

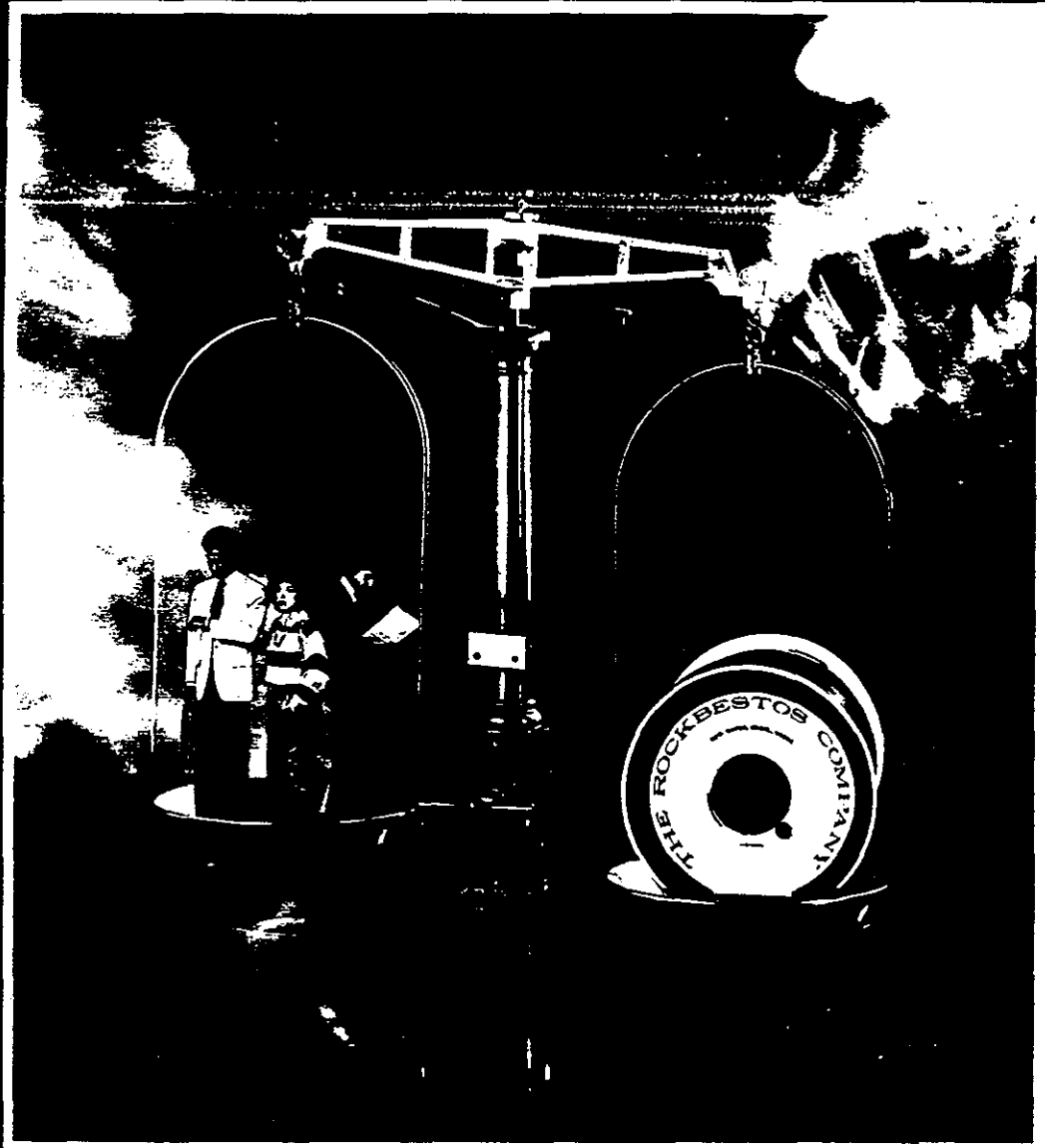
NEW FROM ROCKBESTOS



FIREWALL[®] ZH-125

**High Performance, Zero-Halogen, Low Smoke
125°C Transit Car Wiring**

When Life Safety is in the Balance...



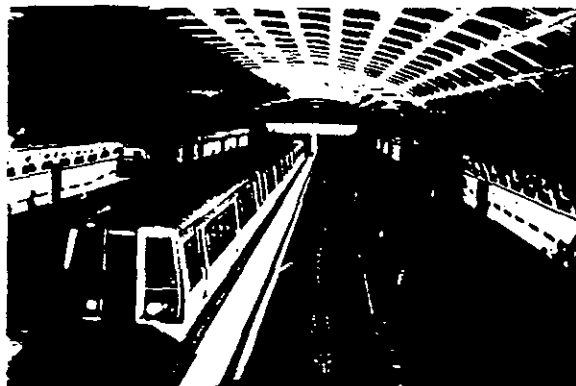
***...The Only Responsible Choice is the Wire
with the Best Balance of Properties***

RBB 02838

THE PROBLEM

"The hazard of fire has long been a concern of the transportation industry. Recent studies have shown that incapacitation or death from smoke is more probable than from fire. In the crowded, confined environment of a rapid transit vehicle, the smoke emission from all sources must be eliminated. The problem of smoke is compounded by the possibility of toxic fumes in the smoke. The use of halogenated compounds and halogenated monomers as flame retardants brings with it the problem of hydrogen-halogenated toxic gasses."

Study by Boeing Aircraft Co. for
The U.S. Dept. of Transportation, Dec., 1978



THE CHALLENGE

At the Sixth Congress of the UITP Working Group for the Protection of Electrical Cables for Metros (Stockholm, 1979) it was concluded that the materials and technologies were currently available to develop wire and cable products with significantly improved fire characteristics approaching the "smokeless cable."

As a follow-up to this Congress, the American Public Transit Association (APTA) and the European members of the International Union of Public Transports (UITP) created a special task force to prepare a performance specification for the development of such improved wire and cable products. It was hoped that this action would provide the impetus for the wire and cable industry to respond to this challenge. The goals of that performance specification were:

"It is expected that the manufacturer will use his expertise with a *balanced* approach, to develop wire and cable products with improved characteristics that can better meet the needs of the rapid transit industry."

"The manufacturers proposed compound(s) for wire and cable should not provide fuel for fire nor contribute to full fire development. Secondly, the smoke, toxic and corrosive off-gases evolved during the combustion of materials should be in very small quantities and should not include halogen and sulfur compounds."

THE PROJECT

In 1981, Rockbestos engineers initiated a project to meet the challenge presented by the rapid transit industry and develop a new wire and cable product that fully utilized state-of-the-art materials and production technology. The guidelines of this project included:

- No Halogen — for reduced toxicity and corrosivity
- Low Smoke — for improved life safety
- High Temperature — for improved ampacities, reduced diameter and longer life
- Flame Retardant — to deter flame propagation

These improvements were to be made without sacrificing the electrical and mechanical characteristics necessary for long product life in transit car service. The objective was to develop a unique product which fulfilled the stated industry needs, while obtaining the best possible balance of cable properties.

THE SOLUTION

From an engineering standpoint, the solution was developed with the realization that no existing single polymeric material could achieve all the stated needs of the transit industry. A dual layer system was conceived to meet these requirements. A careful design process was undertaken to select material combinations and to evaluate their optimum proportions. With Firewall® ZH-125, Rockbestos has developed a truly superior, zero-halogen, low-smoke, 125° C wire with excellent electrical and mechanical properties. It is flexible for ease of installation, and of reduced diameter and weight when compared to conventional car wiring products.

Firewall® ZH-125 represents the "balance" of characteristics that you have asked for. It is available today. It is the only responsible choice where life safety is in the balance.



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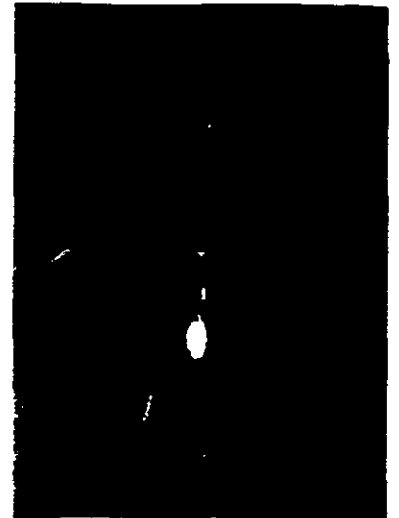
ACID GAS GENERATION:

Firewall® ZH-125 has zero halogen content. This is a unique property when compared to current car wiring products. Rockbestos has chosen the very discriminating Schoniger Flask test method (ASTM E-205) to demonstrate comparative corrosive combustion by-products. This method was chosen because of its:

- reproducibility
- ability to capture all combustion by-products
- ability to measure all types of acids generated
- capacity to measure the products of complete specimen combustion which is more representative of a real fire condition.

MATERIAL	IRRADIATED CROSS-LINKED POLYOLEFIN	HYPALON† (CSPE)	LOW SMOKE HYPALON (CSPE)	TEFZEL† (ETFE)	ROCKBESTOS FIREWALL® ZH-125
Typical Values*	2.8	2.7	2.9	20.2	0

*Milliequivalent of acid per gram of sample.



SMOKE GENERATION:

Firewall® ZH-125 has been formulated to produce minimum smoke when burned. For evaluation purposes typical values of current car wiring products are compared. Results were obtained using an NBS smoke chamber (ASTM E-662) and materials molded into 100 mil slabs. Results are listed for both flaming and non-flaming modes.

MATERIAL	MODE	Ds ₄	Dm
IRRADIATED CROSS-LINKED POLYOLEFIN	F NF	500 250	550 500
HYPALON (CSPE)	F NF	700 500	800 700
LOW-SMOKE HYPALON (CSPE)	F NF	250 300	350 400
TEFZEL (ETFE)▲	F NF	20 15	270 20
FIREWALL ZH-125 ▲▲	F NF	25 25	150 170

Ds₄ = Specific Optical Density @ 4 minutes ▲ - Unknown Slab Thickness
Dm = Maximum Specific Optical Density ▲▲ - Each layer of composite tested separately, results represent worst case



ACCELERATED MOISTURE ABSORPTION

Firewall® ZH-125's primary dielectric layer exhibits excellent electrical characteristics when tested to the EM-60 method in 75° C water. The test is performed prior to the application of the secondary extrusion. The results indicated below are typical of the performance which can be expected.

- SIC after 1 Day 3.3
- Inc. Cap. 1-14 Days 0.5
- Inc. Cap. 7-14 Days 0.3
- Stability Factor 0.3
- Alternate Stability Factor 0.1

†DuPont Registered Trademark



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MECHANICAL PERFORMANCE

To demonstrate Firewall® ZH-125's resistance to mechanical abuse the following three industry recognized tests were chosen. All tests were performed on 14 AWG samples and the results indicated are typical of the performance which can be expected.

SCRAPE ABRASION
G.E. Scrape Abrader
12 Mil Radius Tool 3/8" Stroke, 60 CPM 1,500 Gram Load
Strokes to Penetration
24,000 Strokes (12,000 Cycles)



DYNAMIC CUT THROUGH
Instron Type Tester
1/16" Radius Tool 0.2 Inch/Minute
Lbs. to Electrical Short
700 Lbs.

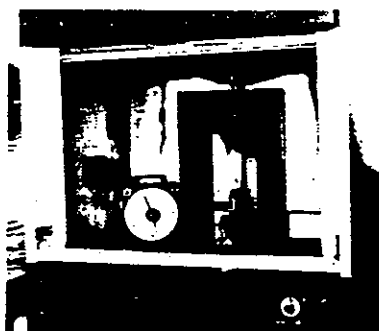


DYNAMIC CRUSH
Instron Type Tester
2" Plates 0.2 Inch/Minute
Lbs. to Electrical Short
Exceeds 2,000 Lbs.



FLAME RESISTANCE

Firewall® ZH-125 is composed of highly flame retardant materials which enable it to readily pass the very stringent VW-1 verticle flame test per UL Standard 44.



HEAT RESISTANCE

Heat resistance is essential for long service life at rated temperature. Firewall® ZH-125 exhibits excellent heat aging properties. When judged by UL standards (168 hours @ 158° C), its level of retention of original physical properties justifies the 125° C continuous conductor temperature rating.



OIL RESISTANCE

To demonstrate the superior oil resistance of Firewall® ZH-125, a 14 AWG sample was immersed for 100 hours in a hot oil bath of ASTM No. 2 oil heated to 150°C ± 2°C. The sample showed less than 30% volume swell with no cracks or splits.



SUMMARY

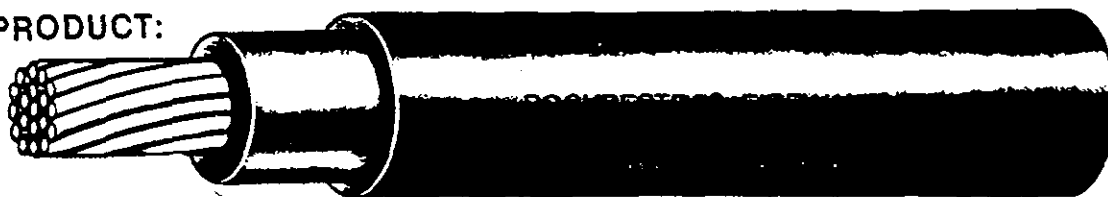
The above cable test results have been chosen to highlight some of the unique and outstanding properties of Firewall ZH-125. More complete data is available upon request.

A review of the excellent characteristics offered by the product, would indicate that Rockbestos has achieved its goal in developing a zero-halogen car wire with the best balance of properties.

Feel confident that when the burden of life safety is in your hands, you can tip the scale in your favor with Rockbestos Firewall® ZH-125.

RBB 02842

THE PRODUCT:



Rockbestos' new one conductor FireWall[®] ZH-125 transit car wire is rated 0-2000 volts and has a continuous conductor temperature rating of 125° C. It is composed of flexibly stranded coated copper conductor insulated with a dual layer of extruded composite insulation. These two layers are divided to provide the best possible balance of cable properties. It is available in sizes 22 AWG through 10 AWG.

DIMENSIONAL DATA

CATALOG NUMBER	AWG SIZE	STRANDING	CONDUCTOR NOM. O.D. (IN.)	WEIGHT LBS/MFT	INSULATION THICKNESS (IN.)	CABLE NOM. OD. (IN.)	AMPACITY 125° C*
RR082201	22	19/0063	.032	6	.030	.095	14
RR082001	20	19/0080	.040	8	.030	.103	18
RR081001	18	19/0100	.050	11	.030	.113	23
RR081601	16	19/0117	.059	14	.030	.122	30
RR081401	14	19/0147	.071	20	.030	.134	39
RR081201	12	19/0185	.089	29	.030	.152	52
RR081001	10	27/0201	.124	44	.030	.187	72

*NOTE: Ampacities: The current ratings listed above are based on ICEA method of calculating per their Publication P-46-426 for insulated isolated cable in free air with a 40° C ambient temperature and a conductor temperature of 125° C.

THE COMPANY

The Rockbestos Company is no stranger to difficult challenges. Since 1918 the company has specialized in high temperature, high performance wire and cable with notable success, resulting in an international reputation for engineering expertise.

The company, especially, has furnished cable for a variety of difficult environments where dependability has been of the utmost importance. Rockbestos has concentrated on heavy industrial applications including: metals, petrochemicals, mining machinery, nuclear utilities, glass and railroad/rapid transit. The company has a number of significant "firsts" in flame retardant applications, including the first flame retardant railroad cable (1936), the first flame retardant mining machinery cable (1942) and the first flame retardant utility control cable (1968).

With this experience, Rockbestos is well equipped to deal with the very real concerns of life-safety in the transit industry.



138,100 sq. ft. production plant for high voltage power cable completed in 1981. Located in Troutman, NC, it is the most modern and efficient facility of its kind in North America.

RBB 02843