

US EPA ARCHIVE DOCUMENT



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

DEC 22 1987

OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Captan - Dietary Exposure and Oncogenic Risk  
Assessment.

FROM: Susan L. Stanton  
Tolerance Assessment Program  
HED/RCB (TS-769C)

*Susan L. Stanton 12/21/87*

THRU: Karl Arne, Ph.D. *KArne*  
Branch Senior Scientist  
HED/RCB (TS-769C)

TO: Valerie Bael  
Special Review Branch  
Registration Division (TS-767C)

and

Eugene Wilson, PM Team 23  
Fungicide-Herbicide Branch  
Registration Division (TS-767C)

Action Requested

Provide an estimate of exposure and oncogenic risk for Captan using anticipated residues and percent of crop treated data where applicable.

Discussion

1. The reference dose (PADI) used in the analysis was 0.013 mg/kg body wt/day, based on a NOEL of 12.5 mg/kg body wt/day obtained in 1-generation and 3-generation rat reproduction studies, with an uncertainty factor of 1000. The additional uncertainty factor of 10 results from outstanding data gaps. This value has been verified by the Toxicology Branch ADI Committee (3/07/86).

In addition, this compound has been identified as an oncogen in rats and mice, and has been classified as a Category B2 oncogen by the Toxicology Branch Peer Review Committee. The upper bound potency estimate (Q\*) obtained in this study was  $2.3 \times 10^{-3} \text{ (mg/kg/day)}^{-1}$  (personal communication, R. Levy).

2. The Tolerance Assessment System (TAS) Program conducted a Routine Chronic analysis and oncogenic risk assessment using percent of crop treated data provided by the Benefits and Use Division (memo Pelletier to Bradley, 7-8-87) and anticipated residues as discussed in the Dec. 14, 1987 memo from Nan Gray to Valerie Bael and Eugene Wilson. In general, where sufficient FDA monitoring data existed, the analysis used the average residue from the maximum year without correction for percent of crop treated. These data include only residues of Captan, per se, and not any of the known plant metabolites, which are not determined by the method used by FDA. The estimates of exposure based on these data are therefore somewhat underestimated. It is not likely that residues for the metabolites would make a significant difference in these estimates, as available metabolism and residue data suggest that captan is a majority of the residue in RACs.

In the absence of sufficient FDA monitoring data, TAS used the average residue from field trials with the percent of crop treated included in the calculation.

3. The food uses evaluated were those published in 40 CFR 180.103 and 21 CFR 193.40, except as explained below.

Residue data have not been submitted in support of many of the existing uses for Captan. In the absence of data, RCB is recommending cancellation of these uses and revocation of the tolerances in the Registration Standard. Since these uses will soon be eliminated, they were not included in the present analysis. Uses to be cancelled include avocados, beans, blackberries, blueberries, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, collards, cottonseed, cranberries, dewberries, eggplant, garlic, kale, leeks, mangos, mustard greens, onions, peas, peppers, pineapples, pumpkins, raspberries, rhubarb, rutabagas, shallots, taro, turnips, and watermelons.

The analysis also included anticipated residues for meat and milk resulting from treated feed items (raisin waste and almond hulls). In this case, no adjustment was made to account for percent of animals receiving treated feed.

A complete listing of tolerance, anticipated residue, and percent of crop treated data used in the analysis is appended in Table 1.

4. Evaluation of Exposure Relative to the PADI: The TAS Routine Chronic Analysis estimates exposure, based on per capita consumption, for the U.S. population and each of 22 population subgroups. In this case the Anticipated Residue Contribution (ARC) for the U.S. population was calculated to be 0.001728 mg/kg body wt/day, corresponding to 13% of the PADI. The two most highly exposed subgroups were non-nursing infants (0.009743 mg/kg body wt/day or 75% of the PADI) and children, aged 1 to 6 years (0.004447 mg/kg body wt/day or 34% of the PADI). A summary of the analysis is provided in the attached Table 2.

It should be noted that approximately 60% (for the U.S. Population) to 67% (for non-nursing infants) of the exposure is due to residues in milk. The TAS analysis assumes that all dairy cows would receive treated feed. Since raisin waste and almond hulls are relatively minor feed items, it is unlikely that this would be true. Therefore, these calculations represent an overestimate of exposure, particularly in the case of non-nursing infants, for whom milk constitutes a major portion of their diet.

5. Calculation of Oncogenic Risk: Risk was calculated only for the U.S. population average, in accordance with current HED policy. This value was calculated by the relationship:

$$\begin{aligned} \text{Risk} &= \text{Exposure} \times Q^* \\ &= \text{ARC} \times Q^* \\ &= 0.001728 \times (2.3 \times 10^{-3}) = 3.9 \times 10^{-6} \end{aligned}$$

The breakdown of risk by food group for the overall U.S. Population is as follows:

<u>COMMODITY</u>	<u>ARC</u> <u>UG/KG/DAY</u>	<u>RISK</u> <u>x 10<sup>-6</sup></u>
Milk <sup>b</sup>	1.053391	2.4
Stone Fruit <sup>a</sup>	0.301456	0.69
Strawberries <sup>a</sup>	0.118010	0.27
Red Meat <sup>b</sup>	0.111589	0.26
Grapes/Raisins <sup>a</sup>	0.062485	0.14
Leafy Veggies. <sup>a</sup>	0.047115	0.11
Pome Fruit <sup>a</sup>	0.026178	0.060
Curcubits <sup>b</sup>	0.004632	0.011
Tomatoes <sup>a</sup>	0.002907	0.0067
Citrus Fruit <sup>b</sup>	0.000466	0.0011
Almonds <sup>b</sup>	0.000165	0.0004

$$\text{Total Risk} = 3.9 \times 10^{-6}$$

<sup>a</sup>analysis based on average monitoring data (Max. year).

<sup>b</sup>analysis based on average field trial residues corrected for percent of crop treated.

For the reasons stated above, this risk analysis overestimates risk from residues in milk and meat. Adjusting milk and meat residues to account for the percent of animals receiving treated feed would likely reduce the risk estimate significantly.

However, approximately one-third of the exposure and oncogenic risk is from other dietary sources, and nearly all of this remaining exposure is from crops for which average monitoring data were used in the calculations (see preceding page table). Therefore, further manipulation of the data is unlikely to result in significantly lower estimates of dietary exposure and oncogenic risk from these crops.

cc. TAS File  
Reading File  
circ.  
Nan Gray (RCB)  
Captan SF  
Tox Branch

Table 1

FOOD CODE	FOOD	TOLERANCE (ppm)	ANTICIPATED RESIDUE (ppm)	AR TYPE	% CROP TREATED	RES. VALUE USED IN TAS RUN (ppm)	STUDY TYPE		EFFECTS		REFERENCE DOSES		DATA GAPS/COMMENTS		STATUS
							Reproduction- rat	NOEL=	ADJ based on results of 1-gen. and 3-gen. reproduction studies. Evidence of oncogenicity in rats and mice.	PET.#	FOOD FORM	ADJ based on results of 1-gen. and 3-gen. reproduction studies. Evidence of oncogenicity in rats and mice.	PADI	OPP Rfd=	
01014A	GRAPE-FRESH	10	RAW-FRESH OR NFS	15	P 50.00000	0.370000	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog	3/07/86.	
01014A	GRAPE-FRESH	21	COOKED-NFS	15	P 50.00000	0.370000	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog	3/26/86.	
01014A	GRAPE-FRESH	31	COOKED-FRESH OR CANNED	15	P 50.00000	0.370000	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog	WHO last reviewed 1984.	
01014A	GRAPE-RAISINS	10	RAW-FRESH OR NFS	15	P 50.00000	0.370000C	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog		
01014A	GRAPE-RAISINS	21	COOKED-NFS	15	P 50.00000	0.370000C	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog		
01014A	GRAPE-RAISINS	22	COOKED-FRESH-BAKED	15	P 50.00000	0.370000C	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog		
01014JA	GRAPE-JUICE	10	RAW-FRESH OR NFS	15	P 50.00000	0.370000	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog		
01014JA	GRAPE-JUICE	15	RAW-FRESH OR CANNED	15	P 50.00000	0.370000	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog		
01014JA	GRAPE-JUICE	21	COOKED-NFS	15	P 50.00000	0.370000	MONITORING	100.00	0.370000	0.370000	1000	0.013000	Chronic feeding- dog		
01016AA	STRAWBERRIES	10	RAW-FRESH OR NFS	15	P 25.00000	3.400000	MONITORING	100.00	3.400000	3.400000	1000	0.013000	Chronic feeding- dog		
01016AA	STRAWBERRIES	21	COOKED-NFS	15	P 25.00000	3.400000	MONITORING	100.00	3.400000	3.400000	1000	0.013000	Chronic feeding- dog		
01016AA	STRAWBERRIES	70	RAW-FROZEN	15	P 25.00000	3.400000	MONITORING	100.00	3.400000	3.400000	1000	0.013000	Chronic feeding- dog		
02002AA	GRAPEFRUIT-UNSP	00	NOT SPECIFIED (NO CONSUMPTION)	15	P 25.00000	3.400000	AVE. RESIDUE	1.00	0.034000	0.034000	1000	0.013000	Chronic feeding- dog		
02002AB	GRAPEFRUIT-PULP	10	RAW-FRESH OR NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02002AB	GRAPEFRUIT-PULP	21	COOKED-NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02002JA	GRAPEFRUIT-JUICE	15	RAW-FRESH OR CANNED	15	P 25.00000	0.000000	AVE. RESIDUE	1.00	0.000000	0.000000	1000	0.013000	Chronic feeding- dog		
02002JA	GRAPEFRUIT-JUICE	31	COOKED-FRESH OR CANNED	15	P 25.00000	0.000000	AVE. RESIDUE	1.00	0.000000	0.000000	1000	0.013000	Chronic feeding- dog		
02004AA	LEMONS-UNSPEC	10	RAW-FRESH OR NFS	15	P 25.00000	6.300000	AVE. RESIDUE	1.00	0.063000	0.063000	1000	0.013000	Chronic feeding- dog		
02004AA	LEMONS-UNSPEC	22	COOKED-FRESH-BAKED	15	P 25.00000	6.300000	AVE. RESIDUE	1.00	0.063000	0.063000	1000	0.013000	Chronic feeding- dog		
02004AB	LEMONS-PULP	10	RAW-FRESH OR NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02004AB	LEMONS-PULP	31	COOKED-FRESH OR CANNED	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02004HA	LEMONS-PEEL	10	RAW-FRESH OR NFS	15	P 25.00000	6.300000	AVE. RESIDUE	1.00	0.063000	0.063000	1000	0.013000	Chronic feeding- dog		
02004HA	LEMONS-PEEL	21	COOKED-NFS	15	P 25.00000	6.300000	AVE. RESIDUE	1.00	0.063000	0.063000	1000	0.013000	Chronic feeding- dog		
02004JA	LEMONS-JUICE	10	RAW-FRESH OR NFS	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02004JA	LEMONS-JUICE	15	RAW-FRESH OR CANNED	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02004JA	LEMONS-JUICE	31	COOKED-NFS	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02004JA	LEMONS-JUICE	00	NOT SPECIFIED (NO CONSUMPTION)	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02005AA	LIMES-UNSPEC	10	RAW-FRESH OR NFS	15	P 25.00000	6.300000	AVE. RESIDUE	1.00	0.063000	0.063000	1000	0.013000	Chronic feeding- dog		
02005AB	LIMES-PULP	10	RAW-FRESH OR NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02005HA	LIMES-PEEL	21	COOKED-NFS	15	P 25.00000	6.300000	AVE. RESIDUE	1.00	0.063000	0.063000	1000	0.013000	Chronic feeding- dog		
02005JA	LIMES-JUICE	15	RAW-FRESH OR NFS	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02005JA	LIMES-JUICE	15	RAW-FRESH OR CANNED	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02005JA	LIMES-JUICE	31	COOKED-FRESH OR CANNED	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000	0.002000	1000	0.013000	Chronic feeding- dog		
02006AA	ORANGES-UNSPEC	00	NOT SPECIFIED (NO CONSUMPTION)	15	P 25.00000	1.100000	AVE. RESIDUE	1.00	0.011000	0.011000	1000	0.013000	Chronic feeding- dog		
02006AB	ORANGES-PULP	10	RAW-FRESH OR NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02006AB	ORANGES-PULP	21	COOKED-NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000	0.001000	1000	0.013000	Chronic feeding- dog		
02006HA	ORANGES-PEEL	21	COOKED-NFS	15	P 25.00000	1.100000	AVE. RESIDUE	1.00	0.011000	0.011000	1000	0.013000	Chronic feeding- dog		
02006HA	ORANGES-PEEL	22	COOKED-FRESH-BAKED	15	P 25.00000	1.100000	AVE. RESIDUE	1.00	0.011000	0.011000	1000	0.013000	Chronic feeding- dog		
02006HA	ORANGES-PEEL	31	COOKED-FRESH OR CANNED	15	P 25.00000	1.100000	AVE. RESIDUE	1.00	0.011000	0.011000	1000	0.013000	Chronic feeding- dog		
02006JA	ORANGES-JUICE	15	RAW-FRESH OR CANNED	15	P 25.00000	0.000000	AVE. RESIDUE	1.00	0.000000	0.000000	1000	0.013000	Chronic feeding- dog		

Table 1 (CONT.)

CHEMICAL		STUDY TYPE		EFFECTS	REFERENCE DOSES	DATA GAPS/COMMENTS	STATUS	
Captain Caswell #159 CAS No. 133-06-2 A.I. CODE: 081301 CFR No. 180.103		Reproduction- rat NOEL= 12,5000 mg/kg 250.00 ppm LEL= 25,0000 mg/kg 500.00 ppm ONCO: Class B2 (TOX NOTE)		Decreased pup body wts. ADI based on results of 1-gen. and 3-gen. repro- duction studies. Evi- dence of oncogenicity in rats and mice.	PADI 1000 OPP RfD= 0.013000 EPA RfD= 0.013000 WHO RfD 0.100000 Type: ADI	Chronic feeding- dog	TOX complete 3/07/86. ORD verified 3/26/86. WHO last reviewed 1984.	
FOOD CODE	FOOD	FOOD FORM	PET.#	TOLERANCE (ppm)	ANTICIPATED RESIDUE (ppm)	AR TYPE	% CROP TREATED	RES. VALUE USED IN TAS RUN (ppm)
02006JA	ORANGES- JUICE	31 COOKED- FRESH OR CANNED	15	P 25.00000	0.000000	AVE. RESIDUE	1.00	0.000000
02007AA	TANGELOS	10 RAW- FRESH OR NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000
02008AA	TANGERTINES	10 RAW- FRESH OR NFS	15	P 25.00000	0.100000	AVE. RESIDUE	1.00	0.001000
02008JA	TANGERTINE- JUICE	15 RAW- FRESH OR CANNED	15	P 25.00000	0.200000	AVE. RESIDUE	1.00	0.002000
03001AA	ALMONDS	10 RAW- FRESH OR NFS	15	P 2.000000	0.100000	AVE. RESIDUE	59.00	0.059000
03001AA	ALMONDS	21 COOKED- NFS	15	P 2.000000	0.100000	AVE. RESIDUE	59.00	0.059000
03001AA	ALMONDS	22 COOKED- FRESH- BAKED	15	P 2.000000	0.100000	AVE. RESIDUE	59.00	0.059000
04-001AA	APPLES- FRESH	10 RAW- FRESH OR NFS	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001AA	APPLES- FRESH	21 COOKED- NFS	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001AA	APPLES- FRESH	31 COOKED- FRESH OR CANNED	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001AA	APPLES- FRESH	62 COOKED- FRESH OR FROZEN- BAKED	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001DA	APPLES- DRIED	10 RAW- FRESH OR NFS	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001DA	APPLES- DRIED	22 COOKED- FRESH- BAKED	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001DA	APPLES- DRIED	62 COOKED- FRESH OR FROZEN- BAKED	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001JA	APPLES- JUICE	15 RAW- FRESH OR CANNED	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-001JA	APPLES- JUICE	31 COOKED- FRESH OR CANNED	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-002AA	CRABAPPLES	00 NOT SPECIFIED (NO CONSUMPTION)	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
04-003AA	PEARS- FRESH	10 RAW- FRESH OR NFS	15	P 25.00000	0.020000	MONITORING	100.00	0.020000
04-003AA	PEARS- FRESH	31 COOKED- FRESH OR CANNED	15	P 25.00000	0.020000	MONITORING	100.00	0.020000
04-003AA	PEARS- FRESH	62 COOKED- FRESH OR FROZEN- BAKED	15	P 25.00000	0.020000	MONITORING	100.00	0.020000
04-003DA	PEARS- DRIED	10 RAW- FRESH OR NFS	15	P 25.00000	0.020000	MONITORING	100.00	0.020000
04-003DA	PEARS- DRIED	21 COOKED- NFS	15	P 25.00000	0.020000	MONITORING	100.00	0.020000
04-004AA	QUINCES	00 NOT SPECIFIED (NO CONSUMPTION)	15	P 25.00000	0.030000	MONITORING	100.00	0.030000
05001AA	APRICOTS- FRESH	10 RAW- FRESH OR NFS	15	P 50.00000	1.200000	MONITORING	100.00	1.200000
05001AA	APRICOTS- FRESH	21 COOKED- NFS	15	P 50.00000	1.200000	MONITORING	100.00	1.200000
05001AA	APRICOTS- FRESH	31 COOKED- FRESH OR CANNED	15	P 50.00000	1.200000	MONITORING	100.00	1.200000
05001DA	APRICOTS- DRIED	10 RAW- FRESH OR NFS	15	P 50.00000	1.200000	MONITORING	100.00	1.200000
05001DA	APRICOTS- DRIED	22 COOKED- FRESH- BAKED	15	P 50.00000	1.200000	MONITORING	100.00	1.200000
05002AA	CHERRIES- FRESH	10 RAW- FRESH OR NFS	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05002AA	CHERRIES- FRESH	21 COOKED- NFS	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05002AA	CHERRIES- FRESH	31 COOKED- FRESH OR CANNED	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05002AA	CHERRIES- FRESH	62 COOKED- FRESH OR FROZEN- BAKED	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05002DA	CHERRIES- DRIED	00 NOT SPECIFIED (NO CONSUMPTION)	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05002JA	CHERRIES- JUICE	15 RAW- FRESH OR CANNED	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05002JA	CHERRIES- JUICE	21 COOKED- NFS	15	P 100.00000	0.570000	MONITORING	100.00	0.570000
05003AA	NECTARINES	10 RAW- FRESH OR NFS	15	P 50.00000	3.600000	AVE. RESIDUE	61.00	2.196000
05004AA	PEACHES- FRESH	10 RAW- FRESH OR NFS	15	P 50.00000	0.230000	MONITORING	100.00	0.230000
05004AA	PEACHES- FRESH	21 COOKED- NFS	15	P 50.00000	0.230000	MONITORING	100.00	0.230000
05004AA	PEACHES- FRESH	31 COOKED- FRESH OR CANNED	15	P 50.00000	0.230000	MONITORING	100.00	0.230000

Table 1 (CONT.)

ANTICIPATED RESIDUE INFORMATION FOR CASWELL NUMBER 159

PAGE: 3

DATE: 12/21/87

FOOD CODE	FOOD	PET.#	TOLERANCE (ppm)	ANTICIPATED RESIDUE (ppm)	AR TYPE	% CROP TREATED	RES. VALUE USED IN TAS RUN (ppm)	EFFECTS	REFERENCE DOSES	DATA GAPS/COMMENTS	STATUS	
												STUDY TYPE
05004AA	PEACHES-FRESH	15	P 50.00000	0.230000	MONITORING	100.00	0.230000					
05004DA	PEACHES-DRIED	15	P 50.00000	0.230000	MONITORING	100.00	0.230000					
05005AA	PLUMS-FRESH	15	P 100.00000	4.300000	AVE. RESIDUE	60.00	2.580000					
05005DA	PLUMS-PRIMES	15	P 100.00000	4.300000	AVE. RESIDUE	60.00	2.580000					
05005DA	PLUMS-PRIMES	15	P 100.00000	4.300000	AVE. RESIDUE	60.00	2.580000					
05005JA	PRUNE-JUICE	15	P 100.00000	4.300000	AVE. RESIDUE	60.00	2.580000					
05005JA	PRUNE-JUICE	15	P 100.00000	4.300000	AVE. RESIDUE	60.00	2.580000					
05005JA	PRUNE-JUICE	15	P 100.00000	4.300000	AVE. RESIDUE	60.00	2.580000					
10002AA	CANTALOUPE-UNSP	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10002AB	CANTALOUPE-PULP	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10002AB	CANTALOUPE-PULP	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10005AA	HONEYDEW MELONS	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10010AA	CUCUMBERS	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10010AA	CUCUMBERS	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10010AA	CUCUMBERS	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10013AA	SQUASH-SUMMER	15	P 25.00000	0.600000	AVE. RESIDUE	40.00	0.240000					
10014AA	SQUASH-WINTER	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10014AA	SQUASH-WINTER	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10014AA	SQUASH-WINTER	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
10014AA	SQUASH-WINTER	15	P 25.00000	0.100000	AVE. RESIDUE	40.00	0.040000					
11005AA	TOMATOES-WHOLE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005AA	TOMATOES-WHOLE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005JA	TOMATOES-JUICE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005JA	TOMATOES-JUICE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005RA	TOMATOES-PUREE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005RA	TOMATOES-PUREE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005RA	TOMATOES-PUREE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005RA	TOMATOES-PUREE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005TA	TOMATOES-PASTE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005TA	TOMATOES-PASTE	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
11005UA	TOMATOES-CATSUP	15	P 25.00000	0.002000	MONITORING	100.00	0.002000					
13001AA	BEETS-TOPS	15	P 100.00000	0.000000	AVE. RESIDUE	20.00	0.000000					
13001AA	BEETS-TOPS	15	P 100.00000	0.000000	AVE. RESIDUE	20.00	0.000000					
13002AA	CELERY	15	P 50.00000	0.013000	MONITORING	100.00	0.013000					
13002AA	CELERY	15	P 50.00000	0.013000	MONITORING	100.00	0.013000					



Table 1 (CONT.)

FOOD CODE	FOOD	STUDY TYPE	EFFECTS	REFERENCE DOSES		DATA GAPS/COMMENTS	STATUS	
				REPRODUCTION- RAT	ADJ			
	Capten	Reproduction- rat	Decreased pup body wts.	PADI 1000	Chronic feeding- dog	TOX complete 3/07/86.		
	Caswell #159	NOEL= 12.5000 mg/kg	ADI based on results of	OPP Rfd= 0.013000		ORD verified 3/26/86.		
	CAS No. 133-06-2	250.00 ppm	1-gen. and 3-gen. repro-	EPA Rfd= 0.013000		WHO last reviewed 1984.		
	A.I. CODE: 081301	LEL= 25.0000 mg/kg	duction studies. Evi-					
	CFR No. 180.103	500.00 ppm	dence of oncogenicity in	WHO Rfd 0.100000				
		OMCO: Class B2 (TOX NOTE)	rats and mice.	Type: ADI				
FOOD CODE	FOOD	FOOD FORM	PET.#	TOLERANCE (ppm)	ANTICIPATED RESIDUE (ppm)	AR TYPE	% CROP TREATED	RES. VALUE USED IN TAS RUN (ppm)
13013AA	LETTUCE-LEAFY	10 RAW-FRESH OR NFS	15	P 100.00000	0.180000	MONITORING	100.00	0.180000
13016AA	FENNEL	00 NOT SPECIFIED (NO CONSUMPTION)	15	P 50.00000	0.013000	MONITORING	100.00	0.013000
13020AA	LETTUCE-UNSPEC	10 RAW-FRESH OR NFS	15	P 100.00000	0.180000	MONITORING	100.00	0.180000
13024AA	SPINACH	10 RAW-FRESH OR NFS	15	P 100.00000	0.130000	MONITORING	100.00	0.130000
13024AA	SPINACH	21 COOKED-FRESH OR CANNED	15	P 100.00000	0.130000	MONITORING	100.00	0.130000
13024AA	SPINACH	31 COOKED-FRESH OR CANNED	15	P 100.00000	0.130000	MONITORING	100.00	0.130000
13045AA	LETTUCE-HEAD	10 RAW-FRESH OR NFS	15	P 100.00000	0.180000	MONITORING	100.00	0.180000
13045AA	LETTUCE-HEAD	21 COOKED-FRESH OR NFS	15	P 100.00000	0.180000	MONITORING	100.00	0.180000
14001AA	BEEETS-ROOTS	10 RAW-FRESH OR NFS	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
14001AA	BEEETS-ROOTS	21 COOKED-FRESH OR NFS	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
14001AA	BEEETS-ROOTS	26 COOKED-FRESH-PICKLED, CORNED, OR CURED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
14001AA	BEEETS-ROOTS	31 COOKED-FRESH OR CANNED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
14013AA	POTATO(UH)-WHOLE	10 RAW-FRESH OR NFS	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AA	POTATO(UH)-WHOLE	21 COOKED-FRESH	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AA	POTATO(UH)-WHOLE	22 COOKED-FRESH-BAKED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AB	POTATO(UH)-UNSPEC	22 COOKED-FRESH-BAKED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AC	POTATO(UH)-PULP	21 COOKED-FRESH	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AC	POTATO(UH)-PULP	22 COOKED-FRESH-BAKED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AC	POTATO(UH)-PULP	23 COOKED-FRESH-BOILED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013AC	POTATO(UH)-PULP	25 COOKED-FRESH-FRIED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013DA	POTATO(UH)-DRY	10 RAW-FRESH OR NFS	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013DA	POTATO(UH)-DRY	31 COOKED-FRESH OR CANNED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
14013DA	POTATO(UH)-DRY	22 COOKED-FRESH-BAKED	15	P 25.000000	0.000000	AVE. RESIDUE	1.00	0.000000
15005AA	CORN,SWEET	10 RAW-FRESH OR NFS	15	P 2.0000000	0.000000	AVE. RESIDUE	75.00	0.000000
15005AA	CORN,SWEET	21 COOKED-FRESH	15	P 2.0000000	0.000000	AVE. RESIDUE	75.00	0.000000
15005AA	CORN,SWEET	31 COOKED-FRESH OR CANNED	15	P 2.0000000	0.000000	AVE. RESIDUE	75.00	0.000000
15029AA	SOYBEAN-SPROUTED	00 NOT SPECIFIED (NO CONSUMPTION)	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
270100A	SOYBEANS-OIL	18 PROCESSED OIL	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AA	SOYBEANS-UNSPEC	21 COOKED-FRESH	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AB	SOYBEANS-DRY	10 RAW-FRESH OR NFS	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AB	SOYBEANS-DRY	21 COOKED-FRESH	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AB	SOYBEANS-DRY	23 COOKED-FRESH-BOILED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AB	SOYBEANS-DRY	25 COOKED-FRESH-FRIED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AA	SOY-FL, FULL FAT	31 COOKED-FRESH OR CANNED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AA	SOY-FL, FULL FAT	21 COOKED-FRESH	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AA	SOY-FL, FULL FAT	22 COOKED-FRESH-BAKED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AA	SOY-FL, FULL FAT	31 COOKED-FRESH OR CANNED	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AB	SOY-FL, LOW FAT	21 COOKED-FRESH	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AC	SOY-FL,DEFAT	10 RAW-FRESH OR NFS	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000
28023AC	SOY-FL,DEFAT	21 COOKED-FRESH	15	P 2.0000000	0.000000	AVE. RESIDUE	20.00	0.000000

Table 1 (CONT.)

ANTICIPATED RESIDUE INFORMATION FOR CASWELL NUMBER 159 DATE: 12/21/87 PAGE: 5

FOOD CODE	FOOD	STUDY TYPE	EFFECTS	REFERENCE DOSES		DATA GAPS/COMMENTS	STATUS	
				REPRODUCTION- RAT	AD1			
28023MC	Captain Caswell #159 CAS No. 133-06-2 A.I. CODE: 081301 CFR No. 180.103	Reproduction- rat MOEL= 12.5000 mg/kg 250.00 ppm LEL= 25.0000 mg/kg 500.00 ppm OMCD: Class B2 (TOX NOTE)	Decreased pup body wts. AD1 based on results of 1-gen. and 3-gen. repro- duction studies. Evi- dence of oncogenicity in rats and mice.	OPP Rfd= 0.013000 EPA Rfd= 0.013000	PADI 1000	Chronic feeding- dog	TOX complete 3/07/86. ORD verified 3/26/86. WHO last reviewed 1984.	
FOOD CODE	FOOD	FOOD FORM	PET.#	TOLERANCE (ppm)	ANTICIPATED RESIDUE (ppm)	AR TYPE	% CROP TREATED	RES. VALUE USED IN TAS RUN (ppm)
28023MC	SOY- FL,DEFAT	22 COOKED-FRESH-BAKED	15	P 2.000000	0.000000		20.00	0.000000
28023MC	SOY- FL,DEFAT	51 COOKED-CANNED	15	P 2.000000	0.000000		20.00	0.000000
28023MC	SOY- FL,DEFAT	53 COOKED-CANNED-BOILED	15	P 2.000000	0.000000		20.00	0.000000
500000B	MILK-NON-FAT SOL	10 RAW-FRESH OR NFS		M 0.100000	0.100000		100.00	0.100000
500000B	MILK-NON-FAT SOL	21 COOKED-NFS		M 0.100000	0.100000		100.00	0.100000
500000B	MILK-NON-FAT SOL	51 COOKED-CANNED		M 0.100000	0.100000		100.00	0.100000
50000FA	MILK-FAT SOLIDS	10 RAW-FRESH OR NFS		M 0.100000	0.100000		100.00	0.100000
50000FA	MILK-FAT SOLIDS	21 COOKED-NFS		M 0.100000	0.100000		100.00	0.100000
50000FA	MILK-FAT SOLIDS	51 COOKED-CANNED		M 0.100000	0.100000		100.00	0.100000
50000SA	MILK-SUG (LACT)	21 COOKED-NFS		M 0.100000	0.100000		100.00	0.100000
50000SA	MILK-SUG (LACT)	51 COOKED-CANNED		M 0.100000	0.100000		100.00	0.100000
53001BA	BEEF-MEAT BYP	21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001BA	BEEF-MEAT BYP	26 COOKED-FRESH-PICKLED,CORINED,OR CURED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001BB	BEEF-OTH ORGAN	21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001BB	BEEF-OTH ORGAN	51 COOKED-CANNED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001DA	BEEF-DRIED	21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001FA	BEEF-FAT	10 RAW-FRESH OR NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001FA	BEEF-FAT	21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001FA	BEEF-FAT	22 COOKED-FRESH-BAKED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001FA	BEEF-FAT	23 COOKED-FRESH-BOILED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001FA	BEEF-FAT	24 COOKED-FRESH-BROILED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001FA	BEEF-FAT	25 COOKED-FRESH-FRIED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001KA	BEEF-KIDNEY	21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001LA	BEEF-LIVER	25 COOKED-FRESH-FRIED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001LA	BEEF-LIVER	31 COOKED-FRESH OR CANNED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001HA	BEEF-LEAN	10 RAW-FRESH OR NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001HA	BEEF-LEAN	21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53001HA	BEEF-LEAN	22 COOKED-FRESH-BAKED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001HA	BEEF-LEAN	23 COOKED-FRESH-BOILED	3E13671	P 0.050000	0.050000		100.00	0.050000
53001HA	BEEF-LEAN	24 COOKED-FRESH-BROILED	3E13671	P 0.050000	0.050000		100.00	0.050000
53002BA	GOAT-MEAT BYP	00 NOT SPECIFIED (NO CONSUMPTION)		M 0.050000	0.050000		100.00	0.050000
53002BA	GOAT-OTH ORGAN	00 NOT SPECIFIED (NO CONSUMPTION)		M 0.050000	0.050000		100.00	0.050000
53002FA	GOAT-FAT	23 COOKED-FRESH-BOILED		M 0.050000	0.050000		100.00	0.050000
53002FA	GOAT-FAT	25 COOKED-FRESH-FRIED		M 0.050000	0.050000		100.00	0.050000
53002KA	GOAT-KIDNEY	00 NOT SPECIFIED (NO CONSUMPTION)		M 0.050000	0.050000		100.00	0.050000
53002LA	GOAT-LIVER	00 NOT SPECIFIED (NO CONSUMPTION)		M 0.050000	0.050000		100.00	0.050000
53002HA	GOAT-LEAN	23 COOKED-FRESH-BOILED		M 0.050000	0.050000		100.00	0.050000
53002HA	GOAT-LEAN	25 COOKED-FRESH-FRIED		M 0.050000	0.050000		100.00	0.050000
53003AA	HORSE	00 NOT SPECIFIED (NO CONSUMPTION)		M 0.050000	0.050000		100.00	0.050000
53005BA	SHEEP-MEAT BYP	21 COOKED-NFS		M 0.050000	0.050000		100.00	0.050000

Table 1 (CONT.)

FOOD CODE	FOOD	CHEMICAL	STUDY TYPE		EFFECTS	REFERENCE DOSES		DATA GAPS/COMMENTS	STATUS
			Reproduction- rat	MOEL=		PADI	OPP Rfd=		
		Captan Caswell #159 CAS No. 133-06-2 A.I. CODE: 081301 CFR No. 180.103			Decreased pup body wts. ADI based on results of 1-gen. and 3-gen. repro- duction studies. Evi- dence of oncogenicity in rats and mice.	1000	0.013000	0.013000	TOX complete 3/07/86. ORD verified 3/26/86. WHO last reviewed 1984.
FOOD CODE	FOOD		FOOD FORM	PET.#	TOLERANCE (ppm)	ANTICIPATED RESIDUE (ppm)	AR TYPE	% CROP TREATED	RES. VALUE USED IN TAS RUN (ppm)
530058B	SHEEP-OTH ORGAN		21 COOKED-NFS		M 0.050000	0.050000		100.00	0.050000
53005FA	SHEEP-FAT		21 COOKED-NFS		M 0.050000	0.050000		100.00	0.050000
53005KA	SHEEP-KIDNEY		21 COOKED-NFS		M 0.050000	0.050000		100.00	0.050000
53005LA	SHEEP-LIVER		00 NOT SPECIFIED (NO CONSUMPTION)		M 0.050000	0.050000		100.00	0.050000
53005MA	SHEEP-LEAN		21 COOKED-NFS		M 0.050000	0.050000		100.00	0.050000
53005NA	SHEEP-LEAN		31 COOKED-FRESH OR CANNED		M 0.050000	0.050000		100.00	0.050000
530068A	PORK-MEAT BYP		21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
530068B	PORK-OTH ORGAN		21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
5300688	PORK-OTH ORGAN		26 COOKED-FRESH-PICKLED, CORNED, OR CURED	3E13671	P 0.050000	0.050000		100.00	0.050000
53006FA	PORK-FAT		10 RAW-FRESH OR NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53006FA	PORK-FAT		21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53006FA	PORK-FAT		23 COOKED-FRESH-BOILED	3E13671	P 0.050000	0.050000		100.00	0.050000
53006FA	PORK-FAT		25 COOKED-FRESH-FRIED	3E13671	P 0.050000	0.050000		100.00	0.050000
53006FA	PORK-FAT		26 COOKED-FRESH-PICKLED, CORNED, OR CURED	3E13671	P 0.050000	0.050000		100.00	0.050000
53006KA	PORK-KIDNEY		21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53006LA	PORK-LIVER		21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53006LA	PORK-LIVER		25 COOKED-FRESH-FRIED	3E13671	P 0.050000	0.050000		100.00	0.050000
53006MA	PORK-LEAN		21 COOKED-NFS	3E13671	P 0.050000	0.050000		100.00	0.050000
53006MA	PORK-LEAN		25 COOKED-FRESH-FRIED	3E13671	P 0.050000	0.050000		100.00	0.050000
53006MA	PORK-LEAN		26 COOKED-FRESH-PICKLED, CORNED, OR CURED	3E13671	P 0.050000	0.050000		100.00	0.050000

## TOLERANCE ASSESSMENT SYSTEM ROUTINE CHRONIC ANALYSIS

DATE: 12/21/87

PAGE: 1

CHEMICAL INFORMATION	STUDY TYPE	EFFECTS	REFERENCE DOSES		DATA GAPS/COMMENTS	STATUS	
			PADI	1000			
			OPP RFD=	EPA RFD=			
Captain Caswell #159 CAS No. 133-06-2 A.I. CODE: 081301 CFR No. 180.103	Reproduction - rat NOEL= 12.5000 mg/kg 250.00 ppm LEL= 25.0000 mg/kg 500.00 ppm ONCO: Class B2 (TOX NOTE)	Decreased plp body wts. ADI based on results of 1-gen. and 3-gen. repro- duction studies. Evi- dence of oncogenicity in rats and mice.	1000	0.013000	Chronic feeding - dog	TOX complete 3/07/86. ORD verified 3/26/86. WHO last reviewed 1984.	
			WHO RFD	0.100000			
			Type: ADI				
<b>POPULATION SUBGROUP</b>							
U.S. POPULATION - 48 STATES			NEW TMRC AS PERCENT OF RFD	1674.416431	8.136238	0.001728	13.295338
U.S. POPULATION - SPRING SEASON				1632.765046	7.547900	0.001742	13.402454
U.S. POPULATION - SUMMER SEASON				1748.406292	7.991469	0.001885	14.501754
U.S. POPULATION - FALL SEASON				1654.557738	8.524008	0.001662	12.781777
U.S. POPULATION - WINTER SEASON				1661.581562	8.483677	0.001625	12.498469
NORTHEAST REGION				1896.936031	8.487685	0.001830	14.079654
NORTH CENTRAL REGION				1679.369662	8.489346	0.001774	13.646269
SOUTHERN REGION				1382.162454	6.993585	0.001422	10.940508
WESTERN REGION				1873.139592	9.128962	0.002056	15.813162
HISPANICS				1933.981185	10.362462	0.002076	15.969592
NON-HISPANIC WHITES				1700.224546	8.136000	0.001763	13.560300
NON-HISPANIC BLACKS				1367.614308	6.983815	0.001327	10.208462
NON-HISPANICS OTHER				1816.198938	9.043338	0.001860	14.304092
MURSING INFANTS (<1 YEAR OLD)				2815.254754	10.818431	0.002754	21.181385
NON-MURSING INFANTS (<1 YEAR OLD)				5215.412615	50.395977	0.009743	74.942900
FEMALES (13+ YEARS, PREGNANT)				1332.667385	5.782438	0.001322	10.172669
FEMALES 13+ YEARS, MURSING				1539.864654	7.609677	0.001590	12.227754
CHILDREN (1-6 YEARS OLD)				3754.201085	23.885208	0.004447	34.210862
CHILDREN (7-12 YEARS OLD)				2351.733762	14.567238	0.002717	20.900877
MALES (13-19 YEARS OLD)				1421.427800	8.984046	0.001634	12.566269
FEMALES (13-19 YEARS OLD, NOT PREG. OR MURSING)				1337.326031	6.816131	0.001351	10.395369
MALES (20 YEARS AND OLDER)				1172.265715	4.307085	0.001075	8.272192
FEMALES (20 YEARS AND OLDER)				1312.740538	3.854992	0.001066	8.197954
				0.216616	0.217674		
				0.211278	0.212259		
				0.226254	0.227293		
				0.213984	0.215093		
				0.214903	0.216006		
				0.245498	0.246602		
				0.217214	0.218318		
				0.178772	0.179681		
				0.242321	0.243508		
				0.250070	0.251418		
				0.219972	0.221029		
				0.176882	0.177790		
				0.234930	0.236106		
				0.364577	0.365983		
				0.671452	0.678004		
				0.172495	0.173247		
				0.199193	0.200182		
				0.484941	0.488046		
				0.303832	0.305725		
				0.183618	0.184786		
				0.172966	0.173852		
				0.151835	0.152395		
				0.170155	0.170656		

\*Current TMRC does not include new or pending tolerances.

\*\*New TMRC includes new, pending, and published tolerances.