General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

Produced by the NASA Center for Aerospace Information (CASI)

DOE/NASA CONTRACTOR REPORT

DOE NASA CR-161094

OWENS-ILLINOIS SUBSYSTEM DESIGN PACKAGE FOR THE SEC-601 AIR-COOLED SOLAR COLLECTOR

Prepared by

Owens-Illinois
P. O. Box 1035
Toledo, Ohio 43666

Under Contract NAS8-32259 with

National Aeronautics and Space Administration
George C. Marshall Space Flight Center, Alabama 35812

For the U. S. Department of Energy

NOV 1979
RECEIVED
NASA STI FACILITY
ACCESS DEPT.

(NASA-CR-161094) OWENS-ILLINOIS SUBSYSTEM DESIGN PACKAGE FOR THE SEC-601 AIR-COOLED SOLAR COLLECTOR (Owens-Illinois, Inc.) 19 p HC A02/MF A01 CSCL 10A

N79-33570

Unclas
G3/44 35979

U.S. Department of Energy

Solar Energy

TABLE OF CONTENTS

I.	Subsystem Performance Specifications	I-1
II.	Assembly and Installation Drawings	II-1

PRECEDING PAGE BLANK NOT FILMED

TABLE OF CONTENTS

I.	Subsystem Performance Specifications	I-1
II.	Assembly and Installation Drawings	II-1

PRECEDING PAGE BLANK NOT FILMED

OWENS-ILLINOIS
AIR COOLED THERMAL
SOLAR COLLECTOR

SUBSYSTEM PERFORMANCE SPECIFICATION
SHC-3060
Dated 8/11/73

Subsystem Performance Specification
SUNPAK™ Model SEC-601
Air Cooled Solar Thermal Collector

1.0 This performance specification establishes the requirements for the design and performance of the air cooled collector subsystem for use With solar combined heating and cooling systems. It designates the Interim Performance Criteria applicable to this collector subsystem.

2.0 The document applicable to this performance specification is the Interim Performance Criteria for Commercial Solar Heating and Combined Heating/ Cooling Systems and Facilities, Document N. 98M10001, Revision Basic, date February 28, 1975. George C. Marshall Space Flight Center, National Aeronautics and Space Administration.

3.0 All of the applicable Interim Performance Criteria for Commercial Subsystems as outlined in Table II so indicated are applicable after completion of the development and testing of the air cooled collector subsystem as outlined in the Statement of Work.

4.0 No deviations from the Interim Performance Criteria are proposed.

5.0 No Government furnished property will be installed in the air cooled collector subsystem.

6.0 No specific requirements have been directed by the Contracting Officer.

7.0 Preliminary performance and installation specifications for the air cooled collector subsystem are attached.

SUBSYSTEM PERFORMANCE SPECIFICATION
OWENS-ILLINOIS

8.0 Warranty - Contractor warrants for a period of five years that the solar collector material will be free of defects in quality and workmanship. Warranty is limited to shipping replacement parts prepaid which in the contractor's opinion are required to correct such defects. No field labor is included, and in no event shall Contractor be liable for special or consequential damages.

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE II

SPECIFICATION NO. SHC-3060
REVISION 3
DATE June 27, 1977

COMMERCIAL SUBSYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 1 OF 6

APPLICATION

A – APPLICABLE TO SYSTEMS INDICATED
NA – NOT APPLICABLE

TYPE SYSTEMS

H – HEATING
HC – HEATING AND COOLING
HW – HOT WATER

COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
1.1 H and HC System Performance	NA	NA	NA	1.6 Energy Transport	NA	NA	NA
1.1.1 Heating Design Temperature	NA	NA	NA	1.6.1 Thermal Losses and Electrical Power	NA	NA	NA
1.1.2 Cooling Design Temperature	NA	NA	NA	1.7 Control	NA	NA	NA
1.1.3 Relative Humidity	NA	NA	NA	1.7.1 Installation and Maintenance	NA	NA	NA
1.1.4 Solar Contribution	NA	NA	NA	1.7.2 Manual Adjustment	NA	NA	NA
1.2 HW System/Subsystem Performance	NA	NA	NA	1.7.3 Inhabited Space Temperature Control	NA	NA	NA
1.2.1 Draw and Temperature Design Output	NA	NA	NA	1.7.4 Hot Water Temperature	NA	NA	NA
1.2.2 Non-Tap Temperature Design Output	NA	NA	NA	1.8 Auxiliary Energy	NA	NA	NA
1.2.3 Solar Contribution	NA	NA	NA	1.8.1 Design Heat Loads	NA	NA	NA
1.3 Collector Performance	A	A	A	1.8.2 Design Cooling Loads	NA	NA	NA
1.3.1 Collector Efficiency	A	A	A	1.8.3 Impairment of Operation	NA	NA	NA
1.4 Thermal Storage Performance	NA	NA	NA	2.1 System Design Conditions	A	A	A
1.4.1 Storage Capacity and Rate	NA	NA	NA	2.1.1 Equipment Capabilities	A	A	A
1.5 Habitability of Occupied Spaces	NA	NA	NA	2.1.2 Noise or Erosion-Corrosion	A	A	A
1.5.1 Heat or Humidity Transfer Effects	NA	NA	NA	2.1.3 Operating Conditions	A	A	A
				2.1.4 Fluid Flow in Collectors	A	A	A
				2.1.5 Entrapped Air	NA	NA	NA
				2.1.6 Thermal Expansion of Fluids	NA	NA	NA
				2.1.7 Pressure Drops	A	A	A

TABLE II

SPECIFICATION NO SHC-3060
REVISION 3
DATE June 27, 1977

COMMERCIAL SUBSYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 2 OF 6

APPLICATION

A - APPLICABLE TO SYSTEMS INDICATED
NA - NOT APPLICABLE

TYPE SYSTEMS

H - HEATING
HC - HEATING AND COOLING
HW - HOT WATER

COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
2.1.8 Condensate Removal	NA	NA	NA	2.6.2 Air Quality	A	A	A
2.2 Mechanical Stresses	A	A	A	2.6.3 Fluid Treatment	NA	NA	NA
2.2.1 Vibration Stress Levels	A	A	A	2.6.4 Freezing Protection	NA	NA	NA
2.2.2 Vibration from Moving Parts	A	A	A	2.7 Piping Supports	NA	NA	NA
2.2.3 Water Hammer	NA	NA	NA	2.7.1 Applicable Plumbing Standards	NA	NA	NA
2.2.4 Vacuum Relief Protection	A	A	A	2.8 Excessive Pressure and Temperature Protection	NA	NA	NA
2.2.5 Thermal Changes	A	A	A	2.8.1 Relief Valves and Vents	NA	NA	NA
2.2.6 Flexible Joints	A	A	A	3.1 Structural Design Basis	A	A	A
2.3 Leakage Prevention	A	A	A	3.1.1 Service Loads	A	A	A
2.3.1 Pressure Test: Non-Potable Fluids	A	A	A	3.2 Failure Loads and Load Capacity	A	A	A
2.3.2 Pressure Test: Potable Water	A	A	A	3.2.1 Ultimate Load Combinations	A	A	A
2.3.3 Air Transport System	A	A	A	3.2.2 Ice Loads	A	A	A
2.4 Collector Adjustments	A	A	A	3.2.3 Vehicular Loads	NA	NA	NA
2.4.1 Orientation and Tilt	A	A	A	3.2.4 Load Capacity	A	A	A
2.4.2 Mutual Shadowing	A	A	A	3.3 Damage Control	A	A	A
2.5 Subsystem Isolation	NA	NA	NA	3.3.1 Resistance to Damage	A	A	A
2.5.1 Shutdown in Multi-unit Facilities	NA	NA	NA	3.4 Cyclic Loads	A	A	A
2.6 Heat Transfer Fluid Quality	A	A	A	3.4.1 Deflection Limitations	A	A	A
				3.5 Cutting of Structural Elements	NA	NA	NA
				3.5.1 Design Provisions	NA	NA	NA

ORIGINAL PAGE IS
OF POOR QUALITY

TABLE II

SPECIFICATION NO. SHC-3060
REVISION 3
DATE June 27, 1977

COMMERCIAL SUBSYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 3 OF 6

APPLICATION

A APPLICABLE TO SYSTEMS INDICATED
NA NOT APPLICABLE

TYPE SYSTEMS

H HEATING
HC HEATING AND COOLING
HW HOT WATER

COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
3.6 Creep and Residual Deflection	A	A	A	4.3.2 Penetrations Through Fire-Rated Assemblies	NA	NA	NA
3.6.1 Deflection Limitations	A	A	A	4.4 Toxic and Flammable Fluids	NA	NA	NA
3.7 Hail Resistance	A	A	A	4.4.1 Provision of Catch Basins	NA	NA	NA
3.7.1 Hail Size and Loading	A	A	A	4.4.2 Detection of Toxic and Flammable Fluids	NA	NA	NA
3.8 Constraint Loads	A	A	A	4.5 Safety Under Emergency Conditions	NA	NA	NA
3.8.1 Foundation Settlement	A	A	A	4.5.1 Emergency Egress and Access	NA	NA	NA
3.9 Ponding Conditions	A	A	A	4.5.2 Identification and Location of Controls	NA	NA	NA
3.9.1 Design Provisions	A	A	A	4.6 Protection of Water and Circulated Air	A	A	A
4.1 Plumbing and Electrical Installation	NA	NA	NA	4.6.1 Contamination by Materials	NA	NA	NA
4.1.1 Plumbing Codes and Standards	NA	NA	NA	4.6.2 Separation of Circulation Loops	NA	NA	NA
4.1.2 Electrical Codes and Standards	NA	NA	NA	4.6.3 Backflow Prevention	NA	NA	NA
4.2 Fail-Safe Controls	A	A	A	4.6.4 Growth of Fungi	A	A	A
4.2.1 System Failure Prevention	A	A	A	4.7 Excessive Surface Temperature	A	A	A
4.2.2 Automatic Pressure Relief Valves	NA	NA	NA	4.7.1 Protection from Heated Components	A	A	A
4.3 Fire Safety	A	A	A	5.1 Effects of External Environment	A	A	A
4.3.1 Applicable Fire Standards	A	A	A	5.1.1 Solar Degradation	A	A	A
				5.1.2 Soil Corrosion	NA	NA	NA
				5.1.3 Airborne Pollutants	A	A	A

TABLE II

COMMERCIAL SUBSYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 1 OF 6

APPLICATION

A APPLICABLE TO SYSTEMS INDICATED
NA NOT APPLICABLE

TYPE SYSTEMS

H HEATING
HC HEATING AND COOLING
HW HOT WATER

COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
5.1.4 Dirt Retention on Cover Plate Surfaces	A	A	A	5.4 Components Involving Moving Parts	NA	NA	NA
5.1.5 Abrasive Wear	A	A	A	5.4.1 Wear and Fatigue	NA	NA	NA
5.1.6 Fluttering by Wind	A	A	A	6.1 Accessibility for Maintenance and Servicing	A	A	A
5.2 Temperature and Pressure Resistance	A	A	A	6.1.1 Access for System Maintenance	A	A	A
5.2.1 Thermal Degradation	A	A	A	6.1.2 Access for System Monitoring	A	A	A
5.2.2 Deterioration of Heat Transfer Fluids	NA	NA	NA	6.1.3 Draining and Filling of Liquids	NA	NA	NA
5.2.3 Thermal Cycling Stresses	A	A	A	6.1.4 Flushing of Liquid Subsystems	NA	NA	NA
5.2.4 Leakage	NA	NA	NA	6.1.5 Filters	NA	NA	NA
5.2.5 Deterioration of Gaskets and Sealants	A	A	A	6.1.6 Water Shutoff	NA	NA	NA
5.2.6 Transmission of Losses Due to Outgassing	A	A	A	6.2 Installation, Operation and Maintenance Manual	A	A	A
				6.2.1 Installation Instructions	A	A	A
5.3 Chemical Compatibility of Components	A	A	A	6.2.2 Maintenance and Operating Instructions	A	A	A
5.3.1 Materials/Transfer Fluid Compatibility	A	A	A	6.2.3 Maintenance Plan	A	A	A
				6.2.4 Replacement Parts	A	A	A
5.3.2 Corrosion of Dissimilar Materials	A	A	A	6.3 Repair and Service Personnel	A	A	A
5.3.3 Corrosion by Leachable Substances	NA	NA	NA	6.3.1 Servicing of H and HC Systems	A	A	A
5.3.4 Effects of Decomposition Products	A	A	A	6.3.2 Servicing of HW Systems	A	A	A
				7.1 Design	NA	NA	NA

ORIGINAL PAGE IS
OF POOR QUALITY

SPECIFICATION NO SHC-3060
REVISION
DATE October 1, 1976

TABLE II

COMMERCIAL SUBSYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 5 OF 6

APPLICATION

A APPLICABLE TO SYSTEMS INDICATED
NA NOT APPLICABLE

TYPE SYSTEMS

H HEATING
HC HEATING AND COOLING
HW HOT WATER

COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
7.1.1 Design-Habitable Facilities	NA	NA	NA	8.1.3 Sensor Location	NA	NA	NA
7.1.2 Esthetics	NA	NA	NA	8.2 Mechanical and Electrical Functioning of Facility and Site	NA	NA	NA
7.1.3 Materials							
7.1.4 Passive Use of Solar Energy	NA	NA	NA	8.2.1 Exhaust and Venting	NA	NA	NA
				8.2.2 Utilities	NA	NA	NA
7.2 Adequate Space	NA	NA	NA	8.3 Mechanical and Electrical Functioning of Connections	NA	NA	NA
7.2.1 Solar Collector	NA	NA	NA				
7.2.2 Storage	NA	NA	NA				
7.2.3 Interface Between Facility and H and HC Systems				8.3.1 Plumbing Connections	NA	NA	NA
				8.3.2 Electrical Connections	NA	NA	NA
				8.3.3 Lightning Protection	NA	NA	NA
7.2.4 Portability	NA	NA	NA	9.1 Structural Integrity of H, HC and HW Systems	NA	NA	NA
7.3 Functioning of Facilities and Sites	NA	NA	NA				
7.3.1 Space Use	NA	NA	NA	9.1.1 Movement of Adjacent Structures	NA	NA	NA
7.3.2 Shading	NA	NA	NA				
7.3.3 Impact on Environment	NA	NA	NA	9.2 Structural Integrity of Facilities	NA	NA	NA
				9.2.1 Loads	NA	NA	NA
7.3.4 View	NA	NA	NA	9.2.2 Penetration of Structural Members	NA	NA	NA
7.4 Compatibility with Conventional Systems	NA	NA	NA				
				9.3 Structural Connections	NA	NA	NA
7.4.1 Utility Compatibility	NA	NA	NA	9.3.1 Structural Connections	NA	NA	NA
				9.3.2 Brittle Components	NA	NA	NA
8.1 Interference with Mechanical Operation	NA	NA	NA	9.3.3 Strength and Stiffness	NA	NA	NA
				10.1 Safety of Facility and Site	NA	NA	NA
8.1.1 Blockage of Solar Solar Components	NA	NA	NA	10.1.1 Fire	NA	NA	NA
8.1.2 Shading of Collectors	NA	NA	NA	10.1.2 Accidents	NA	NA	NA

TABLE II

SPECIFICATION NO SHC-3060
REVISION
DATE October 1, 1976

COMMERCIAL SUBSYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 6 OF 6

APPLICATION

A APPLICABLE TO SYSTEMS INDICATED
NA NOT APPLICABLE

TYPE SYSTEMS

H HEATING
HC HEATING AND COOLING
HW HOT WATER

COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			COMMERCIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
11.1 Durability and Reliability of H, HC and HW Systems	NA	NA	NA	12.3.1 Accessibility	NA	NA	NA
11.1.1 Vegetation	NA	NA	NA	13.1 Visual Characteristics of Facility and Site	NA	NA	NA
11.2 Durability and Reliability of Facilities and Sites	NA	NA	NA	13.1.1 Facility	NA	NA	NA
11.2.1 Chemical Corrosion	A	A	A	13.1.2 Neighborhood	NA	NA	NA
11.2.2 Heat and Moisture	A	A	A				
11.2.3 Exterior Penetrations	NA	NA	NA				
11.3 Durability and Reliability of Connections	A	A	A				
11.3.1 Material Compatibility	A	A	A				
12.1 Maintainability of H, HC and HW Systems	NA	NA	NA				
12.1.1 Accessibility	NA	NA	NA				
12.1.2 Misuse	NA	NA	NA				
12.1.3 Permanent Maintenance Accessories	NA	NA	NA				
12.2 Maintainability of Facility and Site	NA	NA	NA				
12.2.1 Accessibility	NA	NA	NA				
12.2.2 Ice Dams	NA	NA	NA				
12.3 Connections	NA	NA	NA				

Air Cooled Collector Performance

The Owens-Illinois Solar Collector Model SEC 601 will collect a minimum of 1050 Btu/ft.^{2} day of energy at an inlet fluid temperature equal to or less than 160° and an air flow rate equal to or greater than 2 SCFM/ft.^{2} under the following conditions:

Tilt Angle: Equal to latitude; Azimuth Angle: 0°

Anbient Temperature: 30°F

Wind Velocity: 0-5000 ft./min.

Date: March, September 21

Daily Solar Flux in the Plane of the Collector Surface: 2330 Btu/ft.^{2} day.

Longitude: Any: Latitude: Any

The Solar Collector will collect a minimum of 900 Btu/ft.^{2} day of energy at an inlet fluid temperature equal to or less than 220°F and an air flow rate equal to or greater than 2 SCFM/ft.^{2} under the following conditions:

Tilt Angle: Equal to latitude; Azimuth Angle: 0°

Ambient Temperature: 50°F

Wind Velocity: 0-5000 ft./min.

Date: Match, September 21

Daily Solar Flux in the Plane of Collector Surface: 2330 Btu/ft.^{2} day.

Longitude: Any; Latitude: Any

K+E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

$$n = \frac{\bar{M}C_p(\bar{T}_o - \bar{T}_i)}{A_c\bar{I}}$$

$\bar{T}_o$ = collector transport media hourly average outlet temperature (°F)

$\bar{T}_i$ = collector transport media hourly average inlet temperature (°F)

$\bar{T}_a$ = average hourly ambient temperature (°F)

$\bar{M}$ = transport media hourly average flow rate (lb./hr.)

C_p = specific heat of transport media (Btu/lb.°F)

A_c = area of collector (sq. ft.) (based on aperture area)

$\bar{I}$ = hourly average total solar insolation in the collector plane (Btu/hr. - sq. ft.)

NOTE: The data utilized to obtain the hourly averages must be for at least one full day.

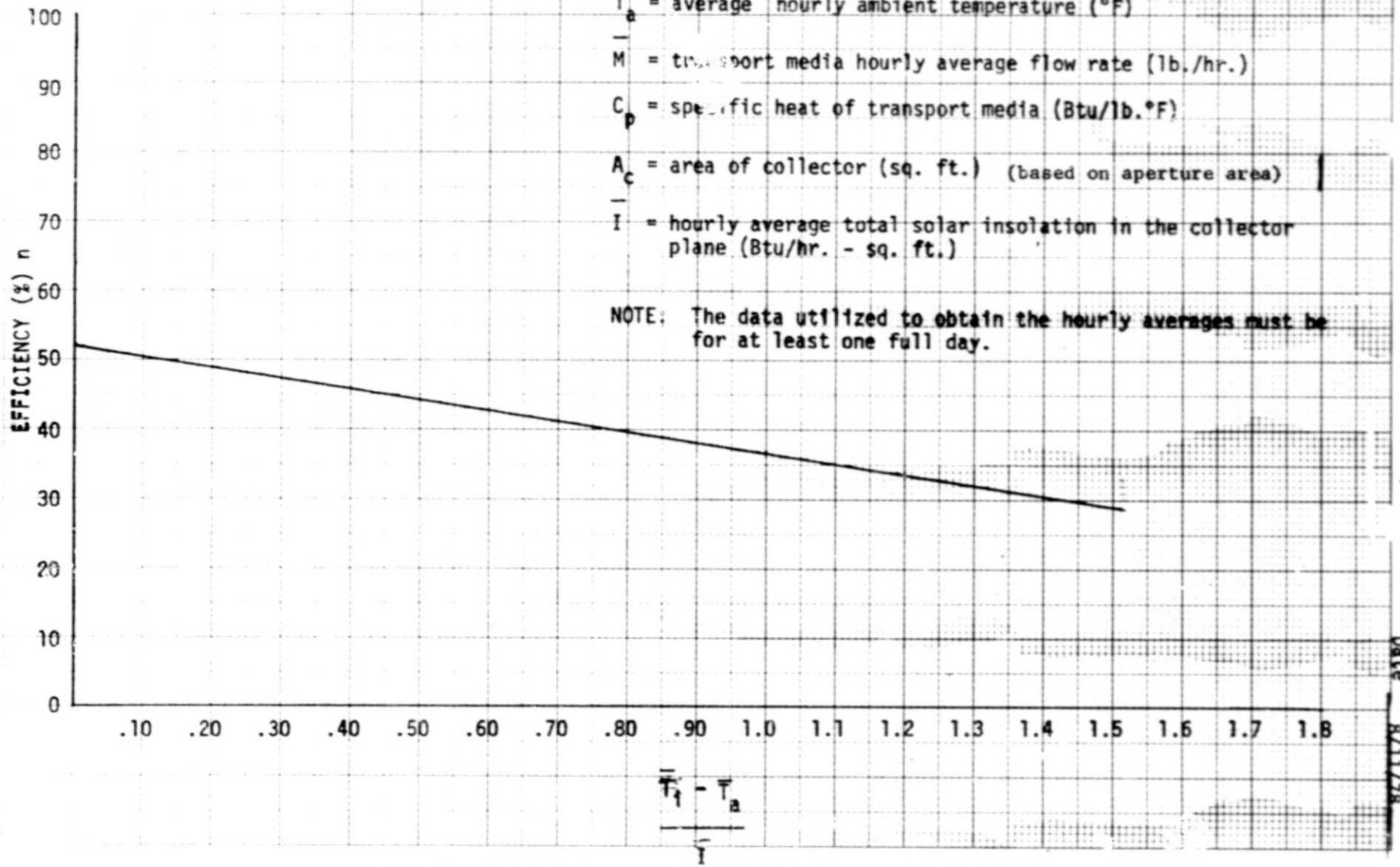


FIGURE 1 - EFFICIENCY AS A FUNCTION OF OPERATING CONDITIONS
PERFORMANCE MUST BE ABOVE LINE

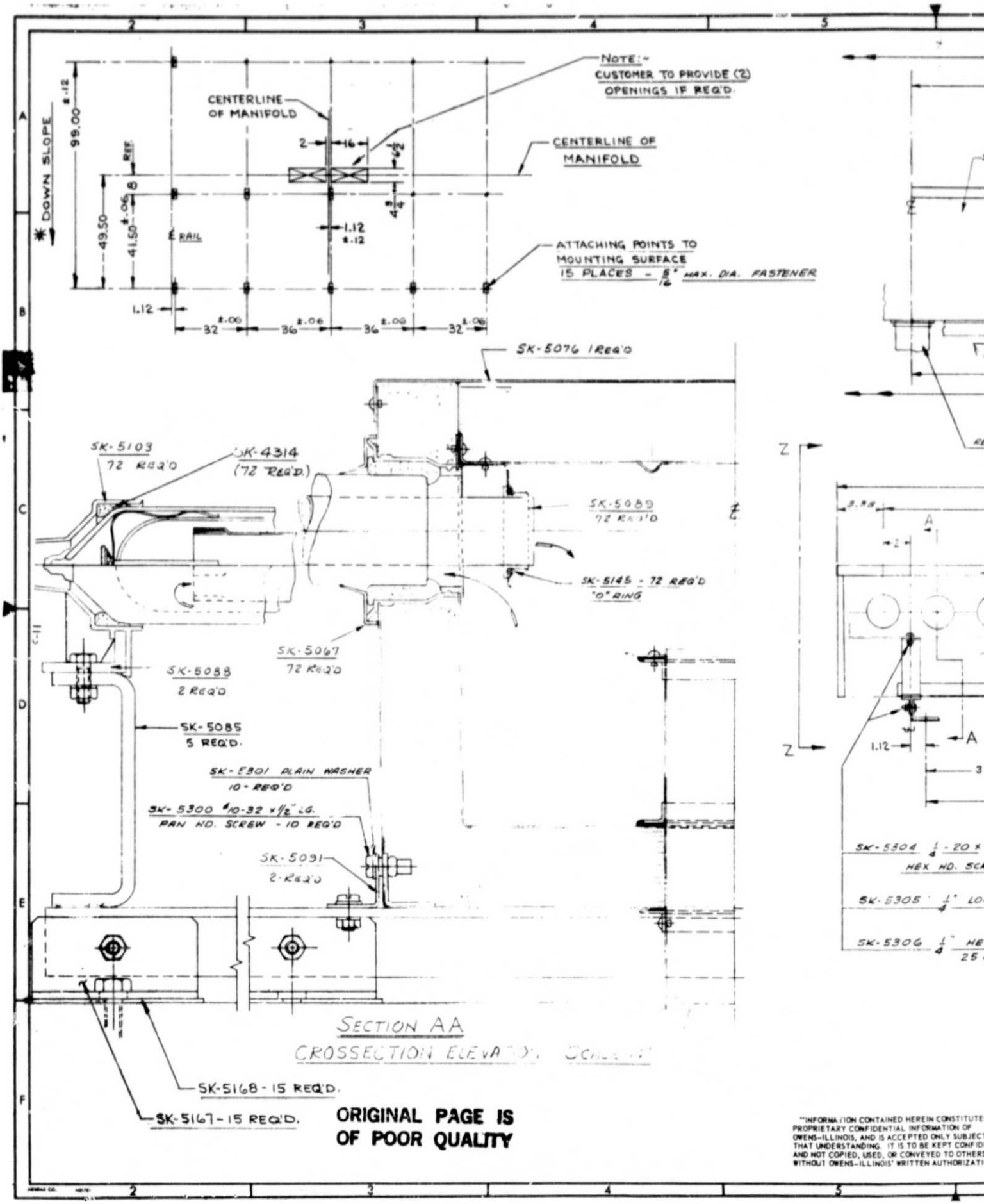
ASSEMBLY AND INSTALLATION DRAWINGS

SK-5076-Manifold Assembly, Complete

SK-5075-Solar Collector Installation

Note: Drawings of the detail parts called out on each of the above drawings may be obtained from Owens-Illinois, P.O. Box 1035, Toledo, Ohio 43666.

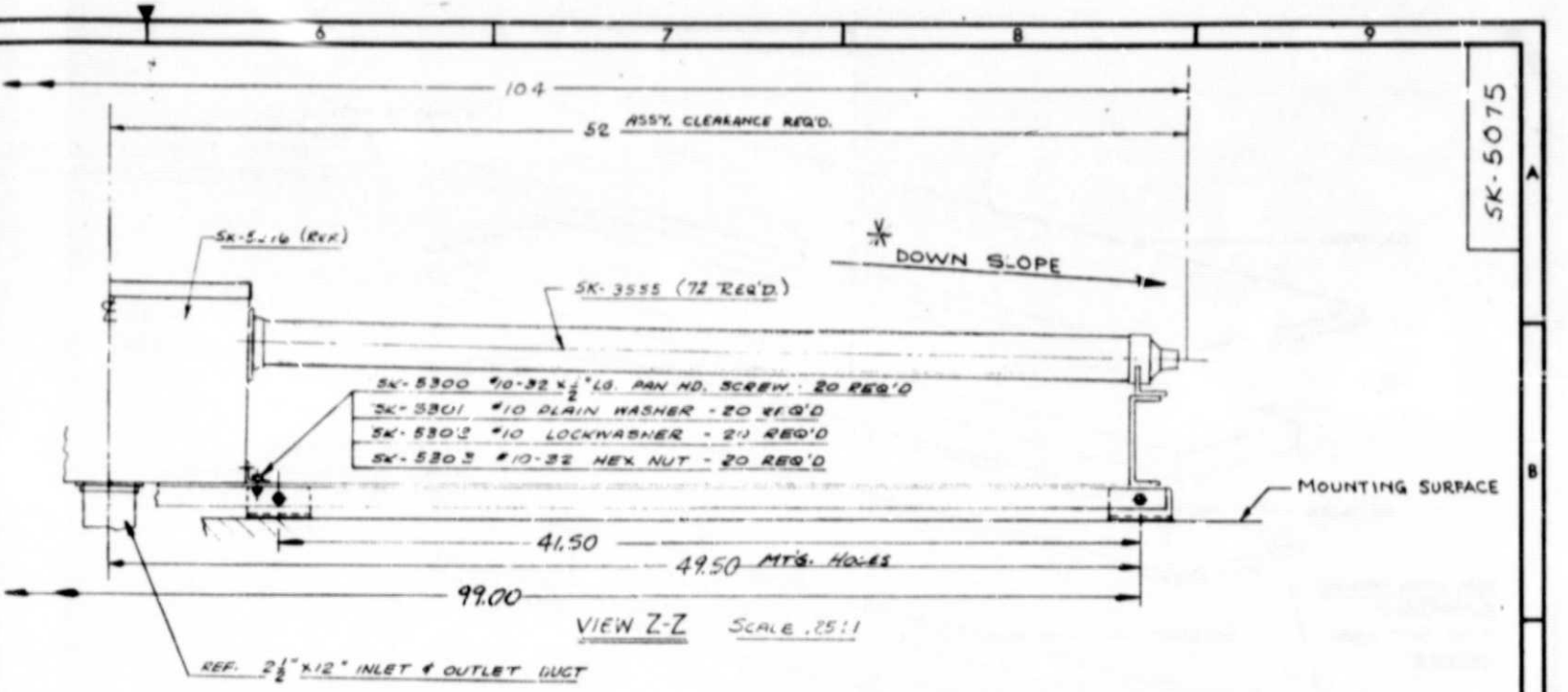
☆ U.S. GOVERNMENT PRINTING OFFICE 1979—640-247/184 REGION NO. 4

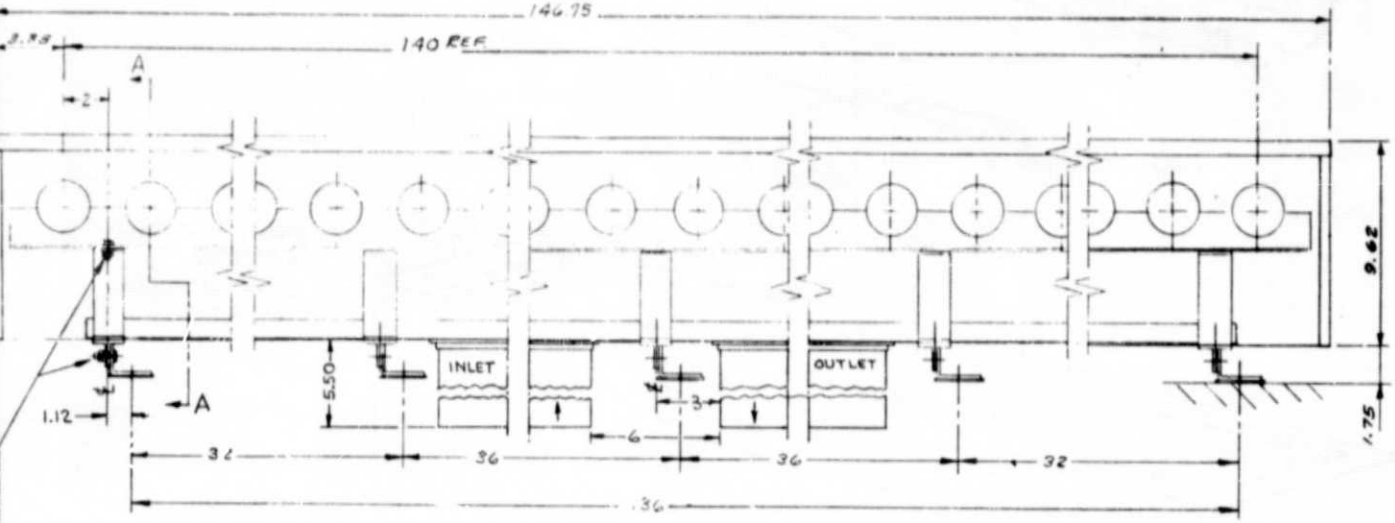


ORIGINAL PAGE IS OF POOR QUALITY

"INFORMATION CONTAINED HEREIN CONSTITUTE
PROPRIETARY CONFIDENTIAL INFORMATION OF
OWENS-ILLINOIS, AND IS ACCEPTED ONLY SUBJECT
THAT UNDERSTANDING. IT IS TO BE KEPT CONFID
AND NOT COPIED, USED, OR CONVEYED TO OTHERS
WITHOUT OWENS-ILLINOIS' WRITTEN AUTHORIZATI

FOLDOUT FRAME





SK-5304 1/4 - 20 x 3/4" LG. HEX HD. SCREW - 25 REQ'D

SIDE ELEVATION SCALE .25:1

SK-5305 1/4" LOCKWASHER 25 REQ'D

SK-5306 1/4" HEX NUT 25 REQ'D

CHG.	DESCRIPTION	BY	DATE	MF
J				
H				
G				
F				
E				
D				
C				
B	RELEASED	[illegible]	10/31	[illegible]
A	ROOF MTGS REVISED	[illegible]	10/[illegible]/77	

USED ON ASSEMBLY NO.

ON CONTAINED HEREIN CONSTITUTES CONFIDENTIAL INFORMATION OF OIS, AND IS ACCEPTED ONLY SUBJECT TO TANDING. IT IS TO BE KEPT CONFIDENTIAL IED, USED, OR CONVEYED TO OTHERS NS-ILLINOIS' WRITTEN AUTHORIZATION."

TOLERANCE UNLESS OTHERWISE NOTED	2 PLACE DEC. ±		
	3 PLACE DEC. ±		
	ANGLES ±		
CORNERS AND/OR EDGES BROKEN	OUTSIDE RAD.	MAX.	
	INSIDE RAD.	MAX.	
UNLESS SPECIFIED, MACHINED SURFACE ROUGHNESS NOT TO EXCEED √		RADII UNLESS OTHERWISE NOTED	

DEFINITION OF SYMBOLS (Total Indicator Reading)
- ⊙ CONCENTRICITY
- ○ ROUNDNESS
- ⌒ FLATNESS
- SYMMETRY
- || PARALLEL
- ⊥ PERPENDICULAR

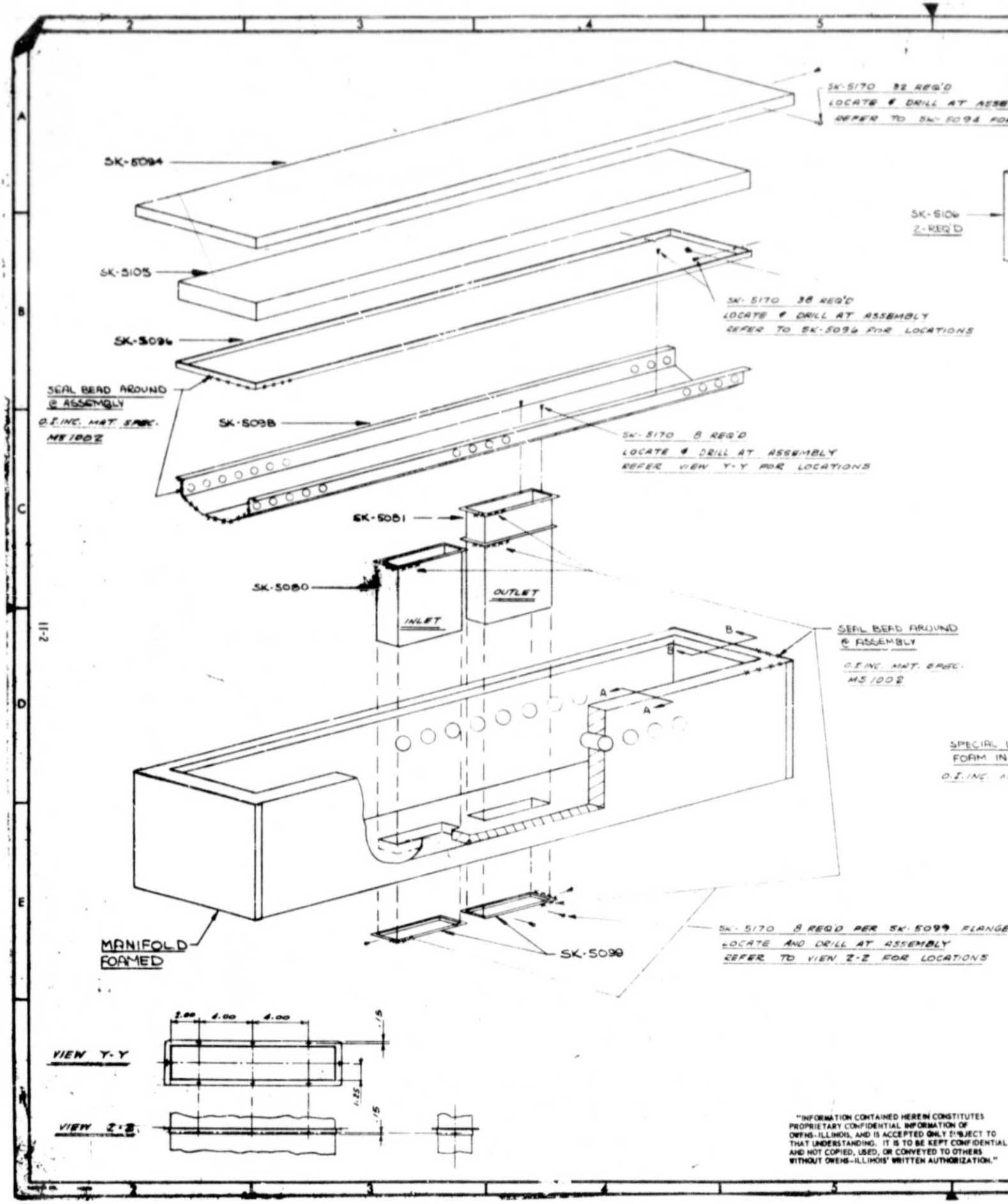
SCALE NOTED	INCHES
MATERIAL	
HEAT TREAT	
CASE DEPTH	
HARDNESS	
SUR. TREAT	

OWENS-ILLINOIS
CORPORATE TECHNOLOGY
TOLEDO, OHIO

PROJECT NO. C- 2370	DES'D	9/28/77
	DR'N	/ /
	CK'D	/ /
SOLAR COLLECTOR MODEL SEC-601		
NUMBER SK- 5075		D
SHEET 1 OF 1		SIZE

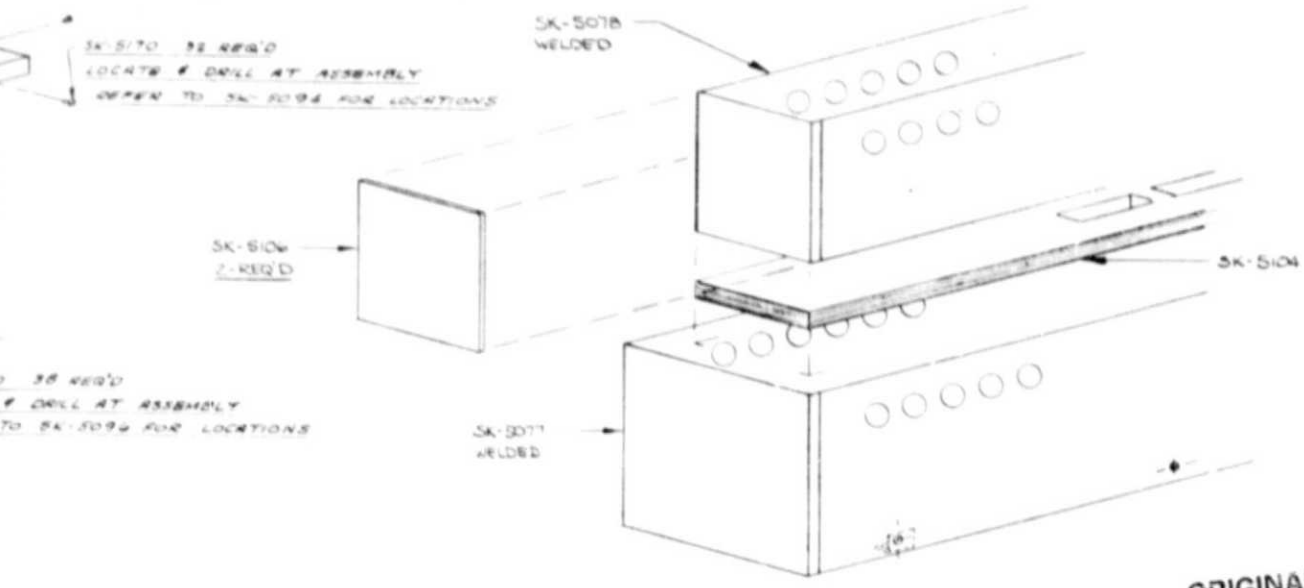
A-1

2 FOLDOUT FRAME

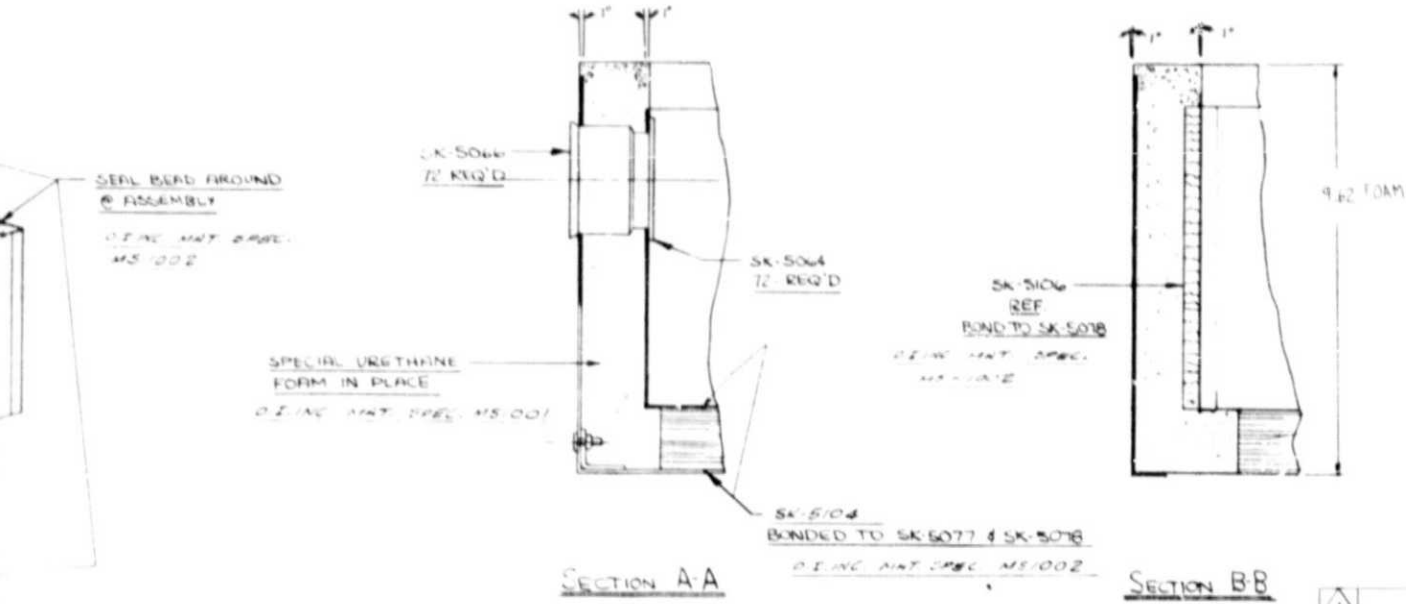


"INFORMATION CONTAINED HEREIN CONSTITUTES PROPRIETARY CONFIDENTIAL INFORMATION OF OWENS-ILLINOIS, AND IS ACCEPTED ONLY SUBJECT TO THAT UNDERSTANDING. IT IS TO BE KEPT CONFIDENTIAL AND NOT COPIED, USED, OR CONVEYED TO OTHERS WITHOUT OWENS-ILLINOIS' WRITTEN AUTHORIZATION."

FOLDOUT FRAME



ORIGINAL PAGE IS
OF POOR QUALITY



8 REQ'D PER SK-5099 FLANGE (16 TOTAL)
AND DRILL AT ASSEMBLY
TO VIEW Z-Z FOR LOCATIONS

CHG	DESCRIPTION	BY	DATE	MF
A	RELEASED			

1 USED ON ASSEMBLY NO. SK 5075

"INFORMATION CONTAINED HEREIN CONSTITUTES PROPRIETARY CONFIDENTIAL INFORMATION OF OWENS-ILLINOIS, AND IS ACCEPTED ONLY SUBJECT TO THAT UNDERSTANDING. IT IS TO BE KEPT CONFIDENTIAL AND NOT COPIED, USED, OR CONVEYED TO OTHERS WITHOUT OWENS-ILLINOIS' WRITTEN AUTHORIZATION."

TOLERANCE UNLESS OTHERWISE NOTED	2 PLACE DEC. ± —	DEFINITION OF SYMBOLS (Total Indicator Reading)	SCALE AND SCALE	OWENS-ILLINOIS	PROJECT NO. C-2370	DEF'D / /
	3 PLACE DEC. ± --	CONCENTRICITY	MATERIAL —			DR'N 9/16/77
	ANGLES ±	ROUNDNESS	HEAT TREAT			CK'D
CORNERS AND/OR EDGES BROKEN	OUTSIDE RAD. MAX.	FLATNESS	CASE DEPTH	CORPORATE TECHNOLOGY TOLEDO, OHIO	MANIFOLD ASSEM. COMPLETE	
	INSIDE RAD. MAX.	SYMMETRY	HARDNESS		NUMBER SK-5076	D
UNLESS SPECIFIED, MACHINED SURFACE ROUGHNESS NOT TO EXCEED √	RADII UNLESS OTHERWISE NOTED	PARALLEL	SUR TREAT		SHEET 1 OF 1	SIZE
		PERPENDICULAR				

FRAME 2