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ISSA Standard for Measuring the Effectiveness of Cleaning in K-12 Schools

Under Development by CIRI and ISSA with the Support of the Clean Standard Development and Stakeholder Committees

Section 1: Overview and Background

The goal of the Standard for Measuring the Effectiveness of Cleaning in K-12 Schools (hereinafter referred to as the Clean Standard: K-12) is to provide schools with a tool that will help them measure and monitor the effectiveness of the cleaning processes at their facilities thereby contributing to the quality of the indoor environment for the benefit of students and staff.

The Clean Standard: K-12 is a performance-oriented standard that is focused on:

- The desired levels of cleanliness that can be reasonably achieved;
- Recommended monitoring and inspection procedures designed to measure the effectiveness of cleaning procedures using quantitative measures (i.e., ATP Meters) and traditional methods (i.e., sight, smell, touch); and
- How to use the results of monitoring and inspection to evaluate and improve the cleaning processes and products that are critical to maintaining a safe and healthy learning environment for students and staff.

The Clean Standard: K-12 is non-prescriptive, i.e. it does not specify or favor any particular cleaning process or products. Instead the Standard is focused on achieving and maintaining an effective cleaning program through the use of a systematic approach and standardized guidelines.

As such, the Clean Standard: K-12 provides schools with a framework and a standardized protocol for using ATP meters to measure and assess cleaning effectiveness related to soiling of biological origin on a consistent and periodic basis. Perhaps more importantly, the Clean Standard: K-12 provides a structured approach to addressing those situations where the school facility's condition is less than desirable.

In developing the Clean Standard: K-12, ISSA and CIRI have followed a consensus based process designed to garner the input of all major stakeholders in an open and transparent manner. The Clean Standard: K-12 development process allowed for stakeholder involvement by participation on the Development or the Stakeholder Committees.

The Clean Standard: K-12 development process was guided and informed by independent research, including thousands of ATP measurements from high touch surfaces (student desks, cafeteria tables, restroom sinks and stall doors) recognized as posing health risks

in schools. The ATP measurements were conducted in numerous schools across the United States to account for potential geographic or climatic variations.

The research indicates that a standardized approach to the measurement of cleaning effectiveness across high touch surfaces could be used as a practical approach to improve the cleaning practices and contribute to a healthier school environment.[1]

Specifically, the research has validated ATP (adenosine triphosphate) measurement systems as a "…relatively simple, rapid and affordable measure of the level of biologically sourced contamination on the interior surfaces of schools." Further the research concluded that ATP is an "…excellent candidate marker for the monitoring of biologically derived soiling/cleanliness…"

In addition, the research has produced reasonable range values based on ATP measurements (for three different ATP meters) for each surface type tested, and that these ranges "…may be used in a standardized and routine approach to the monitoring of cleaning effectiveness in school buildings based on detection and quantification of biologically derived soiling."

However, it must be noted that ATP does not directly measure the total contamination on a surface. For example, ATP monitoring does not indicate the presence or reduction of non-biological and other pollutants that may be recognized and regulated as human health hazards. Examples of such health hazards are lead, asbestos, pesticides, and other chemical residues. In addition, ATP meters cannot identify specific bacteria, virus, fungi or infectious microorganisms.

For a more detailed discussion regarding the limitations of ATP measurement, please see Section 6.

It is hoped that further research and development in the field of cleaning measurement will yield more practical measurement methods for these other contaminants. For now, the research has concluded ATP luminescence is the best available quantitative measure of hard surface cleaning effectiveness.

Section 2: Scope and Purpose

The Clean Standard: K-12 provides a systematic approach to measuring and monitoring the effectiveness of cleaning procedures at K-12 facilities as it relates to surface contamination of biological origin.

Specifically, the Clean Standard: K-12 includes the following elements: (a) a building audit to assess the level of cleanliness at a school facility; (b) periodic measurement of cleaning effectiveness using ATP meters; and (c) establishment and implementation of corrective actions in the event the school is not achieving the desired level of cleaning effectiveness.

These elements are intended to be used in a systematic process to determine the background condition and cleanliness in a school, and also provide for periodic measurement of cleaning effectiveness at the school facility. This process makes it possible to assess the effectiveness of cleaning processes and products used at a school facility. This assessment should be used to improve the effectiveness of the cleaning processes used thereby contributing to improved indoor environmental quality. In this regard, the Clean Standard: K-12 empowers schools to select a cleaning process that is the most effective and economical.

Section 3: Defining Current Cleaning Procedures

The implementation of any improvement program involves defining current cleaning procedure and measuring its effectiveness, analyzing the data, considering potential improvements, and then implementing identified improvements. The improvement process is a continuous cycle that requires constant reevaluation and updating. The Clean Standard: K-12 formalizes this process by inserting the requirement to measure the effectiveness of the cleaning process and to ensure an efficient and healthy outcome rather than just a lower initial cost.

Toward that end, the first step in the process is to document the current custodial program for the facility, including an inventory of all materials & equipment used; personnel; and the scope of work for cleaning services (including the specific tasks to be performed and the frequency of service. If outside services are employed as part of the regular maintenance program (wash windows, refinish gym floor, service to HVAC equipment, etc.) such services should be included as part of a master schedule for the school.

Section 4: Protocol for Measuring and Monitoring Cleaning Effectiveness

This section sets forth a protocol for measuring and monitoring cleaning performance in K-12 school facilities.

4.1: Written Plan. A school facility or school system shall develop and implement a comprehensive written plan describing the process to be used to measure and monitor the effectiveness of the cleaning processes used by the facility. The written plan shall include, at a minimum, the elements contained in this section.

4.2: Building Audit. A building audit shall be conducted to establish baseline conditions and otherwise assess the level of cleanliness of a school facility. This audit involves a walk through inspection of the school facility and seeks to simply answer the question: "Does the facility look and smell clean?"

Two sample building audit forms are provided in Appendix A: the first of which is a comprehensive format covering cleaning and maintenance activities; the other is a more concise format covering cleaning activities only. These sample building audit forms should be adapted to meet the particular needs of a facility.

The building audit should be conducted:

- Initially upon implementation of the Clean Standard: K-12 to establish baseline conditions;
- Two times per year (once per semester) to be scheduled at the convenience of staff and performed consistently each year. The building audit should be performed while school is in session; and
- Whenever there is a significant change in conditions or procedure (e.g., new cleaning program, significant construction activity, etc.)

A completed building audit provides a record of the conditions of specific locations within the school facility as well as an overall assessment of the building.

Audit records should be maintained for 3 years along with a summary of findings and suggested changes. This summary consolidates the findings of the audit into a concise dated document for implementation and follow-up.

4.3: High Touch Points. A school shall identify "high touch points" within the school facility. High touch points shall include, but not be limited to: (a) classroom desks and similar surfaces such as work tables and teacher desks; (b) cafeteria tables, (c) restroom stalls and stall doors, and (d) sink fixtures and sink surroundings especially in restrooms.

Schools may wish to include other high touch points based on experience or unique circumstances, etc. such as floors, drinking fountains, door handles, doors, gym equipment such as mats, and student chairs.

4.4: Limits for Each High Touch Point Based on ATP-RLU. Once the high touch points (HTPs) have been identified, schools shall establish the desired level of "cleaning effectiveness" or "limits" for each HTP based on the ATP-RLU tables and values that are set forth in Section 5. It is recommended that schools establish the limits at the levels associated with "Highly Effective Cleaning" for the appropriate surfaces or areas within the school as set forth in Section 5.

In the event that a school includes HTPs other than the four required in Section 4.3, the school either should use the ATP-RLU tables that are associated with:

- The HTP that is most similar in surface type to the surface actually being tested with the ATP meter; or
- The area in which the surface being tested is located (i.e., the limits for Classroom Desks may be used to set limits for other surfaces in the classroom such as doors or door knobs).

4.5: ATP Testing Protocol for High Touch Points. Schools shall establish an ATP testing protocol based on facility needs. Such protocol should address at a minimum: when and at what frequency ATP testing will occur; and the appropriate procedures to be followed when testing for cleaning effectiveness. The protocol described below is

recommended as a starting point and should be modified to meet specific needs. For example, if a school's cleaning process is determined to be "ineffective" based on ATP measurements, the facility may wish to increase the frequency of testing as well as consider corrective actions.

a) Frequency. ATP testing should be conducted:

i. Upon implementation of the Clean Standard: K-12, before and after cleaning. (Note: Conducting ATP testing before cleaning is optional but recommended if a school wishes to establish a baseline so that they can measure improvement after cleaning. If ATP testing will be conducted before cleaning, it should be conducted in conjunction with the building audit referenced in Section 4.2.);

ii. Twice a year after cleaning has been performed (i.e., once a semester). Such testing should be conducted during the school year. (Note: The frequency of ATP testing adopted by a school should depend on the school's conditions, i.e., schools that are unkempt or dirty should test more frequently (i.e. once every two months) while a school that consistently meets its desired level of cleanliness may wish to conduct ATP testing twice a year.); and

iii. After a change in cleaning methods, process, products, or frequencies; or following the selection of a new cleaning service provider, etc.

b) Procedures. In conducting ATP testing, the following procedures should be followed:

i. Follow the manufacturer's instructions regarding storage and how to conduct ATP testing for the particular ATP meter.

ii. At least 5% of the high touch points referenced in Section 4.3 should be sampled. For example, if a school has 400 desks, at least 20 desks should be tested with the ATP meter. In no case should the total number of sampled points be fewer than 10.

The selection of the actual high touch points that will be tested should be done randomly and in a manner that ensures the selected areas are located throughout the facility. For example, test 5% of the desks in each of the classrooms.

iii. Create a template to control the area to be tested with the ATP swabs. A template can be made from cardboard or poster board by cutting out a square 2 inches by 2 inches (5 cm by 5 cm) in dimension, and placing this over the surface to be swabbed.

For irregular surfaces (such as door handles) it may not be feasible to use a 2" x 2" template. In such cases, swab as much of the surface as possible.

iv. The ATP swabs should be rubbed back and forth, covering the entire 2" x 2"" area, first left to right, then top to bottom.

v. Maintain records of your ATP results noting the ATP value, the high touch points tested, and the date.

4.6: ATP Measurement Evaluation. After ATP testing has been completed, the school shall conduct an evaluation of the effectiveness of its cleaning processes by comparing actual ATP measurements with the ATP-RLU range values associated with the appropriate surface, which are described in detail in Section 5.

In the event that a school discovers that its cleaning effectiveness is consistently measured as "Ineffective Cleaning" or falls within the upper range of the "Effective Cleaning / May Need Improvement" category, based on the tables in Section 5, the school shall implement as appropriate corrective actions described below. Alternatively, if the school's cleaning effectiveness is consistently measured as "Highly Effective Cleaning" or falls within the lower range of the "Effective Cleaning / May Need Improvement" category, no corrective action is needed. Tested surfaces that fall within "Ineffective Cleaning" should be re-cleaned and re-tested.

4.7: Establishment and Implementation of Corrective Actions. If the ATP measurements consistently fall within the "Ineffective Cleaning" or within the upper range of the "Effective Cleaning / May Need Improvement" categories, a school shall consider corrective action. The first step in determining appropriate corrective action shall be to determine the cause of the failure, which shall at a minimum include the reevaluation of the cleaning processes, frequencies, products and tools. Common causes of insufficient cleaning include: inadequate cleaning frequencies, incomplete cleaning (i.e., not cleaning the entire surface), skipped cleaning, lack of training, and inappropriate products or processes.

Following determination of cause, corrective action may include:

- Modification of the cleaning process, products and/or tools;
- Employee training;
- Change in cleaning times and/or frequencies; or
- Implementation of a hand hygiene program.

Corrective action should be based upon a candid dialogue between the cleaning or inspection expert conducting the Clean Standard: K-12 evaluation, and the school's supervisory personnel, school system facilities manager and/or building engineer.

4.8: Recordkeeping Procedures. A school shall have a written plan for recordkeeping and the maintenance of all documents, test results and audit/survey reports. Records that should be covered by the plan include all documents relating to cleaning and testing protocols, procedures and evaluations.

4.9: Ongoing Analyses and Procedures to Ensure Maintenance and/or Continuous Improvement. A school shall have a written policy for ongoing analysis of all measurements and testing results. Such policy shall include a commitment to continuous improvement.

4.10: Technical Training Requirements. Individuals who will perform testing, measurements, monitoring and evaluation activities shall be trained to effectively perform such activities. The training should cover the technical skills needed to ensure proper testing procedures, consistent results, and to eliminate or reduce tester bias. At a minimum, the training shall address the information necessary to implement Section 4: Protocol for Measuring and Monitoring Levels of Cleaning Effectiveness.

Section 5: Quantitative Measurement of Cleaning Effectiveness

5.1: ATP Measurement of Cleaning Effectiveness and Health. Research has validated ATP meters as an effective tool that may be used to measure whether various surfaces in schools (i.e., student desks, cafeteria tables, restroom sinks and stall doors) have been effectively cleaned specifically as it pertains to biological contamination.[2] In addition, the research has produced reasonable ATP range values for three different ATP meters for each high touch point surface tested, and that these ranges "…may be used in a standardized and routine approach to the monitoring of cleaning effectiveness in school buildings based on detection and quantification of biologically derived soiling."

While the ATP range values can provide a reasonable assurance that a surface is clean, ATP meters cannot identify specific contaminants that may present a threat to health. The researchers, therefore, also tested surfaces for culturable bacteria using a different method – RODAC plates. The simultaneous testing demonstrated that a reduction in ATP was accompanied by a consistent reduction in culturable bacteria. The researchers, therefore, were able to reasonably conclude that a reduction in ATP suggests both a cleaner and healthier surface.

The general connection between cleanliness and health is also becoming better understood. For example, studies have shown that improved cleaning of floors and desks in schools reduce upper respiratory symptoms.[3] A long-term cleaning effectiveness study has also demonstrated that a reduction of airborne pollutants through effective cleaning practices reduces occupant exposure and health risks.[4] More recent studies indicate that enhanced hygiene in schools and targeted cleaning of high touch surfaces results in reduced illnesses reduced sick building syndrome symptoms, and reduced absenteeism due to infectious illness.[5-9]

While research has established that cleaning plays a critical role in the quality of the indoor environment, it is well-recognized that there are a number of additional factors that also impact indoor environmental quality. Building maintenance practices such as moisture control, ventilation and air flow, and other factors also play a key role.

5.2: Understanding the ATP-RLU Tables. The effectiveness of the cleaning processes used at a facility may be determined by comparing actual ATP measurements with the tables set forth in this section. The tables below set forth ATP-RLU limits or ranges for specific surface types and ATP metering systems. The limits and ranges are based on extensive scientific research which included ATP measurements in schools across the United States to account for geographic and climatic differences. The limits, ranges, and verbal descriptions reflect the results that can be reasonably attained using cleaning methods readily available today.

The details of the research are set forth in "ATP as a Marker for Surface Contamination of Biological Origin in Schools and as a Potential Approach to the Measurement of Cleaning Effectiveness," as published in the June 2013 issue of *Journal of Occupational and Environmental Hygiene* by Shaughnessy and Cole, et.al. Each school selected its own cleaning method which was then rigorously monitored for compliance by research personnel. Following cleaning, ATP and RODAC sampling procedures were conducted on the cleaned surface.

The limits and ranges are, therefore, based on what can reasonably be expected to be achieved as demonstrated by the research. For example, "Highly Effective Cleaning" represents the top 25% of the thousands of ATP measurements, "Effective Cleaning / May Need Improvement" represents values that fall in the 25th to 50th percentile of all research results, and "Ineffective Cleaning" limits are those that fell in the lower 50% of the results from the research.

5.3: Using the ATP-RLU Tables. The tables below set forth ranges for each of the levels of "cleaning effectiveness" for specific surfaces within a school. These include classroom desks, restroom stall doors, cafeteria tables, and sink surrounds in restrooms. Separate ranges are provided for three ATP metering systems – Charm Sciences NOVALUM, 3M Uni-Lite NG and Hygiena SystemSure PLUS.

It is recommended that schools strive to provide "Highly Effective Cleaning" for the appropriate surfaces or areas as set forth in the tables below, based on ATP measurements for the metering system being used.

In the event that a school includes HTPs other than the four required in Section 4.3, the school either should use the ATP-RLU tables that are associated with:

- The HTP that is most similar in surface type to the surface actually being tested with the ATP meter; or
- The area in which the surface being tested is located (i.e., the limits for Classroom Desks may be used to set limits for other surfaces in the classroom such as doors or door knobs).

In the event that a school uses an ATP measurement system other than those that were used to generate the cleaning effectiveness tables below, then the table that should be

used for interpretation is the one whose ATP range of values is most closely aligned with the manufacturer's suggested ranges for the test system being used.

5.4: ATP-RLU Limits: CLASSROOM DESKS

ATP System	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Highly Effective Cleaning	Effective Cleaning / May Need Improvement	Ineffective Cleaning
Charm Sciences NOVALUM	1695 or below	1696 to 5456	5457 or above
3M Uni-Lite NG	62 or below	63 to 109	110 or above
Hygiena SystemSure Plus	3 or below	4 to 9	10 or above

5.5: ATP-RLU Limits: CAFETERIA TABLES

ATP System	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Highly Effective Cleaning	Effective Cleaning / May Need Improvement	Ineffective Cleaning
Charm Sciences NOVALUM	4951 or below	4952 to 11902	11903 or above
3M Uni-Lite NG	141 or below	142 to 230	231or above
Hygiena SystemSure Plus	9 or below	10 to 18	19 or above

5.6: ATP-RLU Limits: RESTROOM STALL DOORS

ATP System	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Highly Effective Cleaning	Effective Cleaning / May Need Improvement	Ineffective Cleaning
Charm Sciences NOVALUM	4785 or below	4786 to 10834	10835 or above
3M Uni-Lite NG	53 or below	54 to 101	102 or above
Hygiena SystemSure Plus	1 or below	2 to 6	7 or above

5.7: ATP-RLU Limits: SINK SURROUNDINGS

ATP System	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Highly Effective Cleaning	Effective Cleaning / May Need Improvement	Ineffective Cleaning
Charm Sciences NOVALUM	1872 or below	1873 to 5654	5655 or above
3M Uni-Lite NG	31 or below	32 to 62	63 or above
Hygiena SystemSure Plus	1 or below	2 to 4	5 or above

Section 6: ATP Limitations

While ATP meters have been validated as the preferred quantitative method of measuring biologically derived soiling/cleanliness, their use does have certain limitations that are discussed below. For example, in defining a cleaning process as highly effective or effective, the Clean Standard: K-12 does not suggest that a surface is absolutely free of contamination or otherwise presents a completely "healthy" surface.

6.1: Non-Biological Soiling. ATP monitoring is not appropriate for the determination of the presence or reduction of specific non-biological pollutants that may be recognized as health hazards such as lead, asbestos, and other such chemical contaminants.

6.2: Infectious Agents. ATP meters are not capable of identifying specific pathogens or infectious agents, and cannot directly detect viruses.

6.3: Biologically Augmented Cleaning Products. The use of ATP meters is incompatible with the use of biologically augmented cleaning products (BACP). BACP is a cleaning product that is augmented with non-pathogenic bacteria. These products provide a residual level of cleaning that is both safe and effective. The use of an ATP meter on a surface cleaned with a BACP will yield a high ATP/RLU reading indicating the surface is "dirty" when in fact it may be clean.

Section 7: Alternative Methodologies.

While the Clean Standard: K-12 is based on the use of ATP measurement, there are a number of alternative methods that are capable of objectively validating the effectiveness of a school's cleaning processes. These methods include direct practice observation, the use of fluorescent markers and other methods. Such methods may be used in addition to or in lieu of ATP measurement, and are referenced in *Options for Evaluating Environmental Cleaning, Centers for Disease Control (CDC)*, 2010, Appendix B, Objective Methods for Evaluating Environmental Hygiene. However, in no case will use of these methods alone be construed as meeting the requirements of the Clean Standard: K-12.

Section 8: References and Related Documents

Richard J. Shaughnessy, Eugene C. Cole, Demetrios Moschandreas, and Ulla Haverinen-Shaughnessy, (2013); "ATP as a Marker for Surface Contamination of Biological Origin in Schools and as a Potential Approach to the Measurement of Cleaning Effectiveness"; Journal of Occupational and Environmental Hygiene, 10:6, 336-346, June 2013.

Carmen V. Sciortino, PhD, R. Allen Giles, BS, "Validation and Comparison of Three Adenosine Triphosphate Luminometers for Monitoring Hospital Surface Sanitization: A Rosetta Stone for Adenosine Triphosphate Testing," American Journal of Infection Control, Volume 40, Issue 8, October 2012.

[1] **Richard J. Shaughnessy, Eugene C. Cole, Demetrios Moschandreas, and Ulla Haverinen-Shaughnessy, (2013):** "ATP as a Marker for Surface Contamination of Biological Origin in Schools and as a Potential Approach to the Measurement of Cleaning Effectiveness." *Journal of Occupational and Environmental Hygiene 10*:6, 336-346 (2013).

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[9] **Schulte, J., L. Williams, A. Jawaid, et al.:** How we didn't clean up until we washed our hands: Shigellosis in an elementary and middle school in North Texas. *South. Med. J. 105*:1-4 (2012).