Suspension Wire Choice In Corrosive Environments

Suspension wire or hanging wire is typically 12 gage galvanized wire and is supplied often as 12 foot straight pieces. If the environment is too corrosive, you may need a different wire. Your alternatives include stainless steel and Monel (a nickel-copper alloy). If chlorine or chloride are present , Monel should be considered; it's expensive but has some advantages over stainless steel. Monel is preferable to stainless steel in some situations because of the way stainless can fail in some situations – suddenly and it's hard to see where it might fail. Monel can corrode in some environments but you can see that it's happening so preventative maintenance can be done. Details are given below.

Galvanized 12 gage wire is a 0.1 inch diameter iron wire coated in zinc. For this gage, there are about 33.7 feet per pound of wire and the approximate breaking strength for a soft, easily bent, low tensile strength iron is 375 pounds without a safety factor. A safety factor of 4 is recommended (i.e. 94 pounds). This wire is well known and used throughout the industry. Unfortunately, the galvanizing zinc coating doesn't completely protect the iron wire in all environments.

Stainless steel is still mostly iron but is mixed with other metals. Depending on the amount and type of other metals, various grades of stainless are produced. Stainless steel 304 is a common grade for wire. It contains 18-20 percent chromium and 8-12 percent nickel plus some traces of other metals. Type 316 is like 304 in composition but also has 2 to 3 percent of molybdenum metal added. It is very strong with a approximate breaking strength, without a safety factor, of about 825 pounds. It's also hard to bend.

Stainless steel has it uses. In atmospheres with only moisture, it resists rust. A kitchen may fit this scenario. The 302/304 alloy is also nominally nonmagnetic and has been used successfully in "MRI" or magnetic resonance imaging room applications.

The problem with stainless steel is the way it fails in some situations – it cracks. This type of failure is called stress crack corrosion and is particularly severe if chlorine or chloride is present. Chlorine is a common disinfectant used in swimming pools and in water purification. Chloride can come from just common salt – the same you use at the dinner table. In stress crack corrosion, very small nearly invisible cracks form where the wire is in stress. Stress points often form where the wire is bent. And all hanging wire is bent. At some point, the crack fails and the wire breaks. You really can't see this coming – the wire breaking is your first clear sign.

Monel offers and alternative to stainless steel because it does not fail by stress crack corrosion in the presence of chlorine or chloride. Monel is based on nickel. It is two thirds nickel and about one third copper with about 1-2 percent iron and traces of other metals. For a 12 gage wire, there is 28.9 feet per pound and its approximate breaking strength without a safety factor is 600 pounds. A factor of 4 is recommended for safety (i.e 150 pounds). Monel 400 is easily bent which is another advantage over some stainless steels. Monel can corrode but it is an observable process usually forming a greenish material like you've probably seen on copper materials. Monel is sold in coil form and pre-straightened on the job site by the contractor before use.

We provide this technical brief without any recommendation. Each job requires the user, architect, or engineer to determine the suitability of the materials based upon their expert knowledge and their knowledge of the specific conditions of any given project.