

The Ever Evolving And Complex World Of Materials Compliance And Declarations

by Kevin Parmenter, Chair, and James Spangler, Co-chair, PSMA Safety and Compliance Committee

Now more than ever organizations are faced with growing complexities in the world of compliance and materials declarations. With increased social and environmental responsibilities, more-complex trade networks, tariffs and shifting regulations impacting the entire life cycle of electronics component development, product design, production, and disposal, the challenge of staying in compliance is immense. Add in growing fines and the potential of your product being banned from entry into a country or region and it's clear that these compliance concerns are not just about staying on the right side of social and environmental regulations. These issues impact the long-term viability of your organization and its ability to sell products.

The two most adhered-to regulatory standards are EU REACH and EU RoHS. However, attention to the health of citizens and the environment has led to the implementation of guidance and regulation around the world. There are guidelines and regulations that apply on a regional level, but also those that are country specific and, within the U.S., even regulations imposed at the state level. These rules may apply differently in various countries of manufacture and there may be differences with respect to the end markets. For example, military and medical applications often have different requirements than consumer electronics. The table below shows a few of the various materials requirements by region.

Table. Materials compliance regulations by region. (Courtesy of Silicon Expert^[1])

EUROPE	GLOBAL
› RoHS	› ODC
› REACH	› IEC 62474
› WEEE	
› Battery	ASIA
› ELV	› China RoHS
› Halogen Free	› Korea RoHS
› GADSL	› Vietnam RoHS
› Packaging and Packaging Waste	NORTH AMERICA
	› US Conflict Minerals & Calif Prop 65

In this article, we will provide a brief overview of the major compliance directives and regulations that are enforced across the globe. Then, we will provide further background on conflict minerals and explain the regulatory requirements imposed on the use of such materials in the U.S.

Directives and Regulations—Understanding Their Origins And What They Cover

RoHS Directive

Original RoHS, also known as Directive 2002/95/EC, originated in the European Union in 2002 and restricts the use of six hazardous materials found in electrical and electronic products. All applicable products in the EU market since July 1, 2006 must pass RoHS compliance.

Directive 2011/65/EU

This directive was published in 2011 by the EU, which is known as RoHS-Recast or RoHS 2. RoHS 2 includes a CE-marking directive, with RoHS compliance now being required for CE marking of products. RoHS 2 also added Categories 8 and 9 and has additional compliance recordkeeping requirements.

Directive 2015/863 (Also Known As RoHS 3)

RoHS 3 adds four additional restricted substances (phthalates) to the list of six. The RoHS 3 compliance deadline was July 22, 2019.

REACH

REACH, which stands for "registration, evaluation, authorization and restriction of chemicals," places the burden of proof on companies. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They must demonstrate to the ECHA (European Chemicals Agency)^[2] how the substance can be safely used, and they must communicate the risk management measures to the users.

It entered into force on June 1, 2007. The Substances of Very High Concern (SVHC) Candidate List are updated every six months in January and June of every year and it is up to you to be aware of it.

Producers and importers must notify ECHA regarding substances listed on the Candidate list which are present in their products, if both the following conditions are met:

- The substance is present in their relevant products above a concentration of 0.1% by weight.
- The substance is present in these relevant products in quantities totaling over one ton per year.

Companies must notify no later than six months after the inclusion of the substance in the Candidate List.

Conflict Minerals Regulations

Currently in effect is the U.S. regulation also known as the Dodd-Frank Act. Most OEMs know it as such current U.S. regulation resulting from Congress passing the Dodd-Frank Act, in 2010, which directs the SEC (Security and Exchange Commission)^[3] to issue rules requiring certain companies to disclose their use of conflict minerals if those minerals are "necessary to the functionality or production of a product" manufactured by those companies.

Under the act, those minerals include tantalum, tin, gold, or tungsten. Reporting is required by the SEC for all U.S. publicly traded companies. An SEC ruling states that publicly traded companies file Form SD (a specialized disclosure report) on the SEC's EDGAR database in the spring of each year. We will get into more detail on this in a moment.

New EU Regulation Coming

The EU passed a new regulation in May 2017 to stop:

- conflict minerals and metals from being exported to the EU
- global and EU smelters and refiners from using conflict minerals
- mine workers from being abused.

It requires EU companies to ensure they import these minerals and metals from responsible sources only. The regulation will mean changes for you and your business, whether you import minerals or metals, smelt, or refine them, or own "a due diligence scheme". It will go into effect on January 1, 2021.

International substance-related restrictions and guidelines are based on the EU's REACH SVHC Candidate List and the current RoHS Directive. It is important to note that any new substances are added to international lists with a certain time-lag. Knowing the base directives and regulatory schedules and requirements enables proactive assurance to compliance.

EU REACH

REACH is a European Union regulation that was put into place at the end of 2007. REACH addresses the production and use of chemical substances, and their potential impacts on both human health and the environment. It is often useful to know who is obligated to comply with REACH. The answer is that there are three parties subject to this regulation:

- Manufacturers that make chemicals, either to use themselves or to supply to others. In our industry think flux, PCB cleaning materials and so forth.
- Importers—those that buy *anything* from outside the European Union.
- Downstream users. These are all companies that use chemicals, sometimes even without realizing it, including the electronic component manufacturers and users of electronics components including EMS companies and OEMs who design and market end equipment.

REACH has become incredibly complicated because of the whole series of requirements associated with its ever-growing list of Substances of Very High Concern (SVHCs) as well as its authorization and restrictions list that impact almost all equipment manufacturers, including medical, aerospace and defense companies.

Of concern with REACH is its rule, "Once an Article always an Article". This rule has shifted from applying to any individual finished component to any item in the bill of materials of the product that was not otherwise an Article beforehand. For example, assessing REACH compliance for a vehicle is very challenging. Now and going forward you must evaluate the compliance status of each individual electronic component, module and even each screw and nut that's part of the vehicle.

Suppliers are legally obligated to make disclosures and notify their customers if they are contracted or tied to the EU market.

EU RoHS

The Restriction of Hazardous Substances Directive (RoHS) addresses the restriction of the use of certain hazardous substances in electrical and electronic equipment. While this directive originated in Europe, the term RoHS by itself, is typically seen as referring to North American requirements, while EU RoHS is the version specific to Europe. The EU version is considered stricter, but the North American version has some requirements not found in the EU edition. (As the table above indicates, there are also versions for China, Vietnam, and other countries.)

EU RoHS was adopted in February 2003 by the European Union and took effect in July of 2006. It is mandated to be enforced and became a law in each member state.

EU ROHS encountered a couple of major updates that took effect and are known as updated versions of the original regulation 2011/65 RoHS recast or RoHS 2: It is the revamp of RoHS one 2002/95/EC that was introduced on Jan. 2, 2013. This expanded the scope of the registration to include all electronic and electrical equipment (EEE), cables, and spare parts.

CE Marking and Declaration of Conformity designates compliance with RoHS Recast. RoHS 3/ RoHS 10 or RoHS 2015/863: Four additional substances are included which were applied on July 22, 2019. Many companies selling or manufacturing EEE in the European market are subject to restrictions on ten chemicals at the homogeneous level.

The RoHS-restricted substances include:

- Lead (Pb): <1000 ppm (0.1%)
- Mercury (Hg): <1000 ppm (0.1%)
- Cadmium (Cd): <100 ppm (0.01%)
- Hexavalent Chromium (Cr VI) <1000 ppm (0.1%)
- Polybrominated Biphenyls (PBB): <1000 ppm (0.1%)

- Polybrominated Diphenyl Ethers (PBDE): <1000 ppm (0.1%)
- Bis (2-Ethylhexyl) phthalate (DEHP): <1000 ppm (0.1%) (RoHS 3)
- Benzyl butyl phthalate (BBP): <1000 ppm (0.1%) (RoHS 3)
- Dibutyl phthalate (DBP): <1000 ppm (0.1%) (RoHS 3)
- Diisobutyl phthalate (DIBP): <1000 ppm (0.1%) (RoHS 3)

EU RoHS Exemptions

RoHS exemptions are granted when there are no viable alternatives to the restricted substances, or, when the alternative substances produce more environmental risk than restricted substances.

Exemptions are temporary until a safer and better alternative becomes available. Many exemptions carry an expiration date and are reviewed at least every four years. It can be changed, removed, or extended. In March of 2019, the European Commission issued updates to the European Union RoHS Directive exemption list. This change extended nine expired exemptions and added seven new ones. The list goes for more than 140 valid exemptions that are changed each year, with new exemptions added and past exemptions expiring. It is critical to stay in-the-know of the latest exemptions and how they may impact your business.

California Prop 65

Proposition 65 requires any company doing business in California to follow a series of regulatory measures that adequately warn customers or workers about significant exposure to chemicals that are linked to cancer, birth defects, or reproductive harm. This includes 1,000 different chemicals, and in 2017 alone, companies paid more than \$25M in fines for non-compliance. Since organizations do not want to make products for California and then something different for everywhere else, they do business it is in your best interest to make one product that meets the prop 65 requirements and disclosures.

IPC-1752A And IEC 62474

Beyond the specific materials regulations and directives, there are also related standards for reporting compliance information. IPC-1752A provides a standard for companies in the supply chain to govern and communicate information on full materials composition of components back and forth. At least in theory it does.

The International Electrotechnical Commission (IEC) 62474 Material Declaration Standard is used globally within the electronics industry to demonstrate compliance with various environmental regulations. The standard helps companies complete full material disclosures (FMDs).

IPC-1752A and IEC 62474, which are two of the most common FMD standards, require the disclosures to be created using .XML format. This way, the document is universal and can be read by a third-party compliance solution.

While this format is, by design, machine readable, it is common for companies to ask their suppliers for "an IPC-1752A report I can read". In other words, they want a version that is readable by humans, perhaps a PDF, Word, or EXCEL file. In my experience, most organizations seem to want human readable reports. But that means the report will not be in IPC-1752A compliant format. So clearly, there is lots of confusion among companies regarding the reporting requirements.

Conflict Minerals—Some History And Requirements In The U.S.

Conflict minerals are organic minerals mined in conditions of armed conflict and human rights abuses, most notably in the eastern provinces of the Democratic Republic of the Congo (DRC). The most mined conflict minerals are cassiterite (for tin), wolframite (for tungsten), coltan (for tantalum), and gold ore. These four minerals, known as 3TG minerals, are extracted from the Eastern Congo, and passed through a variety of intermediaries before being purchased by multinational electronics companies.

To understand why conflict minerals became so important requires some background. Bear with me because it gets complex.

In 1996, the first war began in the DRC, mainly between a Rwandan political faction and the Congolese regime. After the Congolese regime fell in 1997, surrounding African nations entered the largest war in the history of

the continent, and the Congo's mining potential shifted the struggle from a political fight, to one centered on controlling the DRC's massive natural resources. Prices for minerals increased over the years, and as global demand for digital technology continued to grow, the violence in the DRC continued.

A few international efforts have been attempted to reduce trade in conflict minerals, to minimize the incentive to extract and fight over them. There were movies and documentaries to depict the plight and situation of tantalum and "blood diamonds" and so forth.

Those of us that remember Sarbanes-Oxley fondly where organizations were paralyzed with regulatory burden following the Enron and Tyco scandals will pay special attention to the U.S. Securities and Exchange Commission's (SEC) rules on conflict minerals. The Dodd-Frank act of 2010 provided rules which require public companies to disclose all information relating to conflict minerals contained in their products. Beginning with the calendar year of 2015, companies that were subject to this rule were required file a Form SD (short for "Specialized Disclosures") with the SEC by May 31, 2016.

Previously, issuers were permitted to describe their products as "DRC conflict undeterminable" in the Form SD if they couldn't determine the source and chain of custody of conflict minerals in a product, or whether the conflict minerals in the product financed or benefited armed groups in those regions. Issuers using the "DRC conflict undeterminable" designation were required to file a Conflict Minerals Report (CMR), However, they were not required to obtain an Independent Private Sector Audit (IPSA) to assess the minerals' due diligence process employed by the issuer.

But beginning with Forms SD filed in 2016 with respect to the calendar year of 2015, issuers were no longer permitted to use the "DRC conflict undeterminable" designation. As of 2016, issuers were required to file a CMR as an exhibit to Form SD if they were not a smaller reporting company and were unable to determine that the conflict minerals contained in their products did not originate in the DRC or an adjoining country, while not directly or indirectly financing or benefitting armed groups. As a result of a 2014 court decision, the SEC advised that issuers were not required to describe their products as "DRC conflict free" or having "not been found to be 'DRC conflict free.'"

Conflict minerals and the covered countries in the rule align with those identified by the U.S. State Department. This means that if the State Department modifies its list of conflict minerals or covered countries, the U.S. SEC rule will automatically follow suit. Under the U.S. Conflict Minerals Law, additional minerals may be added in the future, however. But for now, what are they most worried about?

The "3TG" materials, which includes four materials, namely tin, tantalum, tungsten, and gold. These elements can appear in a wide variety of products and devices in the electronics component and manufacturing industry including solder, passive electromechanical components including capacitors, resistors, connectors, inductors, LEDs, solar panels, semiconductor devices and plating on parts or PCBs. With the huge concern over tantalum capacitors, for example, many companies have found alternatives such as ceramic or SP capacitors to just avoid all the requirements.

Alternative Sources Of 3TG Minerals

Never underestimate the potential of the regulatory landscape especially governmental agencies to mandate to the electronics industry. In other words, they are good at inventing a problem that needs a solution, however it must be done for no or lower cost of course.

The good news is that, as an industry, we are pretty good at doing that. The percentage of the global supply of the 3TG coming from the Congo is relatively small, approximately 1%, for most minerals. Tantalum is temporarily much higher, with 30% coming from the Congo, due to suspended production in Australia, the largest supplier of this mineral. The rule does not ban or boycott Congolese minerals, but encourages conflict-free sources. In my experience the use of tantalum capacitors seems to be diminishing as replacements are found by the electronics component industry—we are good at re-inventing ourselves to avoid issues such as this.

As noted above, the percentage of the 3TG coming from the Congo is relatively small, approximately 1% of mineral supplies are from the Congo. That's due to the development of tracing and auditing practices. To determine if the minerals in a product originate from the DRC or a neighboring country, a "reasonable country of origin inquiry" must be conducted.

This analysis must be reasonably designed, and if the company knows the minerals do not originate in the region of the Congo, or the minerals are from recycled sources, a new form SD must be completed. In this case, companies will have to describe the steps that were taken to try to find out the origin of the materials. A full Conflict Mineral Report does not have to be submitted to the SEC.

Sounds like fun, right? It is cheaper to simply buy non-conflict products and get certifications from component suppliers that they do not have any conflict materials in their products you source.

What's Required

Your responsibility as a business for Conflict Mineral Reporting is to make sure all rules are followed. With that in mind, the Responsible Minerals Initiative (RMI)^[4] developed a template for use by manufacturing companies, which is also officially adopted by the EICC (Electronic Industry Citizenship Coalition). This free, standardized reporting tool facilitates the transfer of information through the supply chain regarding mineral country of origin and smelters and refiners being utilized. A list of revisions from version 3.02 and later and a downloadable version of the Standard Smelter List are available here.^[5,6]

The most recent Conflict Minerals Reporting Template (CMRT 5.12) includes an updated Standard Smelter List and several translation improvements to keep users aware of the most recent changes to the IPC standard. Another key update is the amendment of the question-and answer-language in the declaration, to conform to changes adopted by the IPC-1755 Conflict Minerals Data Exchange standard in April 15. These changes will assist CMRT users with confirming the identity of the smelters they are reporting. Many electronic component suppliers have this document on their websites.

You may be wondering, "Will my organization need to submit a Conflict Minerals Report? Will we need to submit an annual conflict minerals report?" The answers depend on two critical concepts. First, are you required to file reports with the SEC? Second, are conflict minerals necessary to the production of the product(s) you manufacture? If both are true statements, your company is responsible for filing an annual conflict materials report.

More On Dodd-Frank Act

The United States Dodd-Frank Act, Section 1502, is landmark legislation that requires manufacturing companies to understand and disclose the use of minerals mined in or around the DRC. This act requires manufacturing companies to identify and disclose to the SEC the source of 3TG minerals used in their products when those minerals originate from or nearby the DRC.

The rule calls for civil penalties against any company knowingly making a misleading or false statement. Outside of legal implications of not complying, issuers may face pressure from non-governmental organizations, human rights activists, and consumer or other market forces to prove they are conflict-free. PR consequences and social media backlash, for example. Currently there is nothing that specifically addresses the applicability of Dodd-Frank to intermediate chemical processes using chemicals that contain conflict minerals. There is no minimum content threshold for reporting or auditing requirements.

The Hidden Costs Of Materials Compliance

In summary, the materials regulatory, compliance and disclosure & reporting tasks are daunting. There is a lot of "let me make my problem your problem at no cost to me". Manufacturers of components often post as much information as possible regarding their materials compliance as self-service references on their websites. You would think this would be enough for most OEM customers. Unfortunately, OEMs frequently outsource the compliance tasks to outside organizations who either have their own systems or special spread sheets.

What this means is that the component supplier is frequently burdened with taking information that they have provided for their customer to access on their own, and must de-construct that information so that they (the component supplier) can fill it in on special forms and online websites. Most importantly, component suppliers are expected to do this for free.

This is not complaining it is just a fact that suppliers must deal with. Companies want to buy from the lowest price source then along comes the added cost to the supplier to provide this information in a myriad of different formats quickly available on demand—for free.

As we all know our industry is under tremendous monetary pressures and much of this compliance-reporting activity, while necessary, is "non-value added." The "soft costs" associated with this activity are tremendous

and if not managed properly can consume revenue margins rapidly. It is often useful to partner with information service providers such as Silicon Expert, which maintains a database with information on four to five million components. Suppliers are grateful for the compliance information provided in this database.^[1]

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About the Authors



Kevin Parmenter is an IEEE Senior Member and has over 20 years of experience in the electronics and semiconductor industry. Kevin is currently director of Field Applications Engineering North America for Taiwan Semiconductor. Previously he was vice president of applications engineering in the U.S.A. for Excelsys, an Advanced Energy company; director of Advanced Technical Marketing for Digital Power Products at Exar; and led global product applications engineering and new product definition for Freescale Semiconductors AMPD - Analog, Mixed Signal and Power Division.

Prior to that, Kevin worked for Fairchild Semiconductor in the Americas as senior director of field applications engineering and held various technical and management positions with increasing responsibility at ON Semiconductor and in the Motorola Semiconductor Products Sector. Kevin also led an applications engineering team for the start-up Primarion.

Kevin serves on the board of directors of the [PSMA](#) (Power Sources Manufacturers Association) and was the general chair of APEC 2009 ([the IEEE Applied Power Electronics Conference](#).) Kevin has also had design engineering experience in the medical electronics and military electronics fields. He holds a BSEE and BS in Business Administration, is a member of the IEEE, and holds an Amateur Extra class FCC license (call sign KG5Q) as well as an FCC Commercial Radiotelephone License.

Jim Spangler is a Life Member of the IEEE with over 40 years of electronics design experience and is president of Spangler Prototype Inc. (SPI). His power electronics engineering consulting firm's priority is helping companies to place products into production, assisting them to pass government regulations and agency standards such as UL, FCC, ANSI, IES, and the IEC.



For many years, he worked as a field applications engineer (FAE) for Motorola Semiconductor, On Semiconductor, Cirrus Logic, and Active Semiconductor, assisting customers in using semiconductors. He published numerous application notes and conference papers at a variety of conferences: APEC, ECCE, IAS, and PCIM. Topics included power factor correction, lighting, and automotive applications. As a FAE, he traveled internationally giving switch-mode power supply seminars in Australia, Hong Kong, Taiwan, Korea, Japan, Mexico, and Canada.

Jim has a master's degree from Northern Illinois University (NIU) and was a PhD candidate at Illinois Institute of Technology (IIT). He taught senior and first-level graduate student classes: Survey of Power Electronics, Fields and Waves, and Electronic Engineering at IIT and Midwest College of Engineering. Jim is a member of the IEEE: IAS, PELS, PES; the Illuminating Engineering Society (IES), and the Power Sources Manufacturers Association (PSMA) where he is co-chair of the Safety and Compliance Committee.

For further reading on power supply-related safety and compliance issues, see How2Power's special section on [Power Supply Safety and Compliance](#).