that are used as structural elements (e.g., beams and columns) in component supports. In general, the concerns are related to the adequacy of using Unistrut members as load-carrying elements, the adequacy of clamps used to attach components to Unistrut members, and the adequacy of the design calculations which document that acceptable safety margins exist for Unistrut supports.

Employee Concern WI-85-100-024 questioned the use of Unistrut in seismic Category I support at Watts Bar Nuclear Plant (WBN). It also raised the concern that such use may compromise the ability of safety-related equipment to perform its intended function. Employee Concerns IN-85-244-001, IN-85-845-002, IN-85-947-001, IN-86-164-001, IN-86-299-002 and IN-85-283-002 questioned the use of Unistrut in certain specified application at WBN.

As a part of the TVA evaluation process, the employee concerns, which originated at WBN, were evaluated for their generic applicability to other TVA nuclear plant sites including the Browns Ferry Nuclear Plant (BFN). The evaluation process further included review of TVA criteria documents related to the issues, applicable FSAR sections, design criteria, design report, calculations and test results as well as input from NRC (letters and staff SERs).

The TVA evaluation team concluded that Unistrut type materials are acceptable for use in supporting seismic Category I items when they are properly designed to ensure that design loads are within the allowable design limits and when they are properly installed to ensure that they can develop their design

allowable loads. A review of Unistrut support designs used at BFN by TVA confirmed that these requirements are fulfilled with the following exceptions. (1) Discrepancy exists between TVA Singleton Lab and Unistrut Corp. test data for Unistrut pipe clamps P2558-20 to P2558-50. (2) There should be a written requirement to use an interaction equation for design of Unistrut pipe clamps subjected to simultaneous loads in more than one direction. TVA did not specify this requirement, although it is a standard engineering practice for this type of application. (3) Reevaluation programs for seismic Category I small bore piping, tubing, and conduit and their supports must be completed for all BFN units in order to verify the adequacy of Unistrut members used for these supports. These reevaluation programs require upgrading the calculations to current design practices and will include computations not previously performed because BFN was designed before many of the current practices were introduced.

TVA committed to the following corrective actions to address the above three exceptions:

(1) Reevaluate the criteria and calculations used to qualify safety-related small bore supports, CRD insert and withdrawal piping supports, instrument tubing supports, and conduit supports.

(2) Reevaluate Unistrut pipe/conduit clamp allowable loads. If necessary, retest the clamps and evaluate the effect of the revised allowable loads on conduit support designs.

(3) Add an interaction equation for Unistrut pipe clamps to design criteria and evaluate the effect on conduit support designs.

Further breakdown of the above summary issues are provided in the Appendix B of the reference report (Reference 5.1) together with corrective action plans. TVA stated that no corrective action, so far, has been identified as requiring hardware or plant modification, but all corrective action plans require an evaluation to determine whether hardware changes are necessary. TVA corrective actions that have been implemented since the concerns were registered have revealed the need for many document changes. A few required other types of corrective actions such as testing and walkdowns.

The staff finds that the licensee's evaluation and corrective action plans are comprehensive and are based on a sound engineering practice. The staff concludes that, when properly implemented, the proposed plans would provide an adequate resolution for the employee concerns.

4.0 CONCLUSIONS

The use of Unistrut members for seismic Category I supports, with proper design and installation, has been accepted by the NRC staff in other licensed plants. The NRC staff reviewed TVA's investigations and corrective action plans and concludes that, with proper implementation, they would provide an adequate resolution of the concern described in Employee Concern 22800 for the Browns Ferry Nuclear Plant.

5.0 REFERENCE

5.1 Employee Concerns Special Program, Subcategory Report 22800, Unistrut Support Design, Revision Number 3.