



INLAND ENGINEERING & CONSULTING, INC.

Structural & Civil Engineering

4883 EAST LA PALMA AVENUE - SUITE 501-A
ANAHEIM, CA 92807
Tel.: (714) 777-7700
FAX: (714) 777-7773

SHT. # 1 OF 4

JOB # 05877

DATE: 6-22-05

REV 1-24-07

STRUCTURAL CALCULATIONS

PREPARED FOR:

SUNTREX

PROJECT:

SOLAR POOL HEATING ATTACHMENT



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DATE _____

SUBJECT SUNTREK

SHEET NO. 2

BY _____

CHKD. _____

JOB NO. 05877

SCOPE OF WORK

SUNTREK'S SOLAR SYSTEM ATTACHMENT TO ROOFS

WEIGHT: 1.5 PSF FULL

MAX. COLLECTOR SPAN = 70 FT.

DESIGN LOADS

WIND: 75 MPH EXP. C

ASSUME HEIGHT OF ROOF 20'

$C_g = .9$ OUTWARD

$$P_w = (1.3)(.9) \left(\frac{12.6 + 16.4}{2} \right) = 14.75 \text{ PSF}$$

SELS. LOAD:

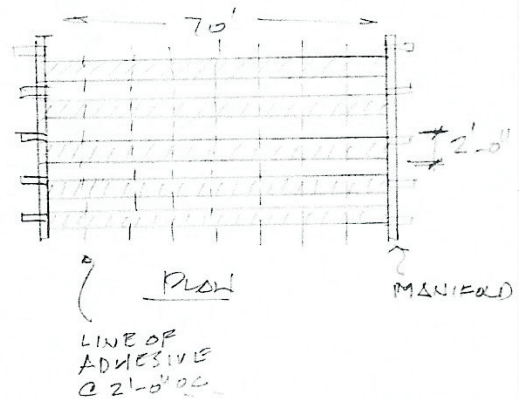
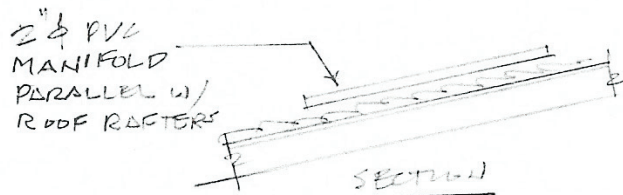
$$F_p = \frac{q_p C_d I_p}{R_p} \left(1 + 3 \frac{h_x}{h_r} \right) W_p$$

$$C_p = 2.5, R_p = 3.0, C_d = .44 N_u = .44(1.3) = .572, I_p = 1.0$$

$$h_x = h_r = 20'$$

$$F_p = \frac{(2.5)(.572)(1)}{(3.0)(1.4)} \left(1 + 3 \frac{20}{20} \right) W_p$$

$$\underline{F_p = 1.36 W_p} \quad \left\{ \begin{array}{l} > .7 C_d I_p W_p = .4 W_p \\ < 4 C_d I_p W_p = 2.28 W_p \end{array} \right.$$



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- ✓ COLLECTORS ARE 2'0" WIDE
- ✓ COLLECTORS ARE ATTACHED TO ROOF @ 2'0" OC.

T.A. OF COLLECTOR = 2' x 2' = 4.0 S.F.

WT. = 4.0 PSF (1.5) = 6.0 lb

SEIS. LOAD + Pp = 1.36 (6.0) = 8.16 #

WIND LOAD : Pw = 14.75 (6.0) = 88.5 # ← CONTROLS

CHK. ADHESIVE STRENGTH (SUN TREK SEALANT)

BASED ON TEST RESULTS PROVIDED BELOW.

AVERAGE TENSILE STRENGTH IS GIVEN AS 8.04 #/IN

Ft = 24" IN (8.04) = 193. # > 88.5 # F.S. = 2.18

The following table is a summary of the data collected during our testing:

Substrates (Adherents)	Average Peel Strength (Pounds Per Linear Inch)
Suntrek Rubber Tubing / Ceramic Tile	12.156
Suntrek Rubber Tubing / Composition Roofing	10.996
Suntrek Rubber Tubing / Wood (maple)	8.045

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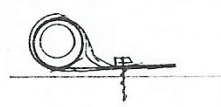
DATE _____ SUBJECT SUNTREK SHEET NO. 4
 BY _____ CHKD. _____ JOB NO. 05877

CHK. CONNECTION OF 2" φ MANIFOLD :

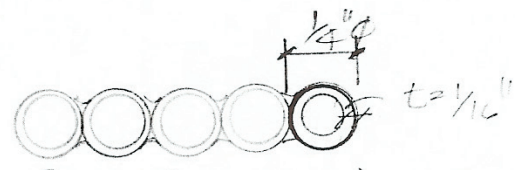
2" φ PVC MANIFOLD ATTACHED EVERY 28" OC TO EXIST'G. ROOF TILES FOR TILE ROOFS.

2" φ PVC MANIFOLD ATTACHED EVERY 28" OC TO EXIST'G. ROOF RAFTERS FOR SHAKE OR SHINGLE ROOFS.

B2. 2" φ PVC WRAPPED W/ SOLAR PANEL TUBING
 CONSISTS OF 1" φ PUSTIC TUBING (TOTAL OF 5 - 1/4" φ TUBING)



ALLOW. TENSILE STRENGTH = 1479 PSI FOR 1 - 1/4" φ TUBE



$$A = \pi D^2/4 = \pi (.25^2 - .125^2) = .036 \text{ in}^2 \quad \Sigma A = 5 (.036) = .184 \text{ in}^2$$

$$T_{ALLOW} = 1479 \text{ PSI} \left(\frac{.184}{4} \right) = 272 \text{ #} > 88.5 \text{ # OK}$$

PHYSICALS OF SUNTREK SOLAR TUBE

SAMPLE	SLAB-DUMBBELL	TUBE
DURO, A	80	80
TENSILE STRENGTH, psi	1728	1479
ELONGATION, %	247	224
MOD@25%, psi	355	281
MOD@50%, psi	370	473
MOD@75%, psi	807	686
MOD@100%, psi	1001	899
MOD@200%, psi	1562	1448

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2" ϕ PVC PIPE SCH. 40 FILLED W/ WATER.
Pipe #, Water #,
 $\Sigma WT. = (3.653 + 1.453) \frac{28''}{12} = 12. \#$ $\frac{28''}{12} = 2.33 \text{ FT.}$

$F_s = 1.36(12) = 16.32 \#$

$F_w = (2.33)(2) 14.75 = 69. \#$ — CONTROLS

1/4" ϕ LAG SC INTO WOOD RAFTERS MIN. 2" ENG.

$T_{ALL} = 225 \#/IN (2") = 450. \# > 69 \#$ OK

USE 1/4" ϕ WOOD-SC. 2" MIN. ENG. INTO ROOF RAFTERS

CONN. TO ROOF TILES (CONC. TILES)

1/2" ϕ LAG-SC W/ SET EPOXY TO CONC. TILES



$T_{ALL} = 90 \# > 60 \#$ OK

USE 1/4" ϕ LAGS W/ SHIELD EPOXY INTO CONC. TILE

COVER HOLES TO PREVENT LEAKAGE

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