Scientific Equipment & Furniture Association
Recommended Practices

SEFA 12-2024
Laboratory Grade Seating

SEFA World Headquarters
1320 Main Street- Ste 300
Columbia, SC 29201

Tel: 516-294-5424
www.sefalabs.com

SEFA SPELLS SAFE

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SEFA 12 Committee Co-Chairs

Edward Metzger BioFit Engineered Products

Ed.Metzger@Biofit.com

Kai Schuler BIMOS Division of Interstuhl GmbH & Co. KG

K.Schuler@interstuhl.de

Foreword

SEFA Profile

The Scientific Equipment and Furniture Association (SEFA) is an international trade association comprised of manufacturers of laboratory furniture, casework, fume hoods and members of the design and installation professions. The Association was founded to promote this rapidly expanding industry and improve the quality, safety and timely completion of laboratory facilities in accordance with customer requirements.

SEFA Recommended Practices

SEFA and its committees are active in the development and promotion of Recommended Practices having domestic and international applications. Recommended Practices are developed by the association taking into account the work of other standard-writing organizations. Liaison is also maintained with government agencies in the development of their specifications. SEFA's Recommended Practices are developed in and for the public interest. These practices are designed to promote a better understanding between designers, architects, manufacturers, purchasers, and end-users and to assist the purchaser in selecting and specifying the proper product to meet the user's particular needs. SEFA's Recommended Practices are periodically updated. The Recommended Practices are numbered to include an annual suffix which reflects the year that they were updated. SEFA encourages architects to specify these Recommended Practices as follows: "SEFA 12-2024", within the following classifications:

- SEFA 12.1 – seating products for use in wet laboratories
- SEFA 12.2 – seating products for use in static-sensitive (ESD) areas

For products intended for use in areas which require both wet lab and ESD protection capabilities, a product must meet requirements of both classifications.

SEFA Glossary of Terms

SEFA has developed a Glossary of Terms (SEFA 4-2020) for the purpose of promoting a greater understanding between designers, architects, manufacturers, purchasers and end users. The terms defined by SEFA are frequently used in contracts and other documents, which attempt to define the products to be furnished or the work involved. The Association has approved this Glossary in an effort to provide uniformity among those who use these terms. Where a specific Recommended Practice contains definitions, which differ from those in the Glossary of Terms, then the definitions in the specific recommended Practice should be used. SEFA encourages all interested parties to submit additional terms or to suggest any changes to those terms already defined by the Association. The definitions should be used to help resolve any disputes that may arise or to incorporate the applicable terms in any contract or related documents.

SEFA Disclaimer

SEFA uses its best effort to promulgate Recommended Practices for the benefit of the public insight of available information and accepted industry practices. SEFA does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with SEFA Recommended Practices or that any tests conducted under its Recommended Practices will be non-hazardous or free from risk. SEFA encourages the use of third-party independent testing where appropriate.

Note: *Testing as described in this document must be performed and documented by a SEFA-approved third-party testing facility. See Page 36 of the SEFA Desk Reference 5th Edition Version 4.0 or visit us at SEFALABS.COM for the most current list of SEFA-approved test labs.*

1.0 Scope

These Recommended Practices provide a comprehensive single source of knowledge pertaining to laboratory chairs and stools. SEFA guidelines are intended to provide manufacturers, specifiers and users with specific information helpful in their evaluation of the safety, durability and structural integrity of laboratory chairs and stools.

2.0 Purpose

The purpose of these Recommended Practices is to provide architects, engineers, planners, specifiers, manufacturers and users with the Industry Standards on laboratory seating equipment. These Recommended Practices cover the design, construction, installation, testing, maintenance and safe use of laboratory chairs and stools. SEFA has made these Recommended Practices available as a guide for regulatory agencies, architects, engineers, consultants, specification writers, contractors, manufacturers and dealers of laboratory furniture, installers, facilities managers and users who specify, recommend for purchase, install and/or use laboratory chairs and stools.

Purpose of good laboratory seating equipment

Seating equipment is always directly connected to the human being working in the laboratory and effects several factors. In order to ensure a quality working environment and therefore also the quality of work, human factors need to be taken into consideration:

- Health
  An ergonomic seating product directly effects the health of the laboratory worker as one spends several working hours on it. An ergonomic chair influences the reduction of sick day absences[1]. Thus, it also reduces the laboratory costs.
- Performance
  Once the laboratory worker feels comfortable and healthy it results in an increase in performance[2]. Whether it is in the efficiency of the work, the effectiveness or the quality of the job performed, there will be an increase of output as the worker concentrates on their work rather than discomfort which results from improper seating.
- Safety
  It is essential that safety is ensured, both for the laboratory operation as well as the lab worker.
- Quality
  Both the quality of work and the quantity of output is essential in a laboratory. Proper seating equipment reduces errors and leads to a reduction of rejects in the laboratory output[3].
- Motivation
  A major human factor is also the motivation of the laboratory worker. Proper seating equipment helps to ensure a worker's wellbeing and commitment[4]. By valuing a worker with an ergonomic seating product, engagement will increase. A nice working environment will also attract highly qualified employees.

3.0 Introduction

Sedentary activities and laboratory ergonomics

A study by the Fraunhofer IAO , "Assessor's Statement Concerning the Functional Quality of the 'Labster' Laboratory Chair" within a joint research project on laboratory work and laboratory design entitled "Lab 2020" determined that the distribution between activities while sitting and activities while standing was about 50:50. In terms of ergonomics, this is a good value because a dynamic alternation between activities while sitting and standing is regarded as healthy, especially for the back muscles and the spine. But if one takes a closer look at the design of workstations in the lab, several critical points come to light.

Lack of ability to adjust height – unfavourable working heights

The workstations in the laboratory are normally shared by a number of people and not assigned to specific employees. If a workstation is to be ergonomically ideal for each individual, it must be adaptable, as in the case in offices, for example, where the height of the desks can be adjusted. In contrast to the office environment, tables in the lab are built either for activities while standing (EU = 90 cm / US = 36’’) or while sitting (EU = 75 cm / US = 30’’). Depending on the type of work done primarily in a specific lab, one of these two variants will predominate. For example, standing heights are frequently built, then tall chairs are used for the work.

Because of the large variation in body stature range, ergonomic laboratory chairs must be designed for a wide range of body shapes and sizes. Ideally, such table heights will function for 90% of all people, i.e., for body heights between the 5th and 95th percentiles (see Fig. 1). The 5th percentile means that five percent of all people are shorter than the value. The 95th percentile means that five percent of all people are taller than the value. The 50th percentile represents a mean value, i.e., that 50% of all people are taller and 50% of all people are shorter than this value. The values which have been obtained from a representative group are fixed in a standard and serve as a basis, along with many other body dimensions, for a diverse range of product developments.

Figure 1 shows that the differences in body heights are quite large. The table shows at times a difference between the 5th and 95th percentiles of 20 cm (8”) and more. A chair alone cannot compensate for such a difference – particularly because shorter people (below the 50th percentile) may require a secure footrest for a higher sitting position.

FIG 1: Body Heights of People According to DIN 33402 Part 2

		Body Height					
		Men			**Women**		
		Percentile					
		5	50	95	5	50	95
	Age group	Shown in mm (Europe) / inches (US)					
Europe	**18 - 65**	**1650**	**1750**	**1855**	**1535**	**1625**	**1720**
US	**18 - 65**	**64.97**	**69.25**	**74.83**	**60.08**	**64.15**	**69.58**

When people are working while sitting, the activities at the lab benches – e.g., with devices, test tubes or pipettes as opposed to activities using a keyboard – usually mean that the arm is held at an unfavourable angle. Activities carried out in the lab often involve dynamic arm movements which take place significantly higher than the edge of the table and require movements at shoulder or head height. Moreover, these activities often demand intense concentration and good hand-eye coordination (e.g., filling small containers, handling materials and samples which are very expensive and/or hazardous to health). If the activities continue for a longer period of time and the laboratory tables are designed at sitting height, doing the work while standing is not easily possible. In addition, the specific design of laboratories means that a high working space (shelves and cabinet areas mounted at a high level) is necessary for the storage of devices or materials while working at laboratory benches. It is important to note in a laboratory environment, the actual working height may not be the table top on a bench, but rather, the height from the floor to the actual height where the lab worker’s hands are doing the work, as in the case of microscopy or other work done on equipment or fixtures. Not accounting for this additional height can place stress on the shoulders, neck and other parts of the body.

Leaning forward and remaining motionless while working at workstations

A study regarding the ergonomics of standing and sedentary concepts in the office came to the conclusion that a person spends about 30% of the working time at the workstation leaning forward in his/her chair. No studies have been made for work performed in a lab. But it can be assumed that the proportion of time spent leaning forward during the relevant activities in the lab is substantially higher. This often occurs in combination with motionless posture, e.g., while looking through a microscope. Leaning forward while sitting hinders proper breathing, digestion, circulation to the lower legs and leads to compression of the spine. This can lead to digestive and circulatory disorders and backaches or even to musculoskeletal illnesses.

Rising proportion of activities while sitting

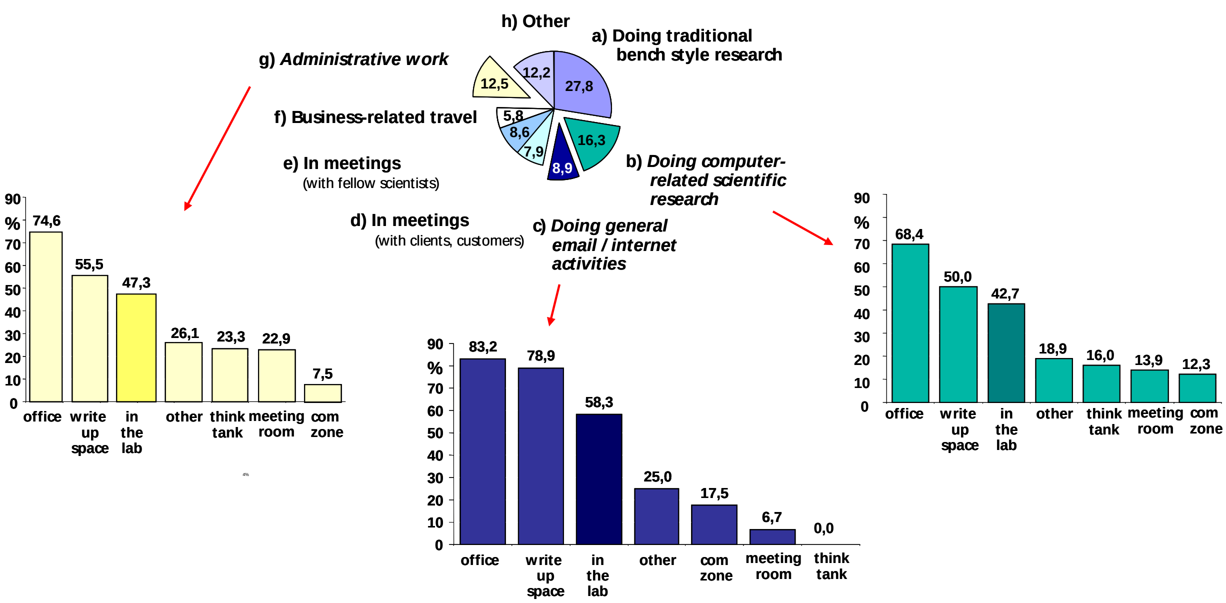
The proportion of work done in a sitting position in laboratories is increasing. One of the factors behind this is the growing activity at computer monitors (see Figure below).

Processes of the lab work are changing in such a way that evaluations, etc., are conducted in the vicinity of devices. The increasing proportion of work on a team makes it necessary and important to be close to colleagues even while doing evaluation work. As a consequence, static writing activities at keyboards are also performed at laboratory benches – with all of the disadvantages described above. This makes even higher demands on the functional flexibility of chairs and the importance of correct, laboratory-focused ergonomic seating to allow for space changes on short notice. Office chairs, for example, are not suitable for use in labs (for hygienic and emission-related reasons).

Laboratory Equipment in different industries

Laboratories are being used in several different industries. Depending on the industry and the type of laboratory, specifications and general requirements for seating equipment may vary. Considering an extract of the most important industries using laboratories however, a general overview of requirements for chairs and stools can be established and illustrated as follows (data from Fraunhofer IAO study):

4.0 Product Requirements



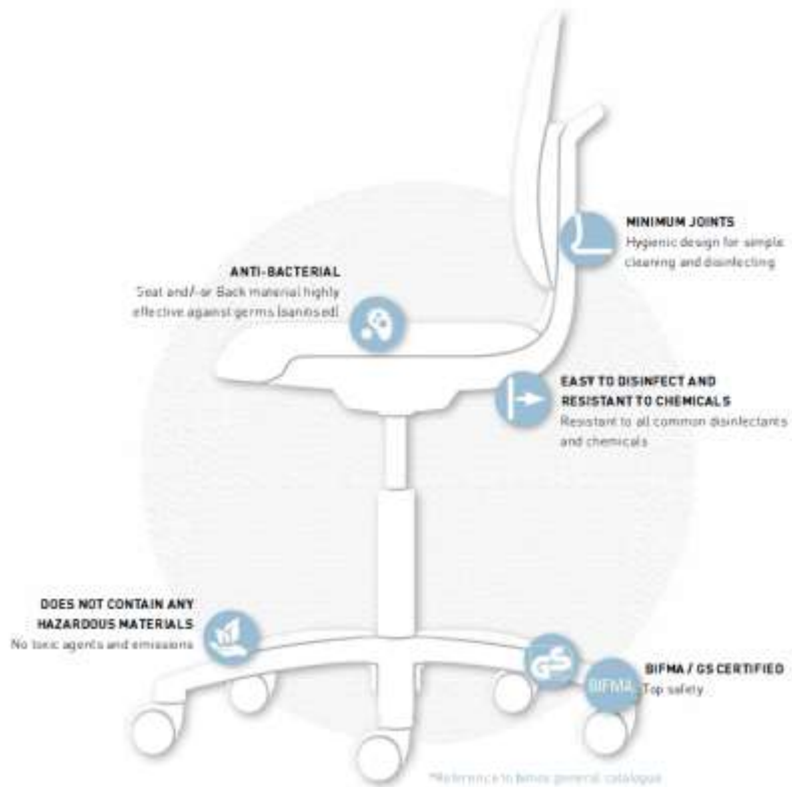
4.1 Lab Chairs – SEFA Classification 12.1

4.1.1 Purpose

Laboratory work imposes unique seating requirements, which are unlike those of any other working environment.

As well as the need for maximum hygiene and easy cleaning, laboratory chairs also have to meet a number of other requirements associated with routine laboratory tasks: They have to allow for flexibility in terms of the work and must not take up too much space. Nevertheless, expectations remain high in regards to ergonomics and comfort, as laboratory tasks call for fine motor skills, and high levels of precision and concentration. The flexible configuration options take the strain out of demanding tasks that involve leaning forward such as microscope or pipette work. The materials used are washable, can be disinfected and some even feature an antibacterial coating. During production, the utmost care is taken to ensure that there are no seams or gaps that could encourage germs or bacteria to grow. Yet at the same time, aesthetic appearance must not be compromised. These Recommended Practices reflect all unique seating product requirements and function as a guide for regulatory agencies, architects, engineers, consultants, specification writers, contractors, manufacturers and dealers of laboratory furniture, installers, facilities managers and users who specify, recommend for purchase, install and/or use laboratory chairs and stools.

4.1.2 Specific Requirements for Seating Equipment



- Easy to disinfect and resistant to chemicals
  Laboratory seating equipment in some environments must be easy to disinfect and resistant to chemicals.

- Bio safety level Laboratories
  Lab seating specified for biosafety laboratory use must meet the specific requirements of the identified biosafety level as described by the Authority Having Jurisdiction, regulatory agencies, and related guidelines. The priority is to minimize transitions and spaces that are difficult to clean thoroughly and frequently, and to provide materials that are resistant to the recommended cleaning and disinfecting agents.

- Minimum Joints/Seamless Construction
  Hygienic Design is an important factor in laboratories. It is crucial that laboratory equipment has a minimum amount of joints or gaps where germs and bacteria can easily accumulate. It must be easy for the user to clean and wipe off the product properly. The criticality of hygienic design is dependent upon the use of the chair; chairs for use in a school lab are not as critical as that of a Biosafety Level 4 laboratory. Reference chair construction details in section 4.1.3.

- Ergonomic

Laboratory furniture must be ergonomically designed and equipped in order to improve the efficiency of the user. Ergonomics can be subdivided into Ergonomic Design, such as self-explaining adjustment features knobs and mechanism handles and Ergonomic Technical Features such as lumbar support, waterfall front edge, adjustable height, adjustable backrest and adjustable footring. Ergonomic design is a minimum requirement for laboratory equipment. It can be replaced or enhanced with technical ergonomic features depending on the work task, physical workspaces, or work environment.

The following ergonomic design or features are required for seating equipment in the laboratory:

- Seat tilt or waterfall seat edge: These features allow blood circulation through the legs even when working in a leaning forward position which is typical for laboratory work.
- Narrowing or hinging/moving backrest: Freedom of movement is especially important throughout the back area. A narrowing upper backrest structure or hinging/moving backrest ensures freedom of movement of the arms and back without hindering certain workflows which require the ability to reach behind, for example. Adjustable lumbar support should be provided for correct ergonomic posture.
- Simplicity: Seating equipment must be easy to use and adjust. It must be ensured that all adjustments of the chair or stool can be manipulated while seated in order to create user comfort efficiently.

- Washable
  All materials used in laboratories must be easily washable. All surfaces must be easily accessible, hydrophobic, and resistant to liquids. Moreover, surfaces must be resistant to any abrasion or wipe-down effects that may be caused by a washing routine.
- Comfortable
  Laboratory equipment, especially chairs and stools, must be comfortable in terms of user experience and health aspects. It should also enable the user to feel good within the workplace surroundings.
- No Hazardous Materials
  Materials being used in any laboratory seating product must not contain any hazardous materials which could cause harm to anyone touching the product throughout the manufacturing process and product life cycle.

4.1.3 Construction

For general laboratory chairs:

Construction of chair surfaces shall be designed to prohibit entrapment of dirt, fluids and/or organic material that may contaminate the laboratory environment. Any gaps or creases must be large enough to allow cleaning wipes and/or tools to reach any recesses to remove foreign material or be completely sealed.

- In wet labs, upholstery cannot be of woven construction, such as cloth, wool or mesh, nor be porous in nature where fluids and spills can soak through to underlying cushioning or mechanical components. Synthetic leathers, such as coated vinyl, coated urethane, coated silicon, etc. are the preferred choices for upholstered wet lab seating as they provide protection against spills and some chemical resistance. Leather should be cautiously considered as it may not hold up well to various organic cleaning/disinfecting agents or spills of other chemical reagents. Solid or semi-solid seating surfaces cannot be absorbent in nature, allowing chemicals, organic fluids or cleaning fluids to soak into the seating surface, causing degradation or damage.

In dry labs (such as electronic and microelectronic labs), cloth upholsteries are acceptable for use.

All upholstery shall, at a minimum, be tested to withstand abrasion resistance of 25,000 double rubs according to EN ISO 12945-2(ASTM D4157) (Martindale-Method) or 30,000 double-rubs per ASTM D4157 (Wyzyenbeek Method).

The top premise for the construction of any laboratory chair or stool must be safety. In order to prove the quality of the seating equipment it is essential that it is certified either according to GS 2014:01 or according to ANSI/BIFMA X5.1 (US) and tested by an independent testing laboratory for adherence to one or both of these standards:

- GS 2014:01 (GS Standards):

Any product bearing the GS Mark indicates that it was tested and complies with the minimum requirements of the German Product Safety Act (a.k.a. ProdSG). The GS Mark, which stands for “Geprüfte Sicherheit” in German, meaning Safety Tested, is a licensed mark of the German government and may only be issued by an accredited product safety testing and certification agency. The GS Mark is recognized throughout Germany and EU countries as symbol of safety. It provides confidence that the products are safe, legal and of high quality. The GS mark also assures end users that the product has been independently tested by an authorized third party for safety. The construction of seating equipment must conform to GS 2014:01 or the ANSI/BIFMA standard following:

- ANSI/BIFMA X5.1 (BIFMA Standards):
This standard is generally applied to general-purpose office chairs, however, can also be applied to laboratory seating when it comes to product safety as all tests are specified to be performed in worst-case product, condition, and/or furniture configurations (including height adjustment capability). It is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of general-purpose chairs.

Moreover, seating equipment needs to fulfill general ergonomic requirements achieved through functionality and overall design. The most important ergonomic features within seating equipment are:

- Seating material surface test - SEFA 49 Chemical Spot Test
The purpose of the chemical spot test is to evaluate the resistance seat surface has to chemical spills. Many organic solvents are suspected carcinogens, toxic and/or flammable. Great care should be exercised to protect personnel and the environment from exposure to harmful levels of these materials. It is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the resistance of the selected or specified surface materials.

- Design of controls:
By design, ergonomic seating incorporates a range of adjustability. The user must be able to get into a comfortable posture quickly and easily and make adjustments over time. To achieve this, intuitive design and consistency in control placement and function is essential.

- Seating comfort:
The true objective of an ergonomic chair is to provide not only the proper function but to ensure the more subtle yet all important aspects of user comfort. People who are more comfortable in their chairs are more likely to be able to sit and be productive for longer durations and will be able to focus on the work at hand, increasing focus and quality of work. Chairs that do not provide effective support and adjustability can significantly increase the spinal stresses resulting in discomfort and increased injury risk.

- Movement:
Seating comfort is created through the ability to move intuitively on a chair or stool. The objective of an ergonomic chair is to allow movement when needed/wanted and still support the body while doing so. If the laboratory work requires fine motor skilled work, the chair should have the ability to be locked in the required seating posture in order to prohibit movement which could disrupt the laboratory work.

- Allow blood circulation:
Especially when the laboratory work requires the worker to lean over their work it is crucial that the chair still allows blood circulation to the lower legs and reduces spine compression. This can be achieved through an active seat tilt function or a flexible and/or waterfall seat edge.

4.1.4 Chair Selection Guide

To assist in the specification of appropriate laboratory-grade seating products, the SEFA Lab-Grade Chair Selection Guide is included in Appendix II. This tool can be used to help specifiers and users to describe, in detail, the needs they have for seating products for their requirements. This will also benefit lab-grade seating suppliers in quoting appropriate products to match the needs of the requirements.

4.2 Static Control Lab Chairs – SEFA classification 12.2

4.2.1 Introduction

Many laboratory areas have environments with a high sensitivity to static electricity and electrostatic discharge (ESD). These can be in labs working on sensitive electronic devices, labs dealing with explosives and/or military ordnance, pharmaceuticals, microbiological labs where the presence of a static discharge can disrupt or damage sensitive work, or in many other areas. Additionally, controlling static electricity is important in some cleanrooms where static buildup attracts particulate matter. In many of these areas the control of electrostatics is extremely important because of the minute scale of work being done. Electrostatic discharges can be many thousands of volts, which can be extremely damaging. Many electronic circuits, for example, can be damaged with under 100 volts of discharge.

Electrostatic charges are commonly built up in laboratory areas when two materials contact each other and are then separated. Many times, friction between the parts exacerbates the electrostatic build-up. This phenomenon is known as *triboelectric charging.*

Common Triboelectric Charging Events in Daily Life:

- Walking across carpet and touching a door handle
- Rubbing balloon on hair
- Taking off synthetic clothing
- Opening plastic packaging
- Separating plastic films
- Lightning

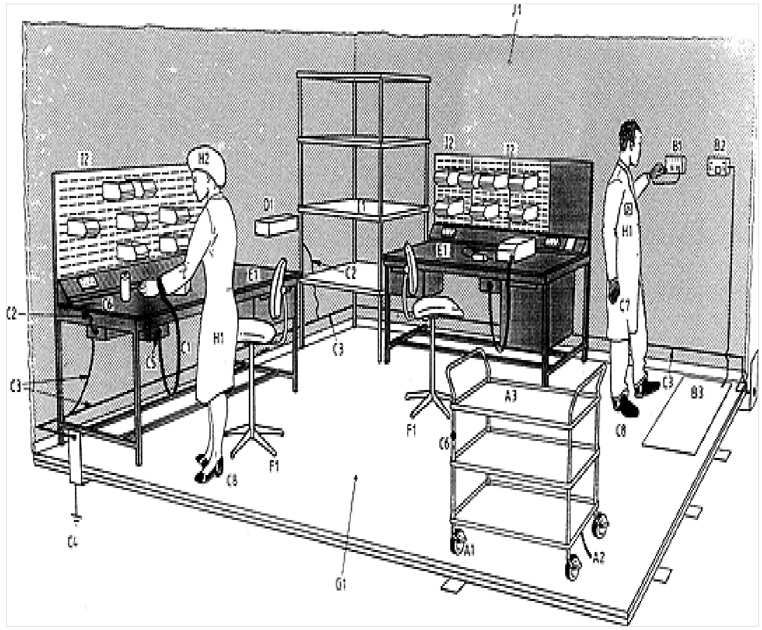
As technology advances, electrostatic discharge events become more of a problem. Electronic components are becoming smaller and smaller while the sensitivity of the components is increasing. As these trends continue, the presence of electrostatic charges has a larger impact. As research in the biological and pharmaceutical industries continues at the nanoscale level, electrostatic charges can cause problems due to electrostatic attraction (ESA) of particulates or contamination (including airborne bacteria) that can disrupt work being done at such a small level.[5]

One of the elements that can help protect ESD protected areas (EPAs) from static electricity is the use of furniture that is built to drain electrostatic charges away from work areas. This is especially important in the seating used in these areas due to its close proximity to the work being done but also because of the interface of the worker in the laboratory seating. Worker movement while seated, and chair/stool movement in the workspace, creates friction which triboelectrically generates static electricity. If this electrostatic charge is not drained quickly to earth ground, it can create negative effects on the work being done in the ESD protected area laboratory.

It is mandatory that the ESD control seating be connected to earth ground, either through conventional conductive flooring, a grounded mat or some other method, in order to function properly. Without a path to ground, electrostatic charges will build up in the seating product to create adverse exposure to sensitive work being done in the ESD protected area.

While properly grounded ESD control seating does help drain charges from the seated workers, it is important to note that the ANSI/ESD S20.20 standard for ESD protected areas requires the use of other devices as the primary means of personnel grounding, such as ESD control wrist straps, heel grounders and others. ESD control seating acts as a secondary means of personnel grounding and helps to eliminate charges in the work area that would be generated by seating products that are not properly constructed to drain electrostatic charges. According to the ESD Association, a typical non-ESD control chair can generate charges up to 18,000 volts at 10%-25% relative humidity, an obvious concern in ESD protected areas.

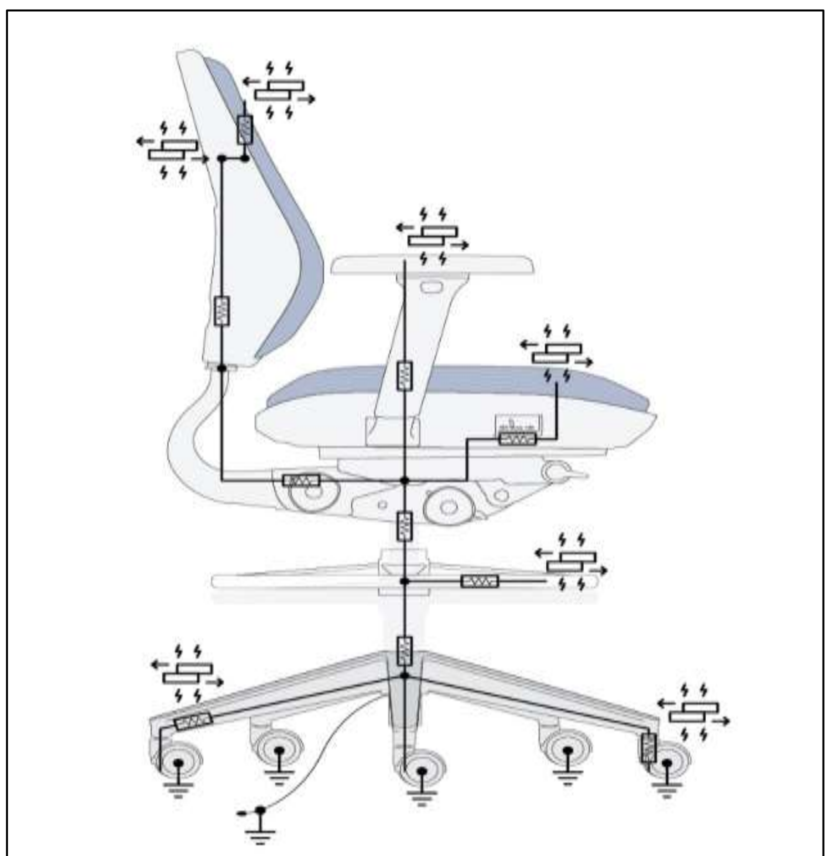
The chair is an important part of the ESD protected area*



The most effective way to avoid electrostatic discharge is to avoid charges in an area. Whatever doesn't charge up – will not discharge. This is what makes proper ESD control seating so important and effective in ESD sensitive areas.

4.2.2 Cleaning

- Dirt buildup can impact the conductivity of chair parts – especially castors
- Clean all visible surfaces regularly
- Use ESD control-compatible cleaners, water or mild soap and water – avoid cleaners which include plastics (silicone e.g.)
- Use non-linting wipes or cloths and avoid paper tissues that can leave a buildup of fibers
- Regularly test ESD control seating to assure cleaning protocols have not impacted ESD control performance



4.2.3 Construction Details

CONSTRUCTION DETAILS

As mentioned before, it is imperative that an ESD control chair or stool be grounded to be effective. The ESD control seating product itself has a type of electrical circuit where each component is electrically connected to each other, creating a path to a groundable point. In this scenario you can envision that an electrostatic charge, triboelectrically generated on any part of the chair, will be immediately drained to ground based on this electrical path (see illustration 1). As an example, as a seated worker rubs their arm numerous times across the armrest pad while doing a task at their workstation, static electricity is generated. In a proper ESD control chair the armrest pad is electrically connected to the arm support and throughout the rest of the chair so the electrostatic charge has an unimpeded flow through the rest of the chair to a grounded floor, mat or other grounding mechanism.

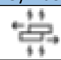
KEY	
Symbol	Description
	Triboelectrically-generated electrostatic charge
	Earth ground
	Electrical path with total measured resistance of <1.0 x 10^9

Illustration 1

Illustration 1

According to the EOS/ESD Association, Rome, NY, USA, there are three basic electrical material characteristics. Chair manufacturers should consider these material characteristics when designing a chair for ESD control:[6]

- **Insulative Materials**: materials with a surface resistance or a volume resistance equal to or greater than 1.0 × 10^{11} ohms
- **Conductive Materials**: a material that has a surface resistance of less than 1.0 × 10^4 ohms or volume resistance of less than 1.0 × 10^4 ohms
- **Dissipative Materials**: a material that has a surface resistance greater than or equal to 1.0 × 10^4 ohms but less than 1.0 × 10^{11} ohms or a volume resistance greater than or equal to 1.0 × 10^4 ohms but less than 1.0 × 10^{11} ohms. For ESD control chair performance, parts should test <1.0 x 10^9 ohms for proper ESD control as the upper range of the static dissipative performance is considered only acceptable for electronics packaging and ESD control garments based on electrostatic decay time

When considering chairs to help control ESD, insulative materials should be avoided, with the vast majority of components being made of conductive or static dissipative materials. It is also important, for long-term ESD control function of the chair, that volume conductive materials are used rather than surface conductive materials, where only the surface is conductive and can wear off over time, reducing the effectiveness of the component(s). Volume conductive materials have conductive elements (such as carbon, carbon fiber, metal flakes, etc.) blended throughout the entire volume of the part or are completely conductive through their entire thickness (such as a piece of sheet steel). This conductive construction will not wear off over time and will ensure the chair or stool will remain ESD control-effective throughout the life of the product.

Per ANSI/ESD S20.20, a seating product that is used in an ESD protected area must have a point-to-ground electrical resistance of less than 1.0 x 10^9 ohms, as measured in accordance with ANSI/ESD STM12.1

4.2.4 Wet or Dry Lab

The SEFA 12 Laboratory Grade Seating standard assumes seating is being used in wet labs. However, not all ESD protected area laboratories have a bench with liquid chemicals as found in a standard wet lab; some do. For this reason, it will be necessary for the specifier to indicate whether ESD control chairs are being used in a wet or dry ESD protected area lab – this will influence decisions on chair features/benefits including upholstery type.

Dry labs dramatically decrease the chance of spills of chemicals on the seating surface. This opens the opportunity for the specified seating to include the option of cloth upholstery materials, if desired. While cloth materials are more difficult to clean and can allow spills to soak through into cushioning, they increase comfort of the user by dissipating body heat and moisture while sitting. Cloth materials can be made volume conductive by weaving carbon fibers and/or metallic fibers through the yarn used in the warp and fill of the material. It is important that conductive elements are used throughout the fabric to avoid any insulative dead zones that may occur.

Wet labs, on the other hand, are often exposed to spills of bench chemicals during day-to-day use. In these areas, cloth upholsteries are not acceptable, and ESD control-compatible faux leather upholstery choices must be made. These materials are typically made ESD-safe by blending carbon and/or metallic particles throughout the material, or by including a homogenous conductive layer underneath the top finish layer that continuously dissipates electrostatic charges generated on the surface of the material.

Non-upholstered surfaces that are ESD-safe are also options in ESD protected area labs. These may include all metal seats/backrests, semi-soft integral urethane components or hard plastic seats and backrests that have been made volume-conductive by adding carbon or metal additives.

Regardless of the type of seating surface selected, the maximum resistance to ground of the finished seat and backrest assemblies cannot exceed 1.0×10^9 ohms.

SEFA 12 ESD chairs being considered for wet lab use must also pass the SEFA 49 chemical spot test as described in section 7.0 Seating Surface Finish Tests.

5.0 SEFA Lab-Grade Chair Cleaning Protocol (see also Appendix IV) – not required for seating in dry labs

1. Dry-clean surfaces with a clean cloth to remove loose dirt/dust/organic material
2. Wet-clean surfaces with warm water and a mild detergent, scrubbing where necessary to remove stubborn dirt and contamination
*3. Rinse surfaces with clean water and cloth – **do not use high pressure spray equipment** as this may force liquids into gaps and crevices where chair parts meet*
4. Manually dry, or allow the area to dry completely
*5. Apply disinfectant/cleaning solution at the recommended concentration for the appropriate contact time. **Do not apply solution at a rate higher than the recommended concentration and do not allow to contact for longer than the recommended contact time. Doing so may result in degradation of upholstery, plastic and rubber parts, or create conditions that will lead to corrosion of metal parts. These outcomes will result in early failure of chair parts and may negate the manufacturer's warranty.***
6. Wet-clean surfaces with warm water and a mild detergent which is extremely important for surfaces that are susceptible to damage from the disinfectant/cleaner chemicals
7. Rinse the chair again with clean water/cloth
8. Manually dry, or allow the area to dry completely
9. In high risk areas, repeat steps 5 through 8 above with a wide spectrum disinfectant

NOTES:

• For proper cleaning, start the cleaning protocol from the top of the chair/stool and proceed to the bottom to assure any cleaning solutions and dirt/contamination are removed should they drip or fall to lower parts of the chair;

• Do not clean oil/grease from the shaft of height-adjustable gas springs or pneumatic pistons as this will interfere with their ability to work over time, and result in shortened lifetime or failure;
The SEFA recommended cleaning protocol should in no way conflict with any other stated cleaning process as defined by governmental or corporate regulations. It is, however, a recommended process to assure long-term wear of laboratory chairs and stools in these challenging environments.

6.0 Minimum SEFA Requirements for an approved SEFA Lab grade seating product – classification 12.1

6.1 SEFA Mandatory Features according to the SEFA chair approval document

- Safety Norms (both or at least one)
  - GS 2014:01
  - ANSI/BIFMA X5.1-2017

- Seat/Backrest Upholstery Norms
  - EN ISO 12945-2 (ASTM D4157) (Martindale Method) minimum of 25,000 rubs or ASTM D4157 (Wyzenbeek Method) minimum of 30,000 double-rubs with #10 cotton duck
  - SEFA 49 chemical spot test

- Seat/Backrest Upholstery
  - Wet Labs: upholstery cannot be porous in nature, such as typical cloth, wool or mesh fabrics used in traditional office settings.

- Non-Upholstered Seat/Backrest
    - Solid or semi-solid seat/backrest surfaces cannot be absorbent in nature, allowing chemicals, organic fluids or cleaning fluids to soak into the seating surface, causing degradation or damage.

6.2 SEFA Suggested Features according to the SEFA chair approval document

- Ergonomics:
    - Design of controls for adjustability should be intuitive and easily made from the seated position
    - Seating comfort – chairs should provide support to critical ergonomic areas such as the lumbar area of the spine, and be able to be adjusted for individual preferences
    - Movement – for long-term use, chairs should give proper support for the user as they move throughout the day, yet be able to be locked into position for critical applications
    - Proper circulation – the chair should provide features that allow uninhibited blood flow to the lower extremities by incorporating a forward seat tilt function or a flexible and/or waterfall front edge

6.3 Minimum SEFA Requirements for an approved ESD control grade seating product – Classification 12.2

- SEFA 12 ESD control chairs must fulfill the minimum requirements as described in section 6.1 SEFA Mandatory Features according to the SEFA ESD control chair approval document. *Note that the SEFA 49 chemical spot test is only necessary for ESD control chairs considered for use in wet labs.*
- ESD control Norms (both or at least one)

    o DIN EN 61340-5-1 & EN 61340-2-3

    According to EN 61340-5-1 seating products shall be tested according to EN 61340-2-3

    o ANSI/ESD S20.20-2021 & STM12.1

    According to ANSI/ESD S20.20 seating products shall be tested according to ANSI/ESD STM12.1

6.4 SEFA Suggested Features according to the SEFA chair approval document

- SEFA 12 ESD control seating is also recommended to include features as described in section 6.2 according to the SEFA chair approval document

Special thanks to David E. Swenson, President, Affinity Static Control Consulting, L.L.C. (http://www.affinity-esd.com) and Carl Newburg, President, Microstat Laboratories/River's Edge Technical Service, Inc. (http://microstatlabs.com/index.html), both members of the ESD Association (https://www.esda.org/) as well as Maciej Noras, PhD, Associate Professor at the Energy Production & Infrastructure Center at the University of North Carolina – Charlotte (https://epic.charlotte.edu/) and Steve Fowler, Consultant with Fowler Associates, Inc. (https://www.sfowler.com/) both members of the Electrostatics Society of America, for their input and references in the writing of this section of the SEFA 12 standard.

7.0 Seating Surface Finish Tests

7.1 Chemical Spot Test

7.1.1 Purpose of Test

The purpose of the chemical spot test is to evaluate the resistance seat surface has to chemical spills.

Note: Many organic solvents are suspected carcinogens, toxic and/or flammable. Great care should be exercised to protect personnel and the environment from exposure to harmful levels of these materials.

7.1.2 Test Procedure

Provide flat and smooth (6) 4” x 12” (100 mm x 300 mm) test samples of upholstery material or (49) 3” x 3” (75 mm x 75 mm) (or equivalent seating surface to test all 49 chemicals) of the seating surface material (PU or urethane Foam, or other polymer). If flat and smooth samples are not available due to surface texturing, shape or patterning, the test facility shall supply a glass cover that prohibits the evaporation of the test reagent, assuring that the soaked cotton ball remains wet for the duration of the test process per Method A below. The samples shall be tested for chemical resistance as described herein. Place samples on a flat surface, clean with soap and water and blot dry. Condition the sample for 48-hours at 73+ 3F (23(+ 2C) and 50+ 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods.

Method A - Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.

Method B – Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.

For both of the above methods, leave the reagents on the sample for a period of **fifteen minutes.** Wash off the sample with deionized water. Dry with a towel and evaluate both top and bottom surfaces after 24-hours at 73± 3°F (23°± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM using the following rating system:

Level 0 – No detectable change.

Level 1 – Slight change in color or gloss, or warping, twisting or deforming of material.

Level 2 – Slight surface etching or severe staining.

Level 3 – Pitting, cratering, swelling, or erosion of surface WITH obvious and significant deterioration of the surface top coat,

exposing raw expanded foam layers

Note: Four observations should be performed by the test associate at a distance of 12” – 17” (300 mm – 430 mm) at varying angles of not less than 75° from each other.

Test No.	Chemical Reagent	Test Method	Test No.	Chemical Regent	Test Method
1.	Acetate, Amyl	A	28.	Methylene Chloride	A
2.	Acetate, Ethyl	A	29.	Mono Chlorobenzene*	A
3.	Acetic Acid, 98%	B	30.	Naphthalene	A
4.	Acetone	A	31.	Nitric Acid, 20%	B
5.	Acid Dichromate, 5%	B	32.	Nitric Acid, 30%	B
6.	Alcohol, Butyl	A	33.	Nitric Acid, 70%	B
7.	Alcohol, Ethyl	A	34.	Phenol, 90%	A
8.	Alcohol, Methyl	A	35.	Phosphoric Acid, 85%	B
9.	Ammonium Hydroxide, 28%	B	36.	Silver Nitrate Saturated	B
10.	Benzene*	A	37.	Sodium Hydroxide 10%	B
11.	Carbon Tetrachloride	A	38.	Sodium Hydroxide 20%	B
12.	Chloroform	A	39.	Sodium Hydroxide 40%	B
13.	Chromic Acid, 60%	B	40.	Sodium Hydroxide Flake	B
14.	Cresol	A	41.	Sodium Sulfide Saturated	B
15.	Dichloroacetic Acid	A	42.	Sulfuric Acid, 33%	B
16.	Dimethylformamide	A	43.	Sulfuric Acid, 77%	B
17.	Dioxane	A	44.	Sulfuric Acid 96%	B
18.	Ethyl Ether	A	45.	Sulfuric Acid 77% &	
19.	Formaldehyde, 37%	A		Nitric Acid 70% equal parts	B
20.	Formic Acid, 90%	B	46.	Toluene	A
21.	Furfural	A	47.	Trichloroethylene	A
22.	Gasoline	A	48.	Xylene	A
23.	Hydrochloric Acid, 37%	B	49.	Zinc Chloride Saturated	A
24.	Hydrofluoric Acid, 48%	B			
25.	Hydrogen Peroxide, 30%	B			
26.	Iodine, Tincture of	B			
27.	Methyl Ethyl Ketone	A			

**If the use of this chemical is permitted by law, in the country where this testing is being performed.*

7.1.3 Acceptance Level

Results will vary from manufacturer to manufacturer due to differences in finish formulations. Laboratory grade finishes shall result in no more than four (4) Level 3 conditions. In addition, any instances of the seating surface absorbing, or allowing any of the SEFA 49 chemicals to leak through the surface, will result in an immediate failure. Individual test results, for the specified 49 reagents, will be verified with the established third party, independent SEFA test submittal form. Suitability for a given application is dependent upon the chemicals used in a given laboratory.

LAB GRADE SEATING CHEMICAL RESISTANCE TESTING

Test Date:________________________ Sample Description:________________________________

Type of Material Coated: ____________________ Coating Type:________________________________

Rating Scale

Level 0 - No detectable change

Level 1 - Slight change in color or gloss, or warping, twisting or deforming of material

Level 2 - Slight surface etching or severe staining

Level 3 - Pitting, cratering, swelling or erosion of surface WITH obvious and significant deterioration of surface top coat, exposing raw expanded foam layers

Test No.	Chemical Reagent	Rating	Comments
1.	Acetate, Amyl		
2.	Acetate, Ethyl		
3.	Acetic Acid, 98%		
4.	Acetone		
5.	Acid Dichromate, 5%		
6.	Alcohol, Butyl		
7.	Alcohol, Ethyl		
8.	Alcohol, Methyl		
9.	Ammonium Hydroxide, 28%		
10.	Benzene*		
11.	Carbon Tetrachloride		
12.	Chloroform		
13.	Chromic Acid, 60%		
14.	Cresol		
15.	Dichloroacetic Acid		
16.	Dimethylformamide		
17.	Dioxane		
18.	Ethyl Ether		
19.	Formaldehyde, 37%		
20.	Formic Acid, 90%		
21.	Furfural		
22.	Gasoline		
23.	Hydrochloric Acid, 37%		
24.	Hydrofluoric Acid, 48%		
25.	Hydrogen Peroxide, 30%		
26.	Iodine, Tincture of		
27.	Methyl Ethyl Ketone		
28.	Methylene Chloride		
29.	Mono Chlorobenzene*		
30.	Naphthalene		
31.	Nitric Acid, 20%		
32.	Nitric Acid, 30%		
33.	Nitric Acid, 70%		
34.	Phenol, 90%		
35.	Phosphoric Acid, 85%		
36.	Silver Nitrate Saturated		
37.	Sodium Hydroxide 10%		
38.	Sodium Hydroxide 20%		
39.	Sodium Hydroxide 40%		
40.	Sodium Hydroxide Flake		
41.	Sodium Sulfide Saturated		
42.	Sulfuric Acid, 33%		
43.	Sulfuric Acid, 77%		
44.	Sulfuric Acid, 96%		
45.	Sulfuric Acid 77%& Nitric Acid 70% equal parts		
46.	Toluene		
47.	Trichloroethylene		
48.	Xylene		
49.	Zinc Chloride, Saturated		

*IF THE USE OF THIS CHEMICAL IS PERMITTED BY LAW IN THE COUNTRY WHERE THE TESTING IS BEING PERFORMED.

TEST PERFORMED BY:____________________________________ DATE:____________________

Endnotes

1 See: Penkala, S., El-Debal, H. & Coxon, K. Work-related musculoskeletal problems related to laboratory training in university medical science students: a cross sectional survey. *BMC Public Health* **18,** 1208 (2018). https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-6125-y; Also: Oregon Occupational Health and Safety Administration publications, "The Advantages of Ergonomics" https://osha.oregon.gov/OSHAPubs/ergo/ergoadvantages.pdf

2 See: Sundaragiri KS, Shrivastava S, Sankhla B, Bhargava A. Ergonomics in an oral pathology laboratory: Back to basics in microscopy. J Oral Maxillofac Pathol. 2014 Sep;18(Suppl 1):S103-10. doi: 10.4103/0973-029X.141341. PMID: 25364157; PMCID: PMC4211216; Also: Puget Sound Human Factors and Ergonomics Society, "Examples of Costs and Benefits of Ergonomics", https://www.pshfes.org/resources/Documents/ROI%20Cost%20Calculator/Ergonomics_cost_benefit_case_study_collection.pdf; Also: Occupational Safety and Health Administration publication OSHA Document 3404-11R, 2011:, "Laboratory Safety Guidance" https://www.osha.gov/sites/default/files/publications/OSHA3404laboratory-safety-guidance.pdf

3 See: Oğuzhan Erdinç & Paul H.P. Yeow (2011) Proving external validity of ergonomics and quality relationship through review of real-world case studies, International Journal of Production Research, 49:4, 949-962, DOI: 10.1080/00207540903555502; Also: Selki, H. M. (2017, February). A literature review of ergonomics programs. In *3rd International Engineering Conference on Developments in Civil & Computer Engineering Applications* (p. 191).

4 See: Occupational Safety and Health Administration publication OSHA Document 3404-11R, 2011:, "Laboratory Safety Guidance" https://www.osha.gov/sites/default/files/publications/OSHA3404laboratory-safety-guidance.pdf; Also: Puget Sound Human Factors and Ergonomics Society, "Examples of Costs and Benefits of Ergonomics", https://www.pshfes.org/resources/Documents/ROI%20Cost%20Calculator/Ergonomics_cost_benefit_case_study_collection.pdf

[5] *Meschke S, Smith BD, Yost M, Miksch RR, Gefter P, Gehlke S, Halpin HA. The effect of surface charge, negative and bipolar ionization on the deposition of airborne bacteria. J Appl Microbiol. 2009 Apr;106(4):1133-9. doi: 10.1111/j.1365-2672.2008.04078.x. Epub 2009 Jan 21. PMID: 19191951. https://pubmed.ncbi.nlm.nih.gov/19191951/#:~:text=Conclusions%3A%20Static%20charges%20on%20fomitic,in%20reduction%20of%20bacterial%20deposition*

[6] *"Fundamentals of Electrostatic Discharge, Part One – An Introduction to ESD" Copyright 2020, EOS/ESD Association, Inc., Rome, NY, https://www.esda.org/assets/Documents/c23d92d4ab/Fundamentals-of-ESD-Part-1-An-Introduction-to-ESD.pdf*

List of Supporting Documents for SEFA 12:

- Heller-Ono, Alison, 2000, Laboratory Ergonomics: A focus on microscopes, https://info.worksiteinternational.com/hubfs/documents/publication-laboratory-ergonomics.pdf
- **https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-6125-y**
- **https://osha.oregon.gov/OSHAPubs/ergo/ergoadvantages.pdf**
- **https://www.osha.gov/sites/default/files/publications/OSHA3404laboratory-safety-guidance.pdf**
- **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4211216/**
- **http:// https://docplayer.net/5036008-J-ulia-not-her-real-name-is-a.html**
- **https://www.travelers.com/resources/business-industries/small-business/economics-of-ergonomics-for-small-businesses**

- https://www.pshfes.org/resources/Documents/ROI%20Cost%20Calculator/Ergonomics_CBA_summary.pdf
- https://www.pshfes.org/resources/Documents/ROI%20Cost%20Calculator/Ergonomics_cost_benefit_case_study_collection.pdf
- Selki, H. M. (2017, February). A literature review of ergonomics programs. In 3rd International Engineering Conference on Developments in Civil & Computer Engineering Applications (p. 191).
- Oğuzhan Erdinç & Paul H.P. Yeow (2011) Proving external validity of ergonomics and quality relationship through review of real-world case studies, International Journal of Production Research, 49:4, 949-962, DOI: 10.1080/00207540903555502
- MacLeod, D. (1994). The Ergonomics Edge: Improving Safety, Quality, and Productivity. United Kingdom: Wiley.
- https://pubmed.ncbi.nlm.nih.gov/19191951/#:~:text=Conclusions%3A%20Static%20charges%20on%20fomitic,in%20reduction%20of%20bacterial%20deposition
- https://www.esda.org/assets/Documents/c23d92d4ab/Fundamentals-of-ESD-Part-1-An-Introduction-to-ESD.pdf

Appendix I – Reference pictures: 49 Chemical Test Level categories

Level 1 rating examples:

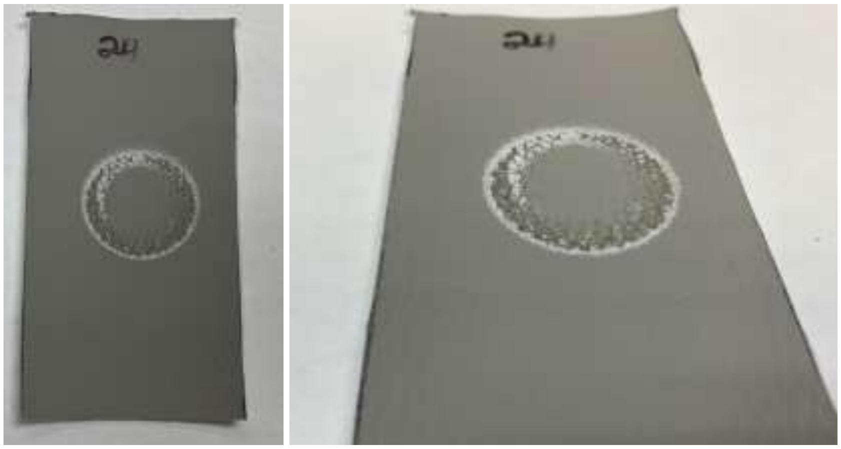
Coated Silicon Upholstery – gloss/color change:

Urethane / PU Foam – gloss change

PVC / Vinyl – slight gloss change

Level 2 rating examples:

Coated Silicon Upholstery – color change and slight surface etch:



Urethane / PU Foam – slight surface etch:

PVC / Vinyl – gloss/color change:

Level 3 rating examples:

Coated Silicon Upholstery – surface erosion:

Urethane / PU Foam – surface erosion:

PVC / Vinyl – surface swelling:

Appendix II – SEFA Lab – Grade Seating Selection Guide

About the Seating Selection Guide:

- The seating selection guide is a tool to help guide specifiers and users to detail their requirements for lab seating with the aim of helping assure proper selection of chairs/stools for their lab use
- By detailing the user's needs, multiple quotes from multiple manufacturers can be obtained while still assuring seating will meet the needs of the user and assuring manufacturers meet the user's requirements
- While not exhaustive, the tool does give users and manufacturers a much better opportunity to pinpoint user's requirements and move the specifying and quoting process along much quicker

How to Use the Seating Selection Guide:

Seating Styles: For each type of chair/stool the user is considering, check the appropriate box. Use one form for each style of chair you are considering, if considering more than one type

Durability/Safety: At least one box must be checked for seating indicating compliance with either GS and/or ANSI/BIFMA standards. The seating must also pass the SEFA 49 Chemical Spot Test

Cleanability: All boxes must be checked to indicate the seating being considered is compatible with wet lab use

ESD Properties: If an ESD control chair is being specified, the box must be checked indicating that the chair has passed either or both tests for electrical resistance

SEFA Lab – Grade Seating Selection Guide

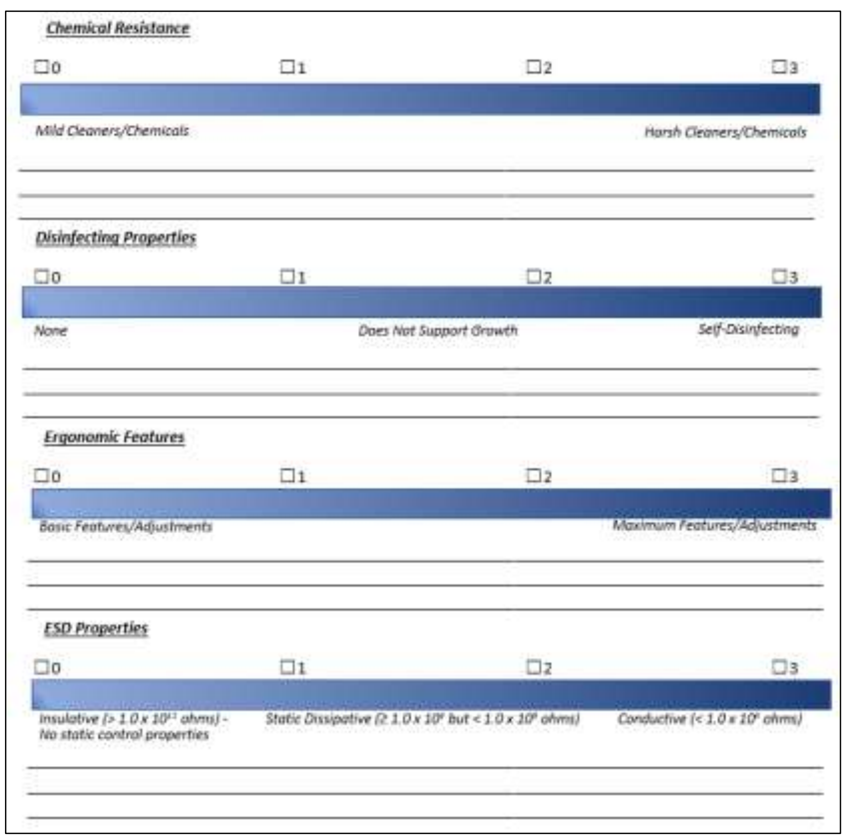
Seating Styles (Select One)	☐Lab Chair/Stool with Backrest ☐ Lab Stool without Backrest ☐ Lean/Stand Stool with or without Backrest
Durability/Safety *Must pass one or both.	☐ GS* ☐ANSI/BIFMA* ☐ Must pass SEFA 49 Chemical Spot Test
Cleanability – for Wet Lab Use. (Must Meet All) *Does not apply to dry lab requirements, such as computer labs, microelectronic labs, etc.*	☐Surfaces must be able to be cleaned with mild cleaning solutions without degrading or retaining solutions. ☐Upholstery must not be a woven construction, such as: cloth, wool, mesh, etc. ☐Surfaces cannot be made of porous or absorbent materials that would retain spills or cleaning agents or allow them to soak through to underlying cushioning or mechanical components.
ESD Properties – if required	☐Point to ground electrical resistance of less than 1.0 x 10^9 ohms tested per EN 61340-2-3, ANSI/ESD STM12.1 or both

---

Desired Properties Section

Chemical Resistance: On a scale from 0 to 3, rate the exposure the lab seating will have to cleaners/chemicals in the lab. On the lines below, give any appropriate details as to chemical names, concentrations, or any other details that will help assure the proper chair is specified

Disinfecting Properties: Using the 0 to 3 scale, indicate the need for disinfecting properties for your use. On the given lines, detail any specific needs for your lab



Ergonomic Features: Using SEFA's 0 to 3 scale, indicate how important ergonomics will be in your selection of a lab chair. On the lines below, add detail such as postures, tasks being performed, stature of users, length of time sitting, type of adjustments preferred, etc.

ESD Control Properties: On the 0 to 3 scale, indicate the level of resistance required for your use. On the lines below, indicate any special needs required for your operation

Feature Preferences

Chair/Stool Features: Check the boxes for your preferences of chair/stool features for each component as listed. Note that more than one box can be selected per feature. As an example, a specifier may wish to have an upholstered seat with waterfall front and a seat slide. Check all features your user indicates they prefer. For stools without backrests, do not check any boxes in the backrest column.

Proposed Classification Features (Select which you would prefer.)

Seat	Backrest	Control Functions	Foot Support	Casters	Armrests	Base Construction	Seat Height
☐Uphol-stered	☐Uphol-stered Backrest	☐Adjusts From Seated Position	☐Fixed Footring	☐Casters for Hard Surface Floors	☐Fixed Armrests	☐Cast Aluminum	☐Desk Height
☐Non-Upholstered	☐Non-Upholstered Backrest	☐Tilt Tension Control	☐Adjus-table Footring	☐Safety Casters (won't roll away)	☐Height Adjustable Armrests	☐Coated Steel	☐Medium Bench Height
☐Waterfall Front	☐Lumbar Support	☐Weight-Activated	☐Attached Foot Support	☐Locking Casters	☐Width Adjustable Armrests	☐Reinforced Composite	☐High Bench Height
☐Seat Slide	☐Backrest Height Adjustment	☐Swivel Tilt	☐External Foot Support	☐Glides	☐Depth Adjustable Armrests	☐Chrome Plated Steel	
☐Seat Height	☐Backrest Depth Adjustment	☐No Tilt	☐No Foot Support		☐Armrest Swivel Adjustment		
	☐Backrest Swivel	☐Forward Seat Tilt					
		☐Recline Lock Out					
		☐Synchro-Tilt					

Feature Descriptions:

For those features that may need further explanation, the following illustrations are provided to describe the functions more fully:

SEATS:

Waterfall Front:

Seat Slide:

Adjustable Seat Height:

BACKREST:

Lumbar Support:

Backrest Height Adjustment:

Backrest Depth Adjustment:

Backrest Swivel:

CONTROL FUNCTIONS:

Tilt Tension Control:

Weight-Activated Control:

Swivel Tilt:

Forward Seat Tilt:

Recline Lock Out:

Synchro-Tilt:

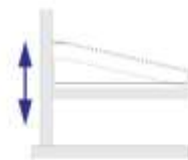
FOOT SUPPORT:

Fixed Footring:

Adjustable Footring:

Attached Foot Support:

External Foot Support:



ARMRESTS:

Height Adjustable Armrests:

Width Adjustable Armrests:

Depth Adjustable Armrests:

Armrest Swivel Adjustment:

SEFA Lab – Grade Seating Selection Guide

Seating Styles (Select One)	☐Lab Chair/Stool with Backrest ☐ Lab Stool without Backrest ☐ Lean/Stand Stool with or without Backrest
Durability/Safety *Must pass one or both.	☐ GS* ☐ANSI/BIFMA* ☐ Must pass SEFA 49 Chemical Spot Test
Cleanability – for Wet Lab Use. (Must Meet All) *Does not apply to dry lab requirements, such as computer labs, microelectronic labs, etc.*	☐Surfaces must be able to be cleaned with mild cleaning solutions without degrading or retaining solutions. ☐Upholstery must not be a woven construction, such as: cloth, wool, mesh, etc. ☐Surfaces cannot be made of porous or absorbent materials that would retain spills or cleaning agents or allow them to soak through to underlying cushioning or mechanical components.
ESD Properties – if required	☐Point to ground electrical resistance of less than 1.0×10^9 ohms tested per EN 61340-2-3, ANSI/ESD STM12.1 or both

Chemical Resistance

☐0 ☐1 ☐2 ☐3

Mild Cleaners/Chemicals *Harsh Cleaners/Chemicals*

____

____

____

Disinfecting Properties

☐0 ☐1 ☐2 ☐3

None *Does Not Support Growth* *Self-Disinfecting*

____

____

____

Ergonomic Features

☐0 ☐1 ☐2 ☐3

Basic Features/Adjustments *Maximum Features/Adjustments*

____

____

____

ESD Properties

☐0 ☐1 ☐2 ☐3

Insulative (> 1.0 x 10^{11} ohms) - No static control properties   *Static Dissipative (≥ 1.0 x 10^4 but < 1.0 x 10^9 ohms)*   *Conductive (< 1.0 x 10^4 ohms)*

____

____

____

<u>Proposed Classification Features (Select which you would prefer.)</u>

Seat	*Backrest*	*Control Functions*	*Foot Support*	*Casters*	*Armrests*	*Base Construction*	*Seat Height*
☐Uphol-stered	☐Uphol-stered Backrest	☐Adjusts From Seated Position	☐Fixed Footring	☐Casters for Hard Surface Floors	☐Fixed Armrests	☐Cast Aluminum	☐Desk Height
☐Non-Upholstered	☐Non-Upholstered Backrest	☐Tilt Tension Control	☐Adjus-table Footring	☐Safety Casters (won't roll away)	☐Height Adjustable Armrests	☐Coated Steel	☐Medium Bench Height
☐Waterfall Front	☐Lumbar Support	☐Weight-Activated	☐Attached Foot Support	☐Locking Casters	☐Width Adjustable Armrests	☐Reinforced Composite	☐High Bench Height
☐Seat Slide	☐Backrest Height Adjustment	☐Swivel Tilt	☐External Foot Support	☐Glides	☐Depth Adjustable Armrests	☐Chrome Plated Steel	
☐Seat Height	☐Backrest Depth Adjustment	☐No Tilt	☐No Foot Support		☐Armrest Swivel Adjustment		
	☐Backrest Swivel	☐Forward Seat Tilt					
		☐Recline Lock Out					
		☐Synchro-Tilt					

Other Notes:____

____

____

<u>Seat Height</u>

Subtract 10" – 12" or 25cm – 30cm from the working height. This measurement should provide an approximate range for the middle of the height adjustment range of the chair or stool.

Be sure to include the height of fixtures or equipment when determining the working height, such as height of microscopes or testing equipment.

Also, be sure to account for aprons, drawers, or other workbench features that may interfere with user's legs.

<u>Notes</u>

For the sake of this standard and due to the importance of upper torso stability for critical eye-hand coordinated tasks and mental concentration in laboratory tasks such as microscopy, pipetting, pharmaceutical compounding, etc. as well as for the safety of reducing occurrence of spills and mistakes, especially in ultra-crucial areas such as biosafety labs, torso-balance seating (such as exercise ball seating and spring seating) will not be considered.

Appendix III – SEFA 12 Laboratory-Grade Seating Checklist – classification 12.1

In order to establish SEFA 12 compliance, the manufacturer is required to submit independent third party testing by a SEFA approved facility. Manufacturers may test a single chair or may opt to test a worst case scenario, tallest chair with highest back rest (most tippable), in order to qualify other chairs from the same line. Model numbers for all chairs in within the same line must be documented by the test facility in the GS 2014:01 or ANSI BIFMA X5-2017 Certificate of Testing.

Complete Test results will include the Mandatory Features Certificates and Test Report as indicated below as well as a copy of the product brochure.

SEFA **Mandatory** Features:

- Safety Norms (both or at least one)
  ☐ GS 2014:01
  ☐ ANSI/BIFMA X5.1-2017
- Seat/Backrest Upholstery Norms
  ☐ EN ISO 12945-2 also known as ASTM D4966 (Martindale Method) minimum of 25,000 rubs or ASTM D4157 (Wyzenbeek Method) minimum of 30,000 double-rubs with #10 cotton duck
  ☐ SEFA 49 chemical spot test
- Seat/Backrest Upholstery
  ☐ Wet Labs: upholstery cannot be porous in nature, such as typical cloth, wool or mesh fabrics used in traditional office settings
- ESD Testing (both or at least one)
  ☐ EN 61340-2-3
  ☐ ANSI/ESD STM12.1-2019

NOTE: TYPICAL CLOTH, WOOL OR MESH FABRICS USED IN TRADITIONAL OFFICE SETTINGS ARE NOT A SUITABLE FOR WET LABS. UPHOLSTERY FOR WET LABS CANNOT BE POROUS IN NATURE.

SEFA **Suggested** Features:

• Ergonomics:
☐ Design of controls for adjustability should be intuitive and easily made from the seated position

☐ Seating comfort – chairs should provide support to critical ergonomic areas such as the lumbar area of the spine, and be able to be adjusted for individual preferences

☐ Movement – for long-term use, chairs should give proper support for the user as they move throughout the day, yet be able to be locked into position for critical applications

☐ Proper circulation – the chair should provide features that allow uninhibited blood flow to the lower extremities by incorporating a forward seat tilt function or a flexible and/or waterfall front edge

Minimum SEFA Requirements for an approved ESD control grade seating product – classification 12.2

- ☐ SEFA 12 ESD control chairs must fulfill the minimum requirements as described in section 6.1 SEFA Mandatory Features according to the SEFA ESD control chair approval document. *Note that the SEFA 49 chemical spot test is only necessary for ESD control chairs considered for use in wet labs.*
- ☐ ESD control Norms (both or at least one)
  - o DIN EN 61340-5-1 & EN 61340-2-3

    According to EN 61340-5-1 seating products shall be tested according to EN 61340-2-3

  - o ANSI/ESD S20.20-2021 & STM12.1

    According to ANSI/ESD S20.20 seating products shall be tested according to ANSI/ESD STM12.1

SEFA SEFA Suggested Features according to the SEFA chair approval document

SEFA 12 ESD control seating is also recommended to include features as described in section 6.2 according to the SEFA chair approval document

Appendix IV – SEFA Lab-Grade Chair Cleaning Protocol

1. Dry-clean surfaces with a clean cloth to remove loose dirt/dust/organic material
2. Wet-clean surfaces with warm water and a mild detergent, scrubbing where necessary to remove stubborn dirt and contamination
3. Rinse surfaces with clean water and cloth – ***do not use high pressure spray equipment*** *as this may force liquids into gaps and crevices where chair parts meet*
4. Manually dry, or allow the area to dry completely
5. Apply disinfectant/cleaning solution at the recommended concentration for the appropriate contact time. ***Do not apply solution at a rate higher than the recommended concentration and do not allow to contact for longer than the recommended contact time. Doing so may result in degradation of upholstery, plastic and rubber parts, or create conditions that will lead to corrosion of metal parts. These outcomes will result in early failure of chair parts and may negate the manufacturer's warranty.***
6. Wet-clean surfaces with warm water and a mild detergent which is extremely important for surfaces that are susceptible to damage from the disinfectant/cleaner chemicals
7. Rinse the chair again with clean water/cloth
8. Manually dry, or allow the area to dry completely
9. In high risk areas, repeat steps 5 through 8 above with a wide spectrum disinfectant

NOTES:

• For proper cleaning, start the cleaning protocol from the top of the chair/stool and proceed to the bottom to assure any cleaning solutions and dirt/contamination are removed should they drip or fall to lower parts of the chair;

• Do not clean oil/grease from the shaft of height-adjustable gas springs or pneumatic pistons as this will interfere with their ability to work over time, and result in shortened lifetime or failure;

The SEFA recommended cleaning protocol should in no way conflict with any other stated cleaning process as defined by governmental or corporate regulations. It is, however, a recommended process to assure long-term wear of laboratory chairs and stools in these challenging environments.