



CORPORATION
JACKSON, MICHIGAN

ENGINEERING DEPARTMENT

TEST REPORT

NO. 2894 DATED 31 JULY 1956

TITLE

FIRE RESISTANCE TEST OF AEROQUIP
606000-4, -6, -8 & -10 TEFLON HOSE
ASSEMBLIES, WITH 624 TYPE SINGLE
LAYER FIRE SLEEVE PROTECTION

P/N 624503 - Size - Length

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28 SEPTEMBER 1956

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REVISIONS AND ADDITIONS

DATE	PAGES AFFECTED	REMARKS

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SUMMARY:

THE TESTS REPORTED HEREIN WERE CONDUCTED FOR THE PURPOSE OF EVALUATING THE FIRE RESISTANCE OF AEROQUIP 666000-4, -6, -8 AND -16 TEFLON HOSE ASSEMBLIES, WHEN PROTECTED WITH 624 TYPE SINGLE LAYER FIRE SLEEVE.

REFERENCES:

- A. PROPOSED TECHNICAL STANDARD ORDER FOR HOSE ASSEMBLIES FOR USE IN FUEL, OIL, ALCOHOL AND MEDIUM PRESSURE HYDRAULIC LINES FOR TRANSPORT AIRCRAFT, DATED 13 JUNE 1954, ISSUED BY THE CIVIL AERONAUTICS ADMINISTRATION, DEPARTMENT OF COMMERCE, ON 17 JUNE 1954.

TEST SPECIMENS:

1. SIX 666000-4-24 HOSE ASSEMBLIES; WITH 624-9 FIRE SLEEVE AND 900752-14 CLAMPS.
2. FOUR 666000-6-24 HOSE ASSEMBLIES; WITH EXPERIMENTAL 624 TYPE FIRE SLEEVE HAVING A STAINLESS STEEL WIRE BRAID COVER.
3. SEVEN 666000-8-24 HOSE ASSEMBLIES; WITH 624-14 FIRE SLEEVE AND 900752-18 CLAMPS.
4. SIX 666000-16-24 HOSE ASSEMBLIES; WITH 624-22 FIRE SLEEVE AND 900752-28 CLAMPS.

TEST PROCEDURE:

A SCHEMATIC DIAGRAM OF AEROQUIP'S FIRE TEST SET-UP IS INCLUDED IN THIS REPORT.

EACH HOSE LINE WAS TESTED INDIVIDUALLY. THE SAMPLE WAS POSITIONED HORIZONTALLY ON THE FIRE TEST BENCH. A FULL 90° BEND WAS INCORPORATED IN THE SET-UP, TO FACILITATE ANY FITTING BLOW-OFF THAT MIGHT OCCUR. ONE END OF EACH HOSE LINE WAS LINKED TO A MACHINE CAPABLE OF IMPARTING VIBRATORY STRESSES AT A RATE OF 1750 CPM. THE TOTAL AMPLITUDE OF VIBRATION WAS 3/16 INCH.

SAE 20 ENGINE OIL WAS CIRCULATED THROUGH THE LINES AT THE FLOW RATES SPECIFIED ELSEWHERE IN THIS REPORT. WITH ONE EXCEPTION (A -6 SIZE LINE), OIL PRESSURE WAS 30 PSI. OIL TEMPERATURE WAS MAINTAINED AT 200 ± 5° F DURING ALL TESTING.

THE PROPANE GAS BURNER USED FOR TESTING PRODUCED A FLAME HAVING A TEMPERATURE OF $2000 \pm 50^{\circ}$ F. THE BURNER MOUTH WAS 6 INCHES FROM THE HOSE LINES, AND THE FLAME ENCOMPASSED AN AREA OF APPROXIMATELY 6 INCHES. THE FLAME WAS CENTERED ON THE JUNCTURE OF THE HOSE AND ONE END FITTING.

AFTER THE DESIRED OIL TEMPERATURE AND OIL FLOW RATE HAD BEEN OBTAINED, THE TORCH WAS LOWERED INTO POSITION BY MEANS OF A REMOTELY CONTROLLED AIR CYLINDER, AND THE PROGRESS OF THE TEST CLOSELY FOLLOWED THROUGH THE OBSERVATION WINDOW. THE TWO PHOTOS INCLUDED SHOW A TYPICAL FIRE TEST IN PROGRESS, AND AT THE CONCLUSION OF A TEST RUN, A TECHNICIAN EVALUATING THE EFFECT OF THE EXPOSURE.

TEST RESULTS:

<u>-4 SIZE</u>	<u>FLOW (GPM)</u>	<u>RESULTS</u>
#1	NONE	INITIAL LEAKAGE AT 120 SECONDS; TEST TERMINATED AT 130 SECONDS.
#2	NONE	INITIAL LEAKAGE AT 125 SECONDS; TEST TERMINATED AT 135 SECONDS.
#3	0.077	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#4	0.077	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#5	0.31	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#6	0.31	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
<u>-6 SIZE</u>	<u>(SPECIAL STAINLESS STEEL WIRE BRAID COVER ON FIRE SLEEVE)</u>	
#1	NONE	INITIAL LEAKAGE AT 175 SECONDS; TEST TERMINATED AT 190 SECONDS.
#2	0.077	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#3	0.31	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#4	NONE	TESTED AT 1000 PSI STATIC PRESSURE. INITIAL AND TERMINAL LEAKAGE AT 110 SECONDS.

<u>-8 SIZE</u>	<u>FLOW (GPM)</u>	<u>RESULTS</u>
#1	NONE	INITIAL LEAKAGE AT 230 SECONDS; TEST TERMINATED AT 260 SECONDS.
#2	NONE	INITIAL LEAKAGE AT 280 SECONDS; TEST TERMINATED AT 330 SECONDS.
#3	0.31	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#4	0.31	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#5	0.62	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#6	0.62	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#7 *	0.31	NO LEAKAGE DURING 15 MINUTE EXPOSURE.

* AFTER 15 MINUTES, THE TORCH WAS REMOVED AND THE PRESSURE WAS IMMEDIATELY INCREASED TO 100 PSI AND HELD FOR 10 MINUTES. THERE WAS NO LEAKAGE.

-16 SIZE

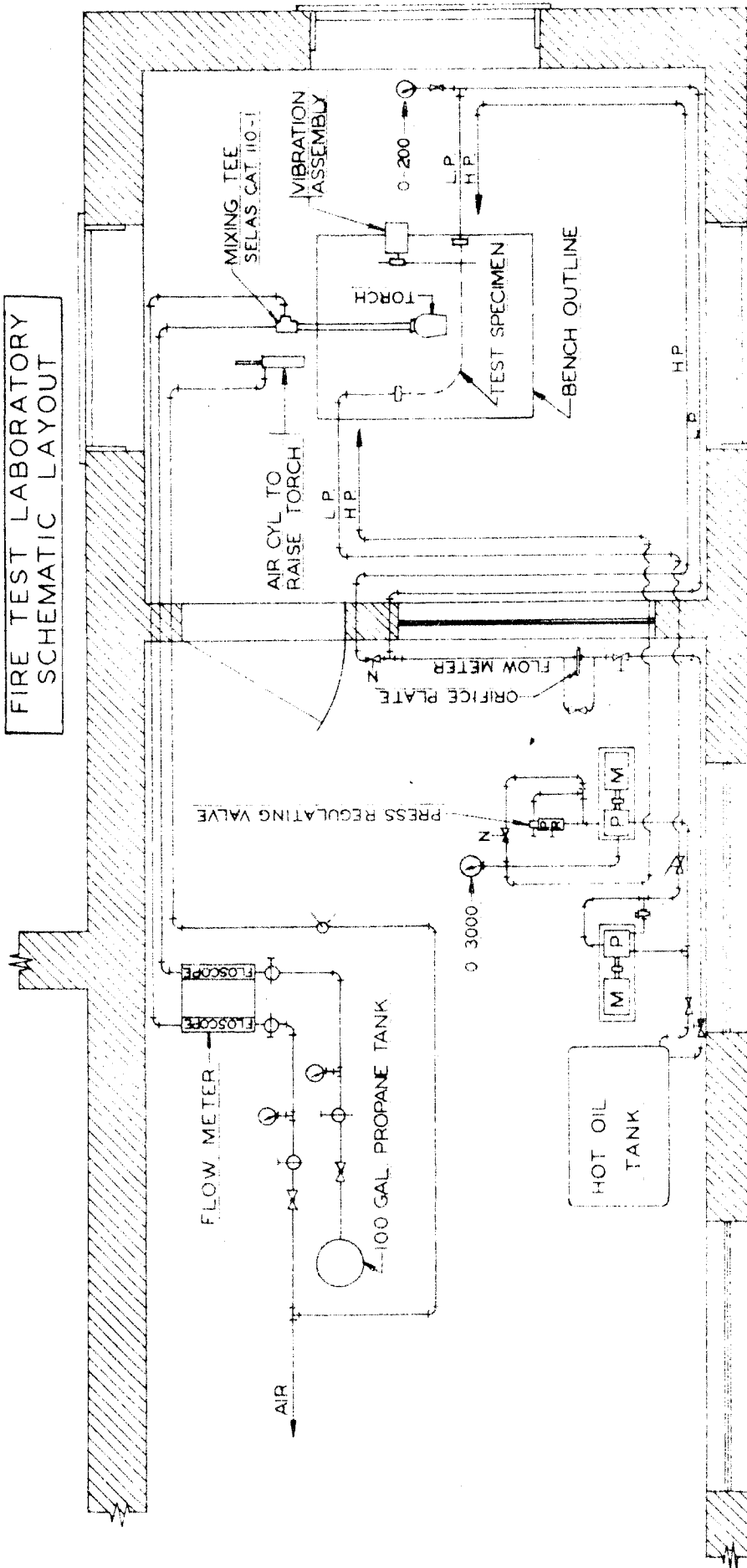
#1	NONE	INITIAL LEAKAGE AT 225 SECONDS; TEST TERMINATED AT 260 SECONDS.
#2	NONE	INITIAL LEAKAGE AT 250 SECONDS; TEST TERMINATED AT 260 SECONDS.
#3	1.25	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#4	1.25	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#5	2.50	NO LEAKAGE DURING 15 MINUTE EXPOSURE.
#6	2.50	NO LEAKAGE DURING 15 MINUTE EXPOSURE.

CONCLUSIONS:

TEST RESULTS SHOW THAT THE SPECIMEN AEROQUIP HOSE ASSEMBLIES WITH SINGLE LAYER FIRE SLEEVE PROTECTION WILL MEET THE 15 MINUTE FIRE PROOF REQUIREMENT OF THE CAA (PER REFERENCE A), AT 30 PSI PRESSURE WITH FLUID FLOW. THIS IS TRUE EVEN WITH FLOWS LESS THAN 50% OF THOSE ALLOWABLE. THE SAME ASSEMBLIES WITH NO FLOW WILL NOT MEET THE 5 MINUTE FIRE RESISTANT REQUIREMENT.

CONCLUSIONS (CONTINUED):

THE ONE -B HOSE LINE (DENOTED BY *) WAS SUBJECTED TO AN INCREASE IN PRESSURE AFTER THE FLAME WAS REMOVED FOLLOWING THE 15 MINUTE EXPOSURE, TO DETERMINE IF THE TEMPERATURES ENCOUNTERED HAD SOFTENED THE TEFLON LINER SUFFICIENTLY TO ALLOW FAILURE AT A HIGHER PRESSURE. SINCE THE RESULTS WERE SATISFACTORY, IT IS EVIDENT THAT THE INNER TUBE WAS NOT DAMAGED DURING THE 15 MINUTE EXPOSURE PERIOD.



FIRE TEST LABORATORY SCHEMATIC LAYOUT

SYMBOLS

- ⊕ PRESSURE REGULATOR
- ⊙ PRESSURE GAGE
- ⊕ GATE VALVE
- ⊕ QUICK OPENING VALVE
- ⊕ STOP COCK
- ⊕ FOUR WAY VALVE
- ⊕ GLOBE VALVE
- ⊕ NEEDLE VALVE
- ⊕ PUMP
- ⊕ MOTOR

NOTE

TORCH - SELAS CAT 124 - 16A REFRAK SCREEN BURNER
 FLOW METERS - ONE SET DUG-MOUNTED FLOSCOPES TO INCLUDE
 ONE SELAS CAT B-2-1 FLOSCOPES CALIBRATED FOR PROPANE
 GAS 0-150 C.F.H. SCALE 1LB. P.S.I. PRESSURE AND ONE SELAS
 CAT B-5-1 FLOSCOPES CALIBRATED FOR AIR AT 1LB. P.S.I.
 PRESSURE SCALE 0-3500 CU. FT. PER HOUR

AEROQUIP CORPORATION JACKSON, MICHIGAN

