



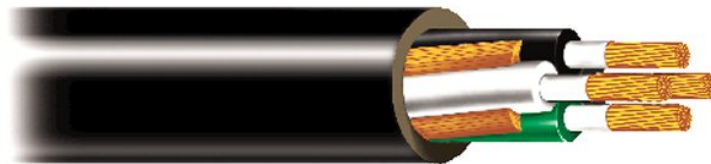
## ENTERTAINMENT AND STAGE LIGHTING CABLES

### Comparative Engineering Tests Prove Carol® Brand Rated Best Against Foreign Competition

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# Comparative Engineering Tests Prove Carol® Brand Rated Best Against Foreign Competition

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## INTRODUCTION

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From the Alaskan arctic cold to the Southwest desert, and from the Burbank back lots to the streets of San Francisco, Carol® Brand entertainment and stage lighting cables power the demands of the television, sports and motion picture industries. The applications where these Type SC and Type W cables are used range from temporary power to stage lighting use. All of these uses rely on the high-quality construction and physical properties of these cables to insure long life and reliable service under demanding environmental and soundstage conditions.

The types of service conditions these cables are exposed to vary widely, but three cable design aspects tend to dominate in most entertainment applications: flexibility, durability and the ability to withstand extreme temperatures. Flexible cable is a must in today's production environment – with cables being used in their primary application of providing temporary power for production and lighting, today they must be able to easily flex through tight spaces, cable runs, and raceways to location-specific equipment. House and standard length runs are constantly being checked in and checked out of studio lots, and the amount of flexing can impact a cable's ultimate lifespan. A quality cable should not “knot” or show “twist” after being placed into service.

Durability is a primary concern for production engineers – and good cable design demands that a cable be tough and abrasion-resistant, that the jacket pull (tensile) strength and heat-induced aging tests meet or exceed UL standards for reliability, and that the cable remain intact with no cracking under extreme low temperature bending conditions. Indeed, with on-location shooting now knowing no boundaries, cables must be able to remain tough under extreme heat and cold conditions.

Studios and production companies continue to face financial pressure to keep costs down, and so there has been a recent trend towards sourcing foreign brands of Type SC and Type W entertainment and stage lighting cables, which are substitutions for the high-quality cable of choice, U.S. manufactured Carol Brand cable. But does quality have a price? And what value can be placed on a rugged, reliable cable in the entertainment and stage industries?

To answer these questions, General Cable, manufacturer of Carol Brand cables, recently conducted a series of comparative tests in its engineering and development laboratories, performing side-by-side testing of its Carol Brand cable against a primary foreign competitor (Brand F). These engineering tests evaluated the Type SC and Type W cables using various characteristics:

**Conductor: Size, Stranding, and DCR (to UL and CSA requirements)**

**Insulation: Wall Thickness, Strength, Elongation and Hot Aging (to UL and CSA Requirements)**

**Complete Cable Tests: Cold Bend (-50°C), Abrasion Resistance and Flex Testing**



### TEST RESULTS

General Cable’s comparative testing revealed significant quality differences between Carol Brand Type SC and Type W cables when compared to Brand F, a foreign-sourced cable. In terms of performance under extreme conditions, including simulated abrasion, extreme cold, pulling and flexing, Carol Brand Type SC and Type W cables performed significantly better than the primary foreign-sourced competitor. The most notable observations made were instances where samples of Brand F cable did not conform to either UL or CSA requirements, as shown in the test results below:

#### TYPE SC – SELECTED TESTING RESULTS OF CAROL BRAND CABLE VERSUS FOREIGN-SOURCED CABLE (BRAND F)

Characteristic	CAROL BRAND	Brand F	UL Requirements	CSA Requirements
Conductor Strand Count	2090/2066	2033	N/A	2066
Insulation: Retained Elongation (%)	55%	21%	50% min	50% min
Cold Bend Test (-50°C)	No Cracks	Cracked	No Cracks	No Cracks
Abrasion Resistance (cycles) [per SAE AS 5756-A1]	143 (49% greater)	96	N/A	N/A

*Brand F’s Type SC cable does not meet CSA requirements for strand count, nor UL requirements for insulation retained elongation. Also cracks under extreme cold conditions and is less abrasion-resistant.*



**TYPE W – SELECTED TESTING RESULTS OF CAROL BRAND CABLE VERSUS  
FOREIGN-SOURCED CABLE (BRAND F)**

<b>Characteristic</b>	<b>CAROL BRAND</b>	<b>Brand F</b>	<b>UL Requirements</b>
<b>Insulation Wall Thickness (in.)</b>	<b>0.110”- 0.121”</b>	<b>0.078” – 0.090”</b>	0.080” min
<b>Insulation: Elongation (%)</b>	<b>215% (3.3 times better)</b>	<b>713%</b>	200%
<b>Retained Tensile Strength (%) – Heat Aged</b>	<b>97% (11% greater)</b>	<b>87%</b>	85%
<b>Tensile Strength (psi) – Pull Strength</b>	<b>1924 (33% greater)</b>	<b>1446</b>	1800 min
<b>Abrasion Resistance (cycles)</b>	<b>322 (15% greater)</b>	<b>280</b>	N/A
<b>Flex Test Results</b>	<b>No twisting after 1000 cycles</b>	<b>Twisting at 450 cycles</b>	<b>N/A</b>

*Brand F’s Type W does not meet UL requirements for insulation wall thickness and tensile strength. Also is less abrasion-resistant (measure of durability) and shows evidence of conductor twist under flex loading (measure of flexibility and durability).*



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## VISUAL COMPARISON

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In creating compelling stories for the entertainment audience, producers rely on striking visuals to convey important themes to the public. The comparative visual cable samples tell a similar story – the long-known story of Carol Brand’s high quality when compared to lesser-quality foreign brands which is exhibited below:

Carol Brand Cable after Flex Testing  
Note: No twisting after more than 1000 cycles



Brand F – Foreign Cable after Flex Test  
Note: Severe twisting after only 450 cycles



Carol Brand Type W cable is specially designed with integral braid reinforcement, unlike the less durable tape reinforcement found in other, lesser quality brands. This integral braid provides excellent flex life and durability, maintaining the jacket and conductor integrity throughout the life of the cable in entertainment and stage/cinema applications.

The lesser quality tape reinforcement of the Brand F foreign-sourced Type W cable gives way in a much shorter length of time under flex applications, leading to waviness, kinking and lesser service life.



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## CONCLUSIONS

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For the production engineer and technician seeking the best quality wire and cable product that will perform under all the demanding conditions required for entertainment and stage applications, the clear choice is Carol Brand Type SC and Type W cables. Rest assured that the Carol history of quality and innovation remains true today, with our focus on product engineering improvements, and unyielding conformance to UL certification standards. And even more, Carol Brand cables are not only easy to use – retaining shape, durability and integrity after years of use, they are also reliable – setting the standard of performance in extreme heat and cold conditions and under the demanding push/pull conditions well-known in the industry.

For the production, stage, or television/media business staff seeking the best value cable for the price, Carol Brand Type SC and Type W cables are the clear choice. Our engineering tests show that Carol Brand cables easily and consistently outperform the lesser-quality foreign cables, with clear benefits and lower risks, such as:

- Better durability and flexibility means cables last longer – reduces costs
- Better flexibility means cables last longer – reduces costs
- Strict adherence to UL certifications means less risk of downtime due to outage – reduces risks to production and events, reduces costs

Yes, higher quality sometimes results in a higher initial price when first compared to an imported cable. But when you consider that many end users continue to use Carol Brand cables that are sometimes decades old, the clear life-cycle cost winner was and continues to be Carol Brand.

Our focus on producing the best quality entertainment and stage cable in the industry is a direct reflection of our motto at General Cable: Demand Better...Expect More™ from Carol Brand.