BRANCH/PROJECT ID:
WCG-1-640

ATTACHMENT E
SHEET 1 OF 2

CALCULATION COVER SHEET

CALCULATION NO.: EQE 50054.01-C-001

PROJECT NUMBER/NAME: 50054.01 WBN CABLE TRAY QUALIFICATION

CALCULATION TITLE: CATEGORY I(L) CABLE TRAY QUALIFICATION, WATTS BAR NUCLEAR PLANT

REFERENCES: SEE SECTION 5

ATTACHMENTS: A. APPENDIX A TO WB-DC-26-21.1

TOTAL NUMBER OF PAGES (INCLUDING COVER SHEET): 299

PREPARED BY: Fargi R. Beig DATE: 11/16/90

CHECKED BY: KWD DATE: 11/16/90

REVIEWED BY: HS Johnson DATE: 11/16/90

APPROVED BY: [signature] DATE: 11/16/90

REV. NO.	DATE	DESCRIPTION OF REVISION	BY	CHECK	REVIEW	APPROVED
0	11/16/90	ORIGINAL ISSUE	FB	KWD	HSJ	[signature]

923/calcov

THIS SHEET ADDED BY REV. 0

923/tp-oct

3) Calculation of Tray frequency in transverse direction based on test results.

At yield the deflection in transverse direction is 0.5 IN under point load of 850 lbs applied to the center of the tray in transverse direction. (Ref. 5.6)

$$\delta = \frac{Pl^3}{48EI}$$ (deflection of a simply supported beam under a point load at center of the span)

$$\Rightarrow EI = \frac{Pl^3}{48\delta}$$

$$= \frac{850\,(96)^3}{48\,(0.5)} = 3.13 \times 10^7$$

$$f_H = \frac{9.87}{2\pi}\sqrt{\frac{EIg}{wl^4}}$$ (Ref. Roark & Young, "Formulas for Stress and Strain," 5th edition.

$$= \frac{9.87}{2\pi}\sqrt{\frac{3.13\times10^7 \times 386.4}{\left(\frac{30\times1.5}{12}\right)(96)^4}} = 9.68 \text{ HZ}$$

4) Use natural frequency formulas for uniform shear beams given in "Formulas for natural frequency and mode shapes," by R. BLevins, p.176 and calculate the transverse frequency of the Tray using test results and considering shear beam behavior.

$$f_H = \frac{\lambda_i}{2\pi l}\sqrt{\frac{KG}{\mu}} \qquad (1)$$

THIS SHEET ADDED BY REV. 03

Modify the above formula, for ease of use, as follows:

first, as given in above reference page 174. The transverse shear load, Q, supported by the cantilever cross section is:

$$Q = KAG\frac{\partial y}{\partial x}$$