

Infill Synthetic Turf Potential Health and environmental Exposure Related Testing

White Paper

By: John J Amato, P.E., JJA Sports, LLC

Introduction:

Infill synthetic turf fields have undergone a large degree of scrutiny regarding potential health and environmental related exposures over the past 20 years, both here in the United States and in Europe. Historically this effort originated as marketplace battles between natural turf grass sod producers and synthetic turf manufactures, due to synthetic turf marketing practices and loss of market share experienced by sod producers beginning early in the 21st century. Sod producers slowly identified health and environmental concerns regarding potential exposures. Two incidences, testing of improperly vulcanized rubber hammer handles in Germany and lead chromate found in synthetic turf in New Jersey, gained traction with health and environmental protection organizations creating a strong opposition to the replacement of natural turf grass fields with synthetic turf.

Since the onset of these concerns, a combination of State and Federal Regulations, general contaminated and hazardous materials testing, and product specific testing developed by the American Society of Testing Materials (ASTM) and European sport governing bodies, have become industry standards for health and environmental related exposures associated with the use of synthetic turf. This paper documents those recommended by JJA Sports, LLC for the testing of synthetic turf materials, which are included in our technical specification and product approval requirements.

Specifications for Testing Synthetic Turf Materials

The following is a brief listing of the testing recommended for inclusion in technical specifications for infill synthetic turf projects. This testing includes the most rigorous standards and regulatory requirements available in the Nation for synthetic turf materials. As many people are aware, the State of California is at the forefront of health and environmental exposure related testing regulations, one of which has been adopted by JJA Sports as criteria against which measure infill synthetic turf fields. Two tests included in our basic specification were developed by ASTM, through F08.65 Subcommittee on Synthetic Turf, to respond to testing for total lead content and extractable heavy metals. The most recent addition to our testing battery is based on the New York Department of Environment and Conservation standard for testing solids contaminated with Per and Polyfluoroalkyl Substances (PFAS) using EPA 533, currently in progress to develop a synthetic turf specific ASTM Standard Specification.

- CAM 17 (California Administrative Manual, Title 22) which is a law intended to protect drinking water sources from heavy metals, includes testing and threshold requirements for 17 heavy metals of concern. .

The JJA Sports technical specification requires testing and compliance certification with CAM 17

- The ASTM 2765 Standard Specification for Total Lead Content in Synthetic Turf Fibers was developed a standard for testing fibers to comply with the Consumer Product Safety Improvement Act of 2008 for lead content. The current threshold is 100 ppm total lead which complies to children's toy levels.

The JJA Sports technical specification requires testing and compliance certification in accordance with ASTM F2765.

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- The ASTM 3188 Standard Specification for Extractable Hazardous Metals in Synthetic Turf Infill Materials was developed a standard for testing fibers to comply with the Consumer Product Safety Toy Standard for heavy metals content. This method addresses health related exposures for Antimony, Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium.

The JJA Sports technical specification requires testing and compliance certification in accordance with ASTM F3188.

- New York Department of Environment and Conservation provided a standard for testing solids using EPA 533 which was recently approved by the EPA, following Isotope Dilution techniques by Liquid Chromatography Tandem Mass Spectrometry as 537.1 M. Reporting limits shall not exceed 0.5 µg/kg (NYDEC part 375), and the reporting criteria shall be less than or equal to 1.0 µg/k kg (NYDEC part 375).

The JJA Sports technical specification requires testing and compliance certification in accordance with the above or the ASTM version of this test when published.

Studies Pertinent to Health and Environmental Exposures

Recently a study on SBR infill material entitled, “ERASSTRI - European Risk Assessment Study on Synthetic Turf Rubber Infill - Part 3: Exposure and Risk Characterization” was published during March of 2020 which concluded the following:

- “As the final part of a Europe-wide study on the risk from synthetic turf infill consisting of rubber granules derived from end-of-life tires (ELT). exposure of sportspeople was assessed and compared with health-based reference values for various chemical substances. Based on information from previous project phases, exposure scenarios were established and exposure was calculated for oral, dermal and inhalation routes. Calculated cancer risks for exposure to polycyclic aromatic hydrocarbons were below 1 :1 million. Risk characterization ratios (RCRs) for non-carcinogenic substances were below 1, indicating no health concerns. For 2-hydroxybenzothiazole no toxicological data were found from which to derive a substance-specific reference value. A threshold-of-toxicological concern approach revealed maximum RCRs slightly above 1, which are acceptable, given the conservatism of the approach. ERAS STRI substantially improved the data available for assessing human health risks from using ELT-derived infill material. Overall, no health concerns could be identified for the use of synthetic turfs with ELT-derived infill material.”

During 2012 a study entitled, “Leaching of Zinc from Rubber Infill on Artificial Turf (Football Pitches) by Laboratory for Ecological Risk Assessment Netherlands, concluded, “the risks of zinc to public health are of no concern: the human toxicity of zinc is low and WHO drinking water criteria are not exceeded. Zinc concentrations in drainage water leaving a field were estimated to be (1.1-1.6 mg/L) when entering waterbodies. Dilution in the water, depends upon size and flow rate of the waterbody and or receiving stream. Considering the area of the contributing watershed upstream in Mill Brook, a mass balance analysis would assume a 100 to 1000 times dilution factor resulting in 1.1 µg/L to 16 µg/L which are far below aquatic thresholds sensitive species such as cutthroat trout, zinc sensitivity at 30 µg/L.

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Conclusions:

The testing required by outlined above and required by the JJA Sports technical specifications area considered to be current state-of-the art criteria by which to measure and evaluate health and environmental exposures associated of synthetic turf materials. Compliance with these requirements, addresses the potential health human exposure concerns related to synthetic turf.

As it relates to environmental exposure, values derived by the above noted testing, adjusted by mass balance resulting from runoff events reduces potential exposure down below critical levels for sensitive species.