

November 2024

To: Customers of Essex Solutions magnet wire

From: Regulatory Compliance at Essex Solutions magnet wire

Re: Request for Certification of Compliance with Initiatives for Substance Restriction, such as EU-RoHS, REACH WEEE, GADSL, JIG-101, CEPA, CSCL, TSCA, etc vs Essex Solutions magnet wire

Essex Solutions is in receipt of inquiries involving 'initiatives for substance restriction' vs Essex Solutions finished magnet wire and Essex Solutions bare copper. These inquiries have included the following:

- Restrictions on Hazardous Substances (EU-RoHS);
- Waste Electrical and Electronic Equipment (WEEE);
- Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH);
- Global Automotive Declarable Substance List (GADSL), and Joint Industrial Guide-101 – Material Composition Declaration for Electrotechnical Products (JIG-101);
- Toxic Substances Control Act (TSCA) and Lautenberg Chemical Safety Act;
- Persistent Organic Pollutants (POPs);
- Canadian Environmental Protection Act-1999 (CEPA) and Canada Chemicals Management Plan /Chemical Challenge;
- Japanese Chemical Substances Control Law (CSCL).

Nothing about Essex Solutions finished magnet wire (also referred to as 'winding wire') and Essex Solutions bare copper could be construed as contrary to these aforementioned initiatives.

Specific to RoHS: Based on our internal review of raw material inputs, Essex Solutions has determined that its finished magnet wire and Essex Solutions bare copper have no substantive content for lead, mercury, cadmium, hexavalent chromium, polybrominated flame retardants, nor free phthalates. This compliance statement holds for RoHS-2 (Directive 2011/65/EU) and RoHS-3 (EU 2015/863).

Specific to WEEE and ELV: Essex Solutions finished magnet wire and Essex Solutions bare copper will not interfere with the collection, treatment, recycling, and recovery of waste electrical and electronic equipment, nor will Essex Solutions magnet wire and Essex Solutions bare copper interfere with management of end-of-life vehicles (ELV). Essex Solutions magnet wire is based on copper or aluminum conductor, two metals of intrinsic value. Therefore, developed nations should already be well-equipped for managing the reclamation of scrap magnet wire and bare copper.

Specific to REACH SVHCs and Annex XVII: Essex Solutions has reviewed the REACH lists of Substances of Very High Concern (SVHCs) against raw material input for Essex Solutions finished magnet wire and Essex Solutions bare copper, **up to and including the SVHC additions finalized in early November 2024.**

Some formulations for raw magnet wire enamel coatings do indeed contain REACH-SVHCs 1-methyl-2-pyrrolidone (aka NMP, CAS # 872-50-4) and/or N,N-dimethylacetamide (aka DMAC, CAS #127-19-5). However, such solvents are removed within the magnet wire oven during the curing process, and analytical data acquired by independent laboratories on behalf of Essex Solutions found all samples of Essex Solutions finished magnet wire to have residual NMP at <0.1% after full curing and thus in compliance with REACH. In addition, when considering physical properties of DMAC vs. NMP, it's further accepted that Essex Solutions finished magnet wire is REACH-compliant for DMAC.

Ultimately, Essex Solutions is aware of nothing contrary about Essex Solutions finished magnet wire and Essex Solutions bare copper vs SVHC lists under REACH.

In addition, Essex Solutions reviewed the provisions of REACH Annex XVII. To that end, Essex Solutions is aware of no quantifiable presence of carcinogens, mutagens, nor reproductive toxins in Essex Solutions finished magnet wire and Essex Solutions bare copper. There is some history of limited use of azo colorants in some magnet wire enamels. However, Essex Solutions notes that interest in azo dyes in REACH Annex XVII is directed at textiles and like products, for which direct skin contact might be expected. This is not at all a typical use for magnet wire.

Related to SCIP Database and Waste Framework Directive: Essex Solutions magnet wire is considered compliant for SVHC content in EU-REACH, and thus EU-SCIP Database is not applicable to Essex Solutions magnet wire. As for EU Waste Framework Directive, Essex Solutions magnet wire is based on copper or aluminum conductor, two metals of intrinsic value, so economics inherently drives magnet wire toward reuse, recycling, and recovery.

Specific to Persistent Organic Pollutants (POPs): Essex Solutions has reviewed persistent organic pollutants as defined by the European Chemicals Agency and by the United Nations Stockholm Convention, and Essex Solutions is aware of no substantive content for persistent organic pollutants in Essex Solutions finished magnet wire and Essex Solutions bare copper.

Specific to GADSL and JIG-101: Essex Solutions has reviewed the GADSL and JIG-101 lists of declarable and/or prohibited substances, and there have been some inquiries involving specific substances on the GADSL and JIG-101 lists. Based on Essex Solutions' internal review of raw material inputs vs. what would be expected to remain in Essex Solutions finished magnet wire product and Essex Solutions bare copper, weighed against specific inquiries received to-date plus Essex Solutions' aforementioned statements about RoHS and REACH, Essex Solutions notes the following about GADSL and JIG-101:

- Essex Solutions copper magnet wire and Essex Solutions bare copper contain metallic copper, a GADSL declarable substance.
- Essex Solutions is aware of no substantive use of ozone depleting chemicals, whether CFCs or HCFCs, in the production of Essex Solutions magnet wire and Essex Solutions bare copper.
- Some formulations for raw magnet wire enamel coatings do indeed contain phenol (CAS # 108-95-2), used as a carrier solvent during production of film-insulated magnet wire. However, phenol is removed during the curing process, and thus there is no substantive phenol content in Essex Solutions finished magnet wire.

- As noted previously in this document, there is some history of limited use of azo colorants in some magnet wire enamels, but Essex Solutions notes that interest in azo dyes in REACH Annex XVII (the basis for inclusion in GADSL) is directed at textiles and like products, for which direct skin contact might be expected. This is not a typical use for magnet wire.
- Essex Solutions film-insulated finished magnet wire (cured enamel coating applied as a solution over copper or aluminum conductor) and Essex Solutions bare copper have no substantive halogen content. Note that halogens may indeed be present in some Essex Solutions fabric-wrapped magnet wire products; see text below re: polyfluorinated organics in specific polyimide tape.
- Essex Solutions film-insulated finished magnet wire (cured enamel applied as a solution over copper or aluminum conductor) and Essex Solutions bare copper contain no substantive perfluorooctane sulfonate (PFOS) and no substantive perfluorooctanoic acid (PFOA). One fabric-wrapped Essex Solutions magnet wire product, a specific polyimide, contains polyfluorinated organics in its tape wrapping, but suppliers of that tape wrapping deny any declarable PFOA or PFOS among these polyfluorinated organics.

Specific to TSCA (USA): As for Toxic Substances Control Act (TSCA) and related Lautenberg Chemical Safety Act, Essex Solutions is aware of no use of Persistent, Bioaccumulative, and Toxic chemicals (PBTs) in production of Essex Solutions magnet wire and bare copper rod. Some solvents used in production of Essex Solutions magnet wire are listed as TSCA High-Priority chemicals (ex: NMP, xylenes), but Essex Solutions bare copper rod and fully cured Essex Solutions magnet wire would have no substantive content for TSCA High-Priority chemicals.

There's ongoing news in the United States at both Federal and State levels about regulatory activity involving PFAS, or per- and polyfluoroalkyl substances. Polytetrafluoroethylene (PTFE) is more commonly known by the brand name Teflon, and PTFE is reportedly a PFAS chemical. Essex Solutions offers a magnet wire product with polyimide tape wrapping with PTFE film. Ultimately, PFAS is applicable to only those Essex Solutions magnet wire products with reference to Apical or Kapton film in polyimide tape wrapping.

Specific to Canadian Initiatives: Essex Solutions has reviewed Canadian expectations about Priority Substances List, Toxic Substances List, and Virtual Elimination List under CEPA as well as Chemical Challenge substances. A few chemical substances from these aforementioned Canadian initiatives may be found in raw magnet wire inputs, but ultimately Essex Solutions is aware of no substantive free content (ie, >0.1%) for these substances in finished Essex Solutions magnet wire and Essex Solutions bare copper. As for Domestic Substances under CEPA, note that Essex Solutions finished magnet wire would be considered a manufactured article, not a chemical substance, while also noting that there is no substantive free content for phthalates in Essex Solutions magnet wire and Essex Solutions bare copper. As for NPRI reporting, consider that Essex Solutions magnet wire is based on copper or aluminum conductor.

Specific to CSCL (Japan): Essex Solutions reviewed this Japanese regulation re: chemicals management, and it's apparent that CSCL addresses manufacture and importation of chemical substances, whereas magnet wire is a manufactured article. As a courtesy to its customers, Essex Solutions will advise to being unaware of any substantive content for Priority Assessment Chemicals (PACs) in Essex Solutions finished magnet wire and Essex Solutions bare copper. A few PACs may be found in raw magnet wire enamels, but ultimately Essex Solutions is aware of no substantive free content for these PAC substances in finished Essex Solutions magnet wire and in Essex Solutions bare copper.

Specific to Packaging: Essex Solutions has reviewed European Union expectations about packaging vs current practices at Essex Solutions magnet wire operations in North America. Based on this review, Essex Solutions considers itself compliant with EU expectations about packaging and packaging waste.

EU regulates packaging and packaging waste under Directive 94/62/EC. Goals include reducing quantity and hazard of packaging waste plus recovery and recycling of packaging. To that end, Essex Solutions magnet wire makes use of reusable plastic spools, reels, and buckets plus reusable wooden reels, boxes, and pallets. Standard terms & conditions for sale of Essex Solutions magnet wire demand that customers return this reusable packaging. As for contents of packaging, Essex Solutions specification for plastic spools, reels, and buckets excludes noteworthy bad-actor chemicals such as heavy metals and halogens.

In addition, specific to wooden reels, boxes, and pallets, Essex Solutions specifies that such wooden packaging must comply with 'International Standard for Phytosanitary Measures', aka ISPM15, typically by heat treatment.

This concludes this review of Essex Solutions magnet wire against the more commonly referenced initiatives for substance restriction.

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