PPE Concerns: PPE Assessments, Job Hazard Analysis, Masks and N-95 Respirators, and OSHA Standards In The Time Of The SARS-CoV2 Virus

Many wastewater Operators have asked for guidance about the use of Personal Protective Equipment at their facilities during the COVID 19 pandemic. A good place to start this discussion is to review the OSHA standards that apply. Two of the most important standards are 1910.132 Personal Protective Equipment and 1910.134 - Respiratory Protection. Let’s start with 1910.132.

One of the most important parts of 1910.132 Personal Protective Equipment is 1910.132(d)(1) which states:

The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE).

OSHA requires that employers document and certify a “Hazard Assessment” for each job task as part of the PPE Standard ( 1910.132 Personal Protective Equipment). Even though this is a very basic requirement of OSHA, not all employers actually perform or document these hazard assessment certifications.

But what constitutes a “Hazard Assessment?” Is it a “Job Hazard Analysis” (JHA), or is it a “PPE Assessment?” If you read the PPE Standard, you’ll notice that the language is very vague regarding what constitutes a “Hazard Assessment,” but if you dig deeper into the standard, you’ll find the answer....

The differences between a JHA and PPE Assessment and the requirements and value of each:

**Job Hazard Assessment:**

A JHA identifies all potential hazards present in a particular job task, and then recommends ALL potential controls to reduce or eliminate those hazards (behavioral, work environment conditions, engineered controls, PPE, etc.).

A primary goal of the JHA is to attempt to eliminate hazards via engineered, administrative and environmental controls, and if those controls cannot completely eliminate the hazard, then PPE controls must also be put into place.

JHAs identify all potential hazards associated with each job task, and then take all controls into consideration for eliminating or reducing those hazards.

JHA’s are also a valuable tool for developing safe work practices and procedures, and as a training tool for workers.

It is critical to note that OSHA does not have a specific requirement that employers document JHA’s , and instead only states that a JHA is “one component of the larger commitment of a safety and health management system.” Even though JHA’s aren’t required, OSHA believes that JHAs are a “best practice” and should always be included as part of a facilities health and safety program.

(continued on page 8)
Where There’s Sewage, There’s Solids

by

Eric J. Wahlberg, Ph.D., P.E. (California), former Colorado Class A Operator
WasteWater Technology Trainers (wwtechtrainers@gmail.com)

In the Abbreviations section of ABC’s Formula/Conversions Table (my copy says, “Effective February 10, 2009”), there is this entry:

SS settleable solids

ABC is not alone identifying settleable solids as SS, but, truth be told, this has forever caused me consternation. First of all, when I see SS, my first inclination is to think suspended solids. Second, especially when I was starting out in wastewater treatment operations, settleable solids always sounded to me like a classification of solids in and of itself, and that didn’t make any sense to me whatsoever. I also remember being very confused by everybody’s incessant referral to BOD and TSS as if these two constituents were distinctly different and included everything in the influent we, as operations professionals, had to be concerned with. That never seemed right to me either, but maybe I’m a slow learner. Or maybe not. Maybe we’ve confused ourselves: Over and over and over again in the operations literature, even on certification exams, is reference to finely divided solids. Ai yi yi! What are we even talking about?

Being the total wastewater nerd I am, I have spent a lot of time thinking about the different solids in wastewater, and that’s what I’m writing about today. Not to spoil things for you, let me say at the outset, there are 11 categories of solids that define the universe of wastewater treatment, unless you count colloidal solids, which would make 12 categories. But, as you’ll learn below, colloids are measured either as total suspended solids (TSS) or total dissolved solids (TDS), so we’re back to 11. We’re getting ahead of ourselves.

The universe of wastewater treatment has a nice ring to it, doesn’t it? But I should qualify what I mean by universe. The Code of Federal Regulations, Title 40, Part 133, Secondary Treatment Standards, defines secondary treatment as a biological process that achieves a minimum of 85% removal of BOD and TSS across the plant. Ammonia oxidation (nitrification), nitrogen removal (nitrification followed by denitrification), and biological phosphorus removal, even if accomplished in a secondary treatment process like activated sludge, are considered tertiary treatment. In this article, my universe is secondary treatment.

To start, assume that I have 30 gallons of raw influent in a garbage can that is being continuously mechanically mixed. The mixing is so complete, every aliquot taken from the can used in the analyses described below is 100% representative of the influent sample. 100%.

A carefully measured volume or mass of sample (from the can) is placed in a tared evaporating dish—tared, as you recall, means the dish has been thoroughly cleaned, fired in a 550°C furnace, and weighed to the nearest 0.1 mg. All the water is then evaporated from the dish and the residue in the dish completely dried in an oven before weighing. The weight of the tared dish subtracted from the weight of the dish-plus-residue, then divided by the volume of sample, is the concentration—after converting to mg/L—of total solids, TS.

Just to add to our confusion, EPA writes, “Total solids are dissolved solids plus suspended and settleable solids in water” (https://archive.epa.gov/water/archive/web/html/vms58.html). Suspended here, although not specifically stated, is in accordance with the dictionary definition of the word, “to keep from falling or sinking by some invisible support (such as buoyancy)” (Merriam-Webster.com Dictionary, Merriam-Webster, https://www.merriam-webster.com/dictionary/suspend. Accessed 23 Apr. 2020).

Let’s be crystal clear here. While suspended was probably not the best choice of words, we, as a profession, define total suspended solids (TSS) as any solid that’s larger than 1.2 µm. (Note: Standard Methods, EPA, and others get around the confusion of suspended by calling TSS and TDS filterable residue and non-filterable residue, respectively.) In the business of wastewater treatment, our use of the word suspended has nothing to do with whether or not solids settle.
MAWEA / NEWEA Events

MAWEA Spring Meeting — Originally Scheduled for Wednesday June 10, 2020 Log Cabin Holyoke MA is Cancelled

MAWEA Annual Golf Tournament — Originally Scheduled for Wednesday June 17, 2020 Heritage Country Club, Charlton MA is Rescheduled to September 30, 2020 at Heritage Country Club, Charlton MA

NEWEA Spring Meeting Originally Scheduled for May 31-June 3, 2020 Lake Morey Resort Fairlee, VT is Cancelled

MAWEA Fall Meeting — Wednesday September 16, 2020 Meeting Mt Wachusett Ski Resort, Princeton MA
Plato, Aristotle, and Me (and you too!)

Around the year 1510 the great Italian Renaissance artist Rafael was commissioned by the pope to paint a huge fresco on one of the walls in the Vatican. This painting is populated with many images of famous people from throughout the ages, the most recognizable being that of the philosophers Plato and Aristotle. The accompanying image from a portion of Rafael’s painting shows an elderly Plato with his right hand raised and his index finger pointing towards the heavens, suggesting his utopian-based philosophy. The much younger Aristotle, one of Plato’s students who eventually split from him to pursue his own philosophical approach to life’s problems, has his right hand outstretched as if over the earth, suggesting his practical and empirical-based philosophy.

A framed copy of this image hung in my home office for years. It was an image I needed to see every day to reminded me of compromise and to keep in check whatever disease it is that I have that made me want to realign every spreadsheet I saw, to keep from crying out in exasperation whenever I received a letter not signed in blue ink, and to straighten out all the cars in the lot so that they were truly parallel to the parking lines. Medication never helped with this, only Plato and Aristotle did. Life is a compromise: I needed to keep focused on the ideal, but to work with what I had. It was okay to be somewhere in the middle. (continued on Page 12)
New name, same NEIWPCC  We know that our name has presented a challenge in the past (and we have heard lots of versions over the years!). After extensive research, we have decided to embrace our acronym – NEIWPCC- as our name. “NEIWPCC” rhymes with “gluey stick” (and “chewy quick”). So say goodbye to all of those versions of our name. And say hello to NEIWPCC.

NEIWPCC Courses Canceled Through May 31, 2020  Effective April 14, 2020, NEIWPCC is canceling all wastewater operator training classes through May 31, 2020. Anyone who has paid for training in that period will receive a full refund. Because the situation with COVID-19 and its impact on access to classroom space and group size limits continues to evolve, there is no immediate plan to reschedule canceled classes at this time. NEIWPCC will announce a determination on the need for additional class cancellations no later than May 18, 2020. For the most recent information about the status of NEIWPCC programs in light of the coronavirus pandemic, consult our status page.

Convening Forums during the Pandemic  NEIWPCC is helping state wastewater operator certification and training program staff throughout New England, New York, and New Jersey prepare for potential operator shortages, investigate opportunities for personal protective equipment and minimize certification and recertification issues resulting from canceled in-person training. NEIWPCC is filling a vital role by hosting weekly teleconferences to support our state and Federal partners through the coronavirus crisis.

Watch for NEIWPCC’s Remote Learning opportunities coming in May!  NEIWPCC is preparing to offer remote training for wastewater operators that do not require face-to-face participation. We will be providing live, two-hour mini-classes via an interactive online training software. Our initial efforts will focus on essential training for those new to the field and seeking to take a license exam. Initial mini-class topics will include: introduction to wastewater treatment (municipal and industrial), collection system operation and maintenance, pumps and hydraulics, and more. Information will be posted on our training calendar page very soon.
Welcome New MAWEA Board of Directors Members

Peter Lyons and Landon Kendricks

Peter Lyons is a licensed professional engineer with Woodard & Curran’s Water Practice. He has over six years of experience providing a variety of engineering services including planning, design, and construction oversight for collection systems, wastewater treatment facilities, and pump stations. He has also served as a part-time operator of wastewater pumping stations, treatment systems, and combined sewer overflow pumping stations in Boston and Hull, MA. He is particularly interested in the development of entry-level wastewater operators and how they can build their skill sets to become effective leaders.

Landon Kendricks, has been a licensed Massachusetts wastewater grade IV operator in the water and wastewater field since 2012. Working predominately in Reclaimed Water Facilities, Wastewater Facilities and CSOs, his focus has been on preventative maintenance, prolonging the usable life of critical assets, and increasing operational efficiency through a standardization of work processes as well as implementation of new technologies. Currently Landon Works for Rockwell Automation as an Account Manager focusing on water, wastewater, and infrastructure accounts bringing the Industrial Internet of Things and “Smart” Water/Wastewater Plant to the New England and Upstate New York Region. Landon also has a passion for Asset Management and Mobile Data Management technologies.

A graduate from the University of Illinois Urbana-Champaign, Landon completed his B.A in Speech Communication with a focus on business in 2008. Landon has put those speech skills to good use as he has been selected twice (2018 & 2019) to present at the New England Water Environment Association Annual Conference in Boston.

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Personal Protective Equipment (PPE) Concerns (Continued from page 1)

PPE Assessment:
A PPE Assessment is a narrower tool for identifying and controlling hazards. Just like the JHA, it identifies all potential hazards associated with each job task, but only considers Personal Protective Equipment as a means of controlling those hazards (and not engineered, administrative or other such controls as in the JHA).

So Which One Of These Assessments Does OSHA Consider a “Hazard Assessment?”
OSHA’s PPE standard actually states a specific requirement that a “hazard assessment” is completed and documented for each job task. Although the term “hazard assessment” is vague, and doesn’t specify “JHA” or “PPE Assessment,” OSHA regulations state the following:
When the walk-through is complete, the employer should organize and analyze the data so that it may be efficiently used in determining the proper types of PPE required at the worksite. The employer should become aware of the different types of PPE available and the levels of protection offered.

OSHA goes on to say the following regarding how to document this assessment:
Documentation of the hazard assessment is required through a written certification that includes the following information:

- Identification of the workplace evaluated;
- Name of the person conducting the assessment;
- Date of the assessment; and
- Identification of the document certifying completion of the hazard assessment.

Based upon this information, it is clear that OSHA’s PPE standard defines a “Hazard Assessment” as a PPE Assessment/Certification.

Every facility should have a written PPE assessment and it relatively easy to do. At a group meeting of the staff develop your list of routine task and discuss what type of PPE should be worn. And, as with all types of these documents it is a living document. It should be reviewed and updated at minimum annually but preferably after each task is complete and the Operators gain new knowledge and perspectives of the correct PPE for the task.

So how should non-routine tasks be handled? Before every non routine task is started the staff should meet to complete a Job Hazard Analysis. And, as mentioned previously, a JHA not only covers PPE but other safety measures such as engineering and administrative controls. A good example would be Lock Out – Tag Out or Combined Space Entry. The JHA’s for non-routine tasks can be saved to be used when the task comes up again. Remember, as mentioned in the previous paragraph, a best practice for both JHA’s and PPE Assessments is to do a post task meeting to discuss how the task went and whether the JHA or PPE Assessment needs additions or updates.

Now let’s discuss 1910.134 - Respiratory Protection. This is a hot topic now as Operators are asking for guidance on masks and respirators as PPE protection against the SARS-CoV2 virus. We’re not going to do an encompassing view of all respiratory requirements but concentrate on face masks and N 95 respirators.

Face masks are not respirators. They are a loose-fitting, disposable face covering providing a physical barrier between the mouth and nose of the wearer and the immediate environment to help block large-particle droplets, splashes, sprays, or splatter. They are designed to be worn to help prevent contamination of others by capturing liquid droplets that are expelled by the wearer. Face masks protect anyone in the environment from the wearer by reducing particles expelled by wearer into the environment. These are not intended to protect the wearer.

N-95 Respirators (Contractor Grade) are designed to help reduce exposure to airborne particulates. N-95 respirators have filtration efficiency of at least 95% against non-oily particles N-95 Respirators are designed to protect the wearer from inhaling airborne particles. N-95 respirators do not protect anyone in the environment.

N-95 Respirators (Surgical Grade) are cleared by FDA as a surgical mask. N-95 Surgical Respirators protect the wearer and anyone in the environment. They help reduce particles both inhaled and expelled by the wearer.

(continued on page 9)
PPE Concerns (continued from page 8)

What does 1910.134 - Respiratory Protection standard have to say about N-95 respirators? If the use of an N-95 respirator is required by a facility the Respiratory Protection Standard requires the following

- Written Respiratory Protection Program (RPP)
- Qualified Administrator
- Medical Clearance for employees to wear an N95
- Annual Fit Testing
- Annual Training

What if N95s for a particular use or application are not specifically required by the facility, but an individual voluntarily chooses to wear an N95? In such a situation, an N95 is the only respirator that OSHA will permit a worker to wear on such a voluntary basis without first obtaining medical clearance.

OSHA does, however, require the employer, in such situations, to provide the worker with a copy of Appendix D to the Respiratory Protection Standard. Be aware that when respirator use is required, employers cannot use the voluntary exception to avoid developing a written respiratory protection program, appointing a qualified administrator, obtaining medical clearance for employees who will use the respirators, or providing annual training and annual fit testing.

The required/voluntary issue of wearing a N-95 respirator is an important one for the facility to consider when developing their PPE assessment list. It is best to fully review 1910.134 - Respiratory Protection and all of its obligations on a facility to protect its workers.

I hope this is helpful advice on PPE during this challenging time. It has certainly caused many facilities to study and re-assess their PPE use and requirements. One of the best pieces of PPE that a facility should consider is the face shield in addition to the use of safety glasses. The face shield works well to protect against sprays and splashes and greatly reduce contact with sewage. Protecting the worker against sprays and splashes can also help to prevent masks and respirators from getting soiled and prolonging the life of the mask or respirator.

MAWEA President’s Message

I hope you and your families are all staying well. Our world has changed a lot over the last eight weeks. Some of those changes, in how communities conduct business, how we educate, how we socialize, may be permanent.

By the time you are reading this, Massachusetts, or at least parts of it, may be getting ready to reopen. Here at home, one in four workers has applied for or is receiving unemployment; across the country, nonessential businesses and public services were ordered closed. This is a health crisis so strange and disruptive that even trained, licensed medical personnel are being laid off. That kind of disconnect really throws into doubt the whole concept of “essential”. For some of us, however, and all of you, there won’t be a “reopening”: you never closed.

Essential is a word you may have heard too often at this point. We are continually reminded of the essential nature of water utilities, their role in our communities’ health, prosperity, and viability. It is undeniable that, without high performing infrastructure, we cannot develop, attract or maintain a prosperous business or social environment. The instantaneous availability of sanitation services is the prerequisite to all of that.

So it was no surprise to find clean water operators listed among the nine pages of essential workers and activities issued by the governor’s office. Of course, like so many other essential workers, you immediately found that some tools needed to keep you safe are in short supply, or are not to be had at all. As some may know, MAWEA Executive Director Mickey Nowak has been helping to coordinate an effective response to that issue, with DEP, by gauging the need for protective masks at the plant level, to ensure an equitable distribution throughout the treatment community. Jane Downing, chief of the drinking water branch for EPA Region 1, arranged a shipment of masks with FEMA, which is expected mid-May. Given the scope of this health crisis, it is not likely to be the last such arrangement required.

(continued on page 15)
A Note to Members Regarding the MAWEA Officer Election of 2020

The NEWEA Bylaws lays out the procedure of officer elections based on the ability of the membership to gather for an Annual Election Meeting at the June quarterly meeting. At that meeting, the chair of the Nominating Committee presents a slate of nominees for the four expiring MAWEA director terms for the year, and a motion is entertained to approve the presented slate of officers for election. The attending membership is given opportunity to discuss or propose amendments to the presented slate, and then a vote is taken to approve the slate as presented/amended.

This year, due to the Covid-19 pandemic, in order to preserve the health of all concerned, there will be no in-person annual election meeting of the MAWEA membership. Given the extraordinary circumstances of the pandemic, and in order to keep the business calendar and officer roster of the association up to date, the Board of Directors has determined that this newsletter announcement shall serve as the notice to the membership of the proposed slate of officers and proposed officer line-up for the coming fiscal year. If, by 12:00 noon on the date of the canceled quarterly meeting (June 10, 2020) there are no objections from the membership to this nominating report, the slate of officers for election will be considered accepted by the membership by unanimous consent. Should any MAWEA member in good standing wish to correspond regarding the following report, such correspondence shall be sent to the attention of the MAWEA Nominating Chair at mawea1965@yahoo.com.

Report of the MAWEA Nominating Committee for the 2020 Election of MAWEA Officers

The proposed slate of officers, as previously approved by the MWPCA Board of Directors, is as follows:

For new terms that will expire on June 30, 2023:
- Benjamin Smith of EOS, incumbent (now serving as Vice-president)
- Raymond Willis of Onsite Engineering, incumbent
- Robert Delgado of the Town of Barnstable, incumbent
- John Digiacomo of the Town of Natick

All listed candidates have indicated a willingness to serve. If there is no objection from the membership sent to the MAWEA Nominating Chair at mawea1965@yahoo.com by 12:00 noon on June 10, 2020, the above-presented slate of officers shall be declared elected by unanimous consent. The terms of these elected officers shall expire as noted above.

The remaining Board seats for FY 2021 are held as follows:

Directors now serving whose terms will expire at the end of June 2021 are:
- Robert Greene of Delta (now serving as Past President)
- Kenneth Harwood of Ayer
- Eric Smith of WhiteWater (now serving as President)
- Landon Kendricks of Rockwell Automation

Directors now serving whose terms will expire at the end of June 2022 are:
- Michael Burke of Suez,
- John Downey of Spire Metering Tech, currently serving as President-elect
- Jennifer Lichtensteiger of NEIWPCC
- Peter Lyons of Woodard & Curran

(continued on page 11)
Sewer workers deserve thanks and praise

Submitted by Linda L Schick, PQE, Fairhaven Sewer Superintendent to the Fairhaven Neighborhood News

We are living through unprecedented times that no one can truly understand. The country has essentially shut down, people are out of work, children are not going to school, and we look at each other and ourselves, wondering if we are carrying or catching a virus that can kill our own family members, friends or strangers. A new world of one way grocery aisles, early senior shopping, and banks welcoming customers with masks on, has us all wondering, praying and hoping that somehow life will go back to what it was before, when we could hug our friends, and smile at a stranger in passing.

When people take a minute to be thankful, they rightly praise their front line workers: police, fire, medical, grocery workers, truckers——all of whom are keeping us safe and fed for which we are ALL thankful. While these front line workers are performing their tasks tirelessly, they are at least recognized for their contribution, and can feel proud that they are serving for the greater good.

I want to take a minute to thank the people that are not front line workers, but BACK end workers: the employees of the Fairhaven wastewater department. For these employees there is no praise or recognition, yet they come to work every day, and put their lives on the line so that their customers can flush their toilets, wash their clothes, take a shower, without having the additional worry of flooding their homes with their own waste. That waste makes its way to the pump stations and treatment plants of Fairhaven where it is silently, fearlessly treated by wastewater operators. These operators are pulling “flushable” wipes from their clogged pipes, running emergency generators when the power goes out, monitoring all aspects of the system that allows the by-products of a good meal to become clean water to return to our beloved harbor.

These people are the essential back end workers——the ones who take something that not many people will work with, that gives them the potential to become ill from not only from COVID-19, but hepatitis, typhoid, paratyphoid, bacillary dysentery, gastroenteritis, and cholera——every day! Many of these illnesses have similar symptoms, which vary in severity. Most infect the stomach and intestinal tract and can cause symptoms like headache, diarrhea (sometimes with blood), abdominal cramps, fever, nausea, and vomiting. These public servants deal with these issues daily, 24 hours a day, 7 days a week for the greater good, but as back end workers, they do not receive praise, and are frequently treated with ire when something does go wrong in the system, causing a backup in a home or business, that they have arrived at to resolve.

I have had the honor of knowing the wastewater operators of Fairhaven for 33 years of my life. I have seen them do the dirty, nasty, gagging jobs that no one else would think of doing, without giving it a second thought. I have watched them when they are listening to everyone praise the front line workers, who 100% deserve the praise, and wonder if anyone even knows they exist. There is no pizza, or cookies, or thank you posters from the school children. They don’t receive awards, or public recognition, but every day they come in and do it all again. They know that they are true environmental protection warriors working the back end so that the front end can do their jobs and go home and shower, empty their bladders and bowels, wash their clothes, or cook a meal without ever giving a second thought to where all that waste goes.

Officer Election

(continued from page 10)

Per article VI, Section 5 of the MWPCA Bylaws:

Executive Officers taking office for the coming fiscal year will be:

John Downey of Spire Metering Technology, President, Benjamin Smith of EOS, President-elect, Eric Smith of White Water, Past President

Vice President and other appointments shall be made as indicated in the bylaws to all other offices at the first meeting of the Board of Directors following the Election Meeting date.

The following annual Board appointments will expire on June 30, 2020, requiring renewal – positions listed need not be sitting members of the Board, and nominations from the membership are encouraged:

DEP Representative (currently John Murphy), Recording Secretary (currently Charles Tyler), Meeting Management Coordinator (currently Robert Greene), Education Coordinator (To be determined), Treasurer (currently Rick Nash of Xylem)

Respectfully, MWPCA Nominating Committee, Charles Tyler (chair)
Plato (continued from page 4) Every day we all work with a grab-bag full of people having various personalities and skill sets. In the morning we walk into our jobs believing it will go one way only to leave at the end of our shift frazzled and wondering why our tasks didn’t go as planned. Under normal conditions all this can be stressful. Now add in the huge disruption caused by the COVID-19 virus: understaffed shift rotations, treatment chemical delivery delays, and unusual ways of doing our day-to-day business. Through all this we are still expected to meet our NPDES permits. It is certainly not the ideal way of doing business, or at least the way we think it should be done, but we work with what we have and do the best we can. Will it be perfect? No. Does it have to be perfect? No. It just has to be functional, and that is okay.

So if someday I’m stressing that I need to organize your kitchen utensil drawer so that all the knives, forks, and spoons are in the proper bin and are all pointing in the right direction, give me a copy of the Rafael painting showing Plato and Aristotle. Then send me back to work. I was just having a little relapse. Utensils are always functional outside the bin regardless of how they are stored inside the bin.

I took a light-hearted approach in this article to help address what the surveys and news reports are acknowledging – the stress in our lives caused by the COVID-19 disruption. Eventually this will pass, and we will be back to business as usual. Together, we will get through this.

If you have any questions, comments, or suggestions, feel free to contact me at TLoftus@ubcleanwater.org
**Solids** (continued from page 2) In the next analysis, a carefully measured volume of the influent sample is passed through a tared, glass-fiber filter with a nominal pore size of 1.2 µm, then completely dried in an oven before weighing. The weight of the tared glass-fiber filter subtracted from the weight of the filter-plus-residue, then divided by the volume of sample filtered, is the concentration—after converting to mg/L—of **total suspended solids, TSS**. Now, a carefully measured volume or mass of filtrate from the TSS test is placed in a tared evaporating dish. All the water is then evaporated from the dish and the residue in the dish completely dried in an oven before weighing. The weight of the tared dish subtracted from the weight of the dish-plus-residue, then divided by the volume of filtrate used, is the concentration—after converting to mg/L—of **total dissolved solids, TDS**.

TS can be subdivided, by Filtration in Figure 1, into TSS and TDS. This establishes the following identity:

\[ \text{TS} = \text{TSS} + \text{TDS}. \]

A colloidal solid—also known as a colloid—is defined by the scientific community as any solid with a maximum dimension of 0.001 to 1.0 µm. The human eye, unaided, can see down to the diameter of a human hair, approximately 100 µm. Therefore, human beings cannot see colloids; they are way smaller than 100 µm. The nominal pore size of the glass-fiber filter used to separate TSS from TDS is 1.2 µm. If a colloid hits the glass-fiber filter just right, it will be captured and measured as TSS. But because of their size, which is smaller than the 1.2-µm pores in the glass-fiber filter, they may pass through the filter and be measured as TDS. Regardless of where they end up, **colloids are invisible to the human eye**.

**Figure 1.** The 11 (and only 11) categories of solids defining the universe of secondary treatment of wastewater (see text for procedures and definitions).

(continued on page 16)
Operator Renewal Deadline Extended  Please be advised that the Massachusetts DEP has extended the wastewater treatment plant operator license renewal deadline for the 2018-2019 renewal cycle to June 30, 2020. Massachusetts' wastewater treatment plant operators are essential to the health and well-being of the commonwealth and their skills and experience are needed now more than ever during the current COVID-19 crisis.

If your license expired on December 31, 2019, you are still able to renew until June 30, 2020. You have the option to change your status to Inactive. In order to declare Inactive status, you cannot be working in the wastewater field. Inactive operators are still required to renew every two years, but aren’t required to submit TCHs. To reactivate a license from Inactive to Active, a Status Change form must be submitted to our office.

If you have any questions or issues pertaining to renewing your license or changing the status of your license please contact John Murphy, MassDEP - Wastewater Operator Certification and Training (mailto:john.j.murphy@mass.gov or 617-352-3375).

The final deadline to get your renewal paperwork into us is extended to June 30, 2020. After that date, your license will be revoked due to non-renewal unless the MassDEP determines it necessary to extend the deadline again, in response to the COVID-19 crisis.

For more COVID-19 information for drinking water and wastewater operators please visit: https://www.mass.gov/lists/covid-19-information-for-drinking-water-and-wastewater-operators
If you have any questions, please contact Michelle Jenkins directly at the Massachusetts Certification Program at 978-349-2516, or by e-mail at mjenkins@neiwpcc.org.

Operator Certification Exams – All PSI testing locations are currently closed and we are working with ABC for updates and options to offer exams in the future, including remote computer-based proctoring.

For More Details
Massachusetts Wastewater Operator Training and Certification:

NEIWPCC Training Calendar:
https://portal.neiwpcc.org/training-calendar.asp

COVID-19 information
https://neiwpcc.org/coronavirus-and-neiwpcc/

For more information or questions on NEIWPCC or the MWOT program, please contact us at training@neiwpcc.org or at (978) 323-7929.
Presidents Message (continued from page 7)

Yet this represents only one of the many challenges the COVID pandemic has brought to your door. The governor’s executive order with respect to your responsibilities is clear - effective treatment, with all that entails, must continue. This raised a lot more very legitimate concerns, around staffing, licensure, work rules, permit compliance, sampling, interacting with the public and interacting among ourselves. The weekly conference calls with Commissioner Suuberg have yielded, to date, 28 pages of discussion points for resolution or follow up. The overarching message from these sessions, however, is consistent: to underscore the importance of communication. Document the challenges, make DEP and your own municipal leaders aware, keep them informed. The world is so new today, we haven’t formulated some of the questions yet, let alone correct answers. And this all comes against the backdrop of the release of the intended use list, which will see 58 clean water projects receive funding later this year, even as we aren’t really sure what “later this year” is going to bring. This situation, perhaps as no other could, underscores the fact that successful treatment and compliance are a collaborative effort. As our society enters clearly uncharted territory, we should look to collaborate, relate our ideas on the challenges, the successes we’ve had, and share some of the common sense approaches we’ve hit upon to see us through. Clean water operators solve problems daily, because there is no leaving it to tomorrow. What better community with whom to share your thoughts than this one?

June is membership renewal month. As members, I hope you value the benefits MAWEA has brought over the last year, and the community of shared knowledge and support we provide each other. MAWEA membership facilitates maintaining your license through sponsored training, technical meetings, coordination with NEIWPCC and OSHA, support of the Operators’ Challenge, providing continual updates on industry news and events, and advocating for your success- including, as mentioned, helping get you the protective equipment you need to minimize the chance of infection. I hope you will renew your membership soon, encourage your colleagues to consider joining with us, and continue the tradition of mutual support and career development that MAWEA was founded to promote.

Fairhaven Superintendent Linda Schick wrote an editorial this week for her local newspaper to highlight the contribution her operators make, now in this oddest of crises, but also every day. Linda points out that the work is routinely health-threatening, can be dangerous, and requires not just an uncommon level of talent, but an uncommon commitment to success. Operators are the unseen and unsung among the many heroes in the present story, perhaps because the rest of us are so used to the benefits of their success. They, and you, should not go unnoticed, not today, and not on any day when we enjoy a healthier environment.

So thank you for your work, your commitment to providing the part of the infrastructure that holds the rest of the place together. We will continue to support your efforts, and look forward to getting together when we can. Until then, work safely, be well, and good health to those you care about.

John Downey
President, MWEA 2020-2021
Solids (continued from page 13) TS, TSS, and TDS are now all fired in the 550°C furnace. This step is indicated in Figure 1 as Incineration. After incineration, ash remains in the TS and TDS evaporating dishes and on the TSS glass-fiber filter, and each receptacle holding ash is weighed. The weight of the tared dish used in the TS analysis subtracted from the weight of the dish-plus-ash, then divided by the volume of sample used, is the concentration—after converting to mg/L—of inorganic solids, IS. The weight of the tared dish used in the TDS analysis subtracted from the weight of the dish-plus-ash, then divided by the volume of filtrate used, is the concentration—after converting to mg/L—of inorganic dissolved solids, IDS. The weight of the tared glass-fiber filter used in the TSS analysis subtracted from the weight of the filter-plus-ash, then divided by the volume of sample filtered, is the concentration—after converting to mg/L—of inorganic suspended solids, ISS. (Note: Inorganic solids are also known as fixed solids.)

Anything that burns at 550°C (i.e., incineration) is operationally defined in our business as volatile. Volatile is synonymous with organic. Computationally, the concentration of TS minus the concentration of IS equals the concentration of volatile solids, VS; the concentration of TSS minus the concentration of ISS equals the concentration of volatile suspended solids, VSS; the concentration of TDS minus the concentration of IDS equals the concentration of volatile dissolved solids, VDS. Given how VS, VSS, and VDS are determined, as just explained, the following identities are self-evident:

\[
\begin{align*}
TS &= IS + VS \\
TSS &= ISS + VSS \\
TDS &= IDS + VDS
\end{align*}
\]

Settleable solids are determined volumetrically using an Imhoff cone. A 1-L aliquot of the influent sample from the can is poured into an Imhoff cone and a stopwatch started. After 45 minutes, the sides of the cone are gently scraped with either a glass stirring rod or a wire to dislodge any adhering solids, and after 60 minutes the volume of settled solids in the tip of the cone is measured. Anybody that has ever done an imhoff cone test has observed solids remaining in the supernatant in the cone after 60, 120, or more minutes. Both the solids in the tip of the cone and in the supernatant are visible. Because they are visible, they are greater than 100 µm and, therefore, will be measured as TSS. From this, an important, indisputable fact emerges: All settleable solids are TSS, but not all TSS are settleable. On this account, TSS are subdivided in Figure 1 by Sedimentation into settleable TSS, TSSset, and non-settleable TSS, TSSnon.

And: TSS = TSSset + TSSnon

Whether or not a visible solid—let’s call it a particle—will settle depends on three attributes: the particle’s size, shape, and density. From above, colloids are specifically defined based on their size. While there may be some overlap, TSSnon and colloids are not the same thing. Because human beings can’t see colloids, the “stuff” we see suspended (dictionary definition) in the supernatant of an Imhoff cone cannot be colloidal. Although I’ve been unsuccessful finding anywhere a definition of finely divided solids, despite its widespread use, I am willing to bet that someone somewhere at some point decided the visible stuff in the supernatant in an Imhoff cone was finely divided solids. No! If we can see it, it’s TSS, and if it doesn’t settle, it’s TSSnon. In short, I believe TSSnon are the finely divided solids of yesteryear. As a profession, we need to get away from the confusing terminology settleable solids and non-settleable solids, and, certainly, finely divided solids has no place in our lexicon; we’re smarter than that.

Figure 1 defines the universe of wastewater treatment; excepting nutrient removal, everything operations professionals are concerned with is described by Figure 1. But, you ask, where’s the BOD?

The BOD of the influent sample in the can is either soluble (sBOD) or is associated with particles, particulate BOD (pBOD). pBOD in the sample is determined by subtracting the BOD of the filtrate in the TSS test (sBOD) from the total BOD in the sample. Volatile is synonymous with organic. BOD also is a measure of organics. Thus, for all intents and purposes, VS and BOD measure the same material (all or- ganics in the sample), VDS and sBOD measure the same material (dissolved/soluble organics in the sample), and VSS and pBOD measure the same material (particulate organics in the sample).

Let’s suppose I emptied a 5-lb bag of salt into the influent sample in the can. Salt dissolves and is inorganic so would be measured as IDS (and, therefore, would be part of IS). Instead of salt, suppose I emptied a 5-lb bag of sugar into the sample. Sugar dissolves and is pure BO D so would be measured as VDS (and, therefore, would be part of VS). I recently saw an actual-size photograph of a person’s finger tip after it was stuck in the sand at an ocean beach. Visible on the person’s finger tip were grains of sand and small, blue spheres of microplastic. If a 5-lb sample of this beach sand was emptied into our influent sample, where would the sand and microplastic show up in Figure 1? Since both are visible to the naked eye, both are greater than 100 µm so would be measured as TSS, but in the 550°C furnace the microplastic would burn (measured as VSS) and the sand wouldn’t (measured as ISS). As well, the microplastic would not exert biodegradability. Numerically, would you expect VSS = BOD? VDS = sBOD? VSS = pBOD? Absolutely not. For one, they are entirely different tests: something has to burn at 550°C to be measured as volatile, and BOD is measured based on oxygen usage by aerobic microorganisms over 5 days. And some pollutants would be measured in one test, but not the other; as just discussed, microplastic would burn at 550°C but is unbiodegradable. Take note of for all intents and purposes in the previous paragraph; for all intents and purposes, VS = BOD, VDS = sBOD, and VSS = pBOD in Figure 1. Indeed, Figure 1 defines the universe of secondary treatment of wastewater!

Secondary wastewater treatment plants, my universe, remove everything with a V in Figure 1 (VS, VSS, VDS), all of which, as discussed above, equate to BOD. All TSS in Figure 1 (TSS, VSS, ISS, TSSset, TSSnon) also are removed. (Note: The TSS in secondary effluent is escaping biomass and bears absolutely no resemblance to the TSS in raw sewage.) IDS is relatively untouched in wastewater treatment plants, passing through influent to effluent. So, BOD and TSS are the constituents removed in wastewater treatment. Interesting, though, that they overlap each other (VSS = pBOD), but not completely: ISS isn’t measured in the BOD test and sBOD (VDS) isn’t measured in the TSS test.

Where there’s sewage, there’s solids. Eleven different categories of solids. Wouldn’t it be nice if we could standardized these categories and stop with all the confusion?