Requirements for Recreational Water Facility Equipment

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Live safer, Swim Safer™

- Risk Mitigation and why you should require independent validation of materials, products, systems
- Conformity Assessment-Standard, Test, Audit, Certify
- Requirements/Standards - Development Process
- Certification Process
- Specifics of Product Evaluation
- Requirement Examples Filters, Media, UV, Pumps, Alarms, WQTD, AC, SVRS
- Updates to North American Industry Standards
- Benefits and Value of Product Testing & Certification

Live safer, Swim Safer™

The need for 3rd party testing and certification to standards is greater than ever

- Consumers are increasingly concerned about public health and safety issues.
- RWI Outbreak reporting is high (pools-crypto)
- Entrapment/drowning incidents are devastating to individuals as well as to the recreational water industry
- Lax management, insufficient products, violent deaths and accidents along with the associated bad press have tarnished the image of the Pool and Spa industry
- Industry is increasingly concerned about the potential negative impact of a health and safety crisis.

"Each year people are severely injured and drown due to hair, finger, limb, and body entrapment." **(CDC)**

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Terms and Definitions

- Code
  - Criteria of reference to general and specific criteria such as
    - standards, performance requirements etc.
  - Many Types:
    - Public health, pool/spa, plumbing, building, electrical, Food-restaurant,
- Standard
  - Mfrs, users, public health
  - ASTM, ASME, NSF, UL, etc.
- Testing
  - Nationally Recognized Testing Laboratory (NRTL)
  - NSF, UL, etc,
- Certification – CA On-going conformity assessment
  - What is done
  - When, or How often
  - Where is work performed
  - By Who
    - NSF, UL, etc.
- Accreditation
  - Accreditation (ANSI, SCC, many others)
  - ILAC – Laboratory Testing Accreditation under ISO 17025
    - verify via ILAC website www.ilac.org
  - International Accreditation Forum
    - Product Certifiers/Systems Reg to ISO 17021 – verify at www.iaf.nu

Work & Services to Support Industry and Protect Public Health

- Develop and expand standards for products that impact public health safety (recreational water product/systems)
- Use of standards in Testing and Certification
  - Performance, NSF, ASTM, ASME, CSA, IAPMO, UL
  - Health, NSF, RoHS, etc.
  - Claim validation based on manufacturer claims
- Facility Inspections (production site, water park, hotel, pool/spa)
- Facility Operator education and training also for end user and general public, mfr. site, etc.
- Regulatory Support Education and Training (Public Health Inspectors)
- Research and development testing - validate claims or technologies

Common Components of a Testing and Certification Program

1. A consensus standard to evaluate product, system, materials, etc.
2. Members that support certain minimum requirements to protect users and assure quality
3. Health safety and public health protection as well as other factors like and performance, electrical safety, life test, etc.
4. Initial validation testing of item(s) against standard
5. Initial production facility audit to verify QA/QC, materials, design, construction, process, etc.
6. Literature review or marking requirements
7. Validation of manufacturer claims
8. Monitoring or follow-up or testing (annual or 5yr)
9. Monitor or follow-up audits at production site(s)

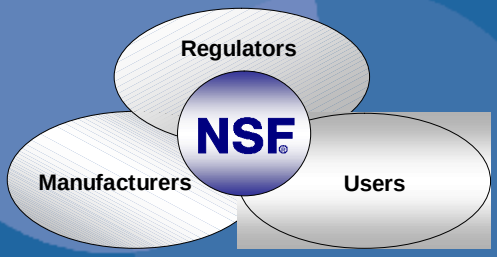
Accreditations

NSF Standards are approved by ANSI

NSF Certification Programs are accredited by ANSI

Labs and Certification Programs are accredited by SCC

Standards Development
True Consensus Process Standards



The NSF/ANSI Standard 50

- Voluntary, consensus standards
- Equal voting membership* (Reg, Mfr, User)
- Encourage input from all stakeholders
- Developed with broad participation (water facility operators, manufacturers, public health officials, inspectors, engineering firms, service staff, hotel management, regulators, etc.)
- Standards are dynamic – continue to expand to incorporate new products, technologies, change as knowledge gained

- **NSF/ANSI Standard 50 – Recreational Water Facilities, Detailed criteria for many pool/spa products**
  - Filters (Granular, Pre-Coat, Cartridge)
  - Pumps
  - Valves, hose, tubing, fittings
  - Skimmers
  - Mechanical Slurry/Liquid Feeders
  - Flow-Through Feeders for Cl/Br etc.
  - UV
  - Ozone
  - Electrolytic or Brine/Batch Type Chlorinators and Brominators
  - Copper and/or Silver Ion Generators
  - Automatic Controllers
  - Water Quality Test Devices
  - Many other devices via reference to NSF, ASTM, ASME, IAPMO Stds

Recreational Water Program

- NSF Standard 50 Establishes minimum requirements including: material health effects, product design, data plate and product marking, installation and use recommendations, and performance requirements for:
- Filters, Filtration Systems, Filter Media
- Pumps, Strainers, Flow/Pressure Meters
- Valves, Drains & Suction Fittings, Pool Alarms, SVRS
- Skimmers, Valves, Tubing, Hose, Piping, Fittings, Materials
- Process Equipment (Ozone, Cl/Br Gen, UV, Cu/Ag Ion)
- Chemical Feeders (Flow Through, Batch, Mech. Pumps)
- Automatic Controllers
- Water Quality Test Devices and many other items

Specification and use of Certified Products enables purchasers, public health officials, engineers, facility operators, and home owners greater quality, safety, and comfort.

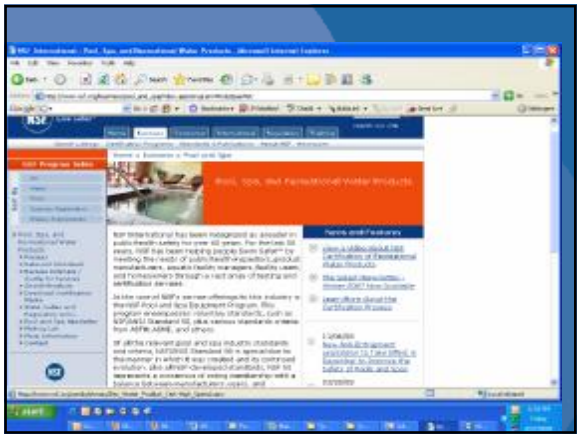
Provides the structure for understanding the products, conducting a thorough evaluation, and a logical testing to NSF, ASTM, ASME, etc. and certification to ensure ongoing conformity assessment.

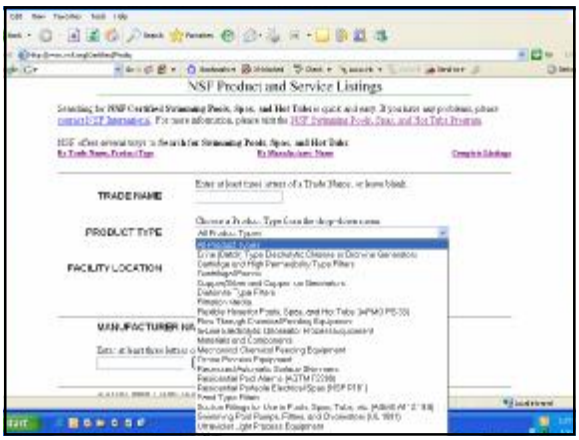
Certification and Testing program and interaction with all stakeholders creates a communication pathway between all entities.

Use of the infrastructure and active support of standards and use of certified products helps to ensure the health of facility users (swimmers) and the industry.

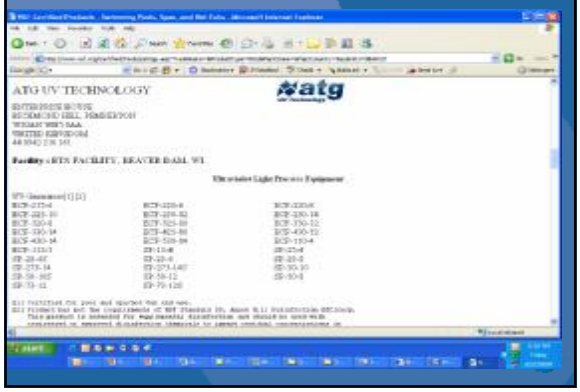
How to Find Tested-Certified Products

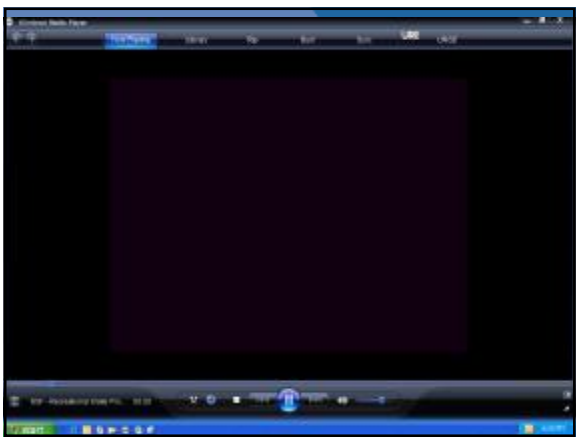
- Visit the Product Official Listings at:
  - http://www.nsf.org/Certified/Pools
  - Many Search Criteria / Categories
    - Updated daily
    - Easy to navigate and use
    - Detailed Information about products
    - Rapid response





Example of Product Listing





NSF Standard 50
The complete assessment standard

- This standard has a variety of requirements but there are certain commonalities for each product type based on:
- product end use or normal stresses
- past regulatory or industry issues with products,
- or common concerns with product function.

The next sections deal with the those specifics

Testing Certification Process

- Application
- Review of product Information
- Inspection of manufacturing facility
- Testing of product to appropriate standards
- Product documentation report
- On-going annual Inspections
- Product evaluation - annual or 5-year re-testing
- Modifications in materials, design, etc. need written authorization from project manager prior to implementation and sale in the marketplace with the Certifiers Mark.

How are recreational water products evaluated to ASME/ASTM/NSF/UL Stds.

Specifics vary by product type and use,

- Performance, (Burst, filtration, entrapment, impact, etc)
- Materials health safety-chemical/color leachate extraction
- Corrosion resistance
- Design and construction
- Marking and data plate
- Output, Life or longevity testing
- Manufacturer claim validation
- Microbial efficacy or dis-infection
- Electrical safety

General Material Requirements

Corrosion and/or Chemical Resistance

- Materials must meet corrosion and or chemical resistance standards (NSF, AISI, ASTM)

Health Effects

- Materials must pass extraction test to measure contaminants that migrate into pool and spa water
- Certified and Authorized drinking water or food contact materials are acceptable to meet this requirement
- Color leachate requirements

ASTM Standards

- **ASTM F1346 – Pool/Spa Safety Covers**
- ASTM F1908 – Fences
- ASTM F2286 – Removable mesh fencing for pool/spa
- **ASTM F2208 – Pool Alarms**
- ASTM F2518 – Guide for safety audit of pool to prevent drowning
- ASTM F2666 – Aboveground residential portable pools
- **ASTM F2387 – SVRS**

NSF Testing of Pool Alarms to NSF 50 and ASTM F2208-2008

- NSF evaluates pool alarms to the requirements of both NSF 50 -2008 and ASTM F2208 – 2008
- Work includes a product facility inspection and health effects plus testing at NSFs indoor test facility
- 5.1.1 Alarm shall sound within 20 seconds poolside/inside
- 5.1.2 Operational condition shall be visibly indicated
- 5.1.3 Alarm testing includes 85dBA sound pressure rating
- 5.1.4 Low Battery indicator (if applicable)
- 5.1.5 Automatic reset
- 5.1.6 RF wireless device shall comply w/ FCC Part-15 rules
- 6.2.1 Vertical "Timmy" drop (2x) Head 1st and (2x) Feet 1st
- 6.2.2 Horizontal drop (2x) for each of 3 different positions
- 6.3 Simulated wind test (15 min fan on, 15 off, 15 on) 1x

ASTM F1346 – Pool and Spa Covers

- Power safety, manual safety, other covers
- General material reqs, but way to validate or quantify
- no specific UV or life testing, or
- Chemical resistance testing requirements
- Installation, use, labeling, marking requirements
- 7.1-Static load test, 485lb-8ft+, or 275lb-<8ft
- 7.2-Perimeter deflection (passage of ball object)
- 7.3-Surface drainage (normal rain within 30 min)
- 7.4-Opening test (passage of object)
- Details of marking in Section 8
- Details of testing in Section 9
- Control mechanism detail in Section 10

SVRS Standards Comparison

Requirements	ASTM F2387-04	ASME A112.19.17-2002
General		
Vacuum Gauge on SVRS Unit	None required.	Required for field adjustable devices.
UV Resistance	Devices exposed to outdoors shall conform to UL 746A.	"UV inhibitors shall be added to the polymer mixture".
Check valves	If permitted by manufacturer, allowed in branch pressure line with < 60% of flow.	**None allowed.**

SVRS Standards Comparison
ASTM F2387-04 ASME A112.19.17-2002

Test Setup		
Water Tank	48 in. diameter HDLPE, with adequate height to maintain water level 8 ft. above suction fitting outlet.	No required dimensions, baffle between return and suction fittings shown in standard figure.
Test Vacuum Gauge	No specific requirements.	Must be capable of measuring vacuum 50 times per minute.
Suction Line	100 ft. of 2 in. sch. 40 pipe. Shall include a minimum of 5 elbows.	2 in. piping, adjustable from 25 to 200 ft.
Return Line	Shall match suction line.	No specific requirements.
Suction Outlet Fitting	Prefabricated 8 in. diameter uncovered outlet sump.	8 in. diameter suction outlet sump. Once uncovered and once covered with a flat grate.
Blockage Switch	Equip a sensing switch to record the moment the interrupter element blocks the sump.	Control vertical movement by utilization of limit switches.

SVRS Standards Comparison

Requirements	ASTM F2387-04	ASME A112.19.17-2002
Tests		
Time vs. Vacuum Response	No pump HP requirements. Perform at elevations 3 ft. below and 3 ft. above static water level.	Perform with 1/2 HP and 3 HP self-priming pumps at elevations 3 ft. below and 5 ft. above static water level.
Test Flow Rate	Perform at 60 and 30 gpm. For devices that incorporate indirect drain systems, tests shall be run at 50 and 100% of the manufacturers recommended flow rates.	Perform at 60 gpm, or the maximum flow rate provided by the pump, or at the flow rate the provides the maximum vacuum level recommended by the SVRS manufacturer.
Acceptance Criteria	Blocking element must be released within 3 seconds.	Vacuum shall decay within an elapsed time of 3 sec. for distances <100 ft., and 4.5 sec. for distances between 100 and 200 ft.

ASME A112.19.8 – Suction Fitting

- Standard contains Material, Design, and Performance Evaluation Criteria
  - Standard recently revised 2x in 2 years after previous 20 years with no changes…
  - Currently a 2007 issue with 2008 Addendum
  - Evaluation of Cover or Cover/Sump Combination, ie not one size fits all
  - Evaluation for various forms of strength and entrapment risk mitigation
  - Flow and Load testing
  - UV and Heat resistance testing

ASME A112.19.8 – Suction Fitting

- ASME A112.19.8 Suction Fittings
  - Certification, It's not just a one-time single test
  - Full Evaluation, Cover or Cover and Sump combination
  - Thorough approach, different materials
  - Each Design and Material is considered ie
    - Cover shape and Sump depth/open area
    - Fastener materials
    - Cover materials thermosets, thermoplastics, and metals

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ASME A112.19.8

- 1.1 Scope - materials, testing, marking
- 1.2 Related Standards
- 1.3 Units of measure
- 1.4 References (other stds)
- 1.5 Definitions
- 2.1 General Mat. Design Assem.
- 2.1.1 Fasteners
- 2.1.2 Dimensions
- 2.2 Fitting Exposure UV
- 2.3 Field Fabricated Outlets
  - RDP, 1.5fps and 18"x23"
  - Calculation of flow & force
- General inclusions and exclusions
- A112.19.17, F2387, N1-9, -7
- US Customary units (+ SI)
- ASTM material method & stds
- 29 terms are defined
- 316L ss or better, inserts, etc.
- 15 tightening/removal cycles
- Connections, pipe, ASTM
- Polymeric exposure & test
- Allowance for calculations
  - Provided cover is large or unblockable
  - Flow rate is below 1.5fps

ASME A112.19.8, Section 2.2 Fitting Exposure (UV)

UV Chambers for ASTM G154, unit on right is in condensation cycle mode

ASME A112.19.8 Vertical, Horizontal, Shear, Vacuum & Impact, Pull Load, & Stress Relief

- 3.3 Vertical Load and Deformation Test
- 3.4 Horizontal L & D
- 3.5 Point load to Excess Test (use same 6 fittings)
- 3.6 Shear Load Test to test fastener strength
- 3.7 Vacuum (Pressure Differential) & Point Impact
- 3.8 Pull Load Test
- 3.9 Mold Stress Relief Distortion

- 300lbs applied to 6 fittings, no crack, deform, loss
- Same except 150lbs
- 600lbs load, may deform, can't lose material (except plating)
- 6 fittings, after UV, 150lbf load, angle of 30 degrees
- Same fittings, cover, vacuum, 5lb tup impact, then inspect
- 150lb pull, cant loosen, crack
- 1 sample, non UV exposed, for 7hr in oven at 140F then used for hair and body entrapment tests

ASME A112.19.8 Tensile Strength, Vertical Load, Horizontal Load, Shear Load Testing

ASME A112.19.8 Hair and Body Entrapment

- 4.1 Hair Entrapment-2 hair types
- 4.2 Test Method – Conduct 10 passes each, 60 sec feed, 30 sec hold, 30 sec float, then measure entrapment force
- 4.3 Requirement
- 5.1 Body Entrapment, if cover is over 18"x23" rate either by testing or by 2.3.1 RDP calculation. When testing a smaller cover a smaller body block is used to increase challenge and block pull
- 5.2 Test Method describes how to setup, place element, start flow, conduct pull, record and calculate
- 5.3 Requirement depending upon the size of fitting and block element

- 5.5oz Full Head & 2oz Dowel
- Conduct testing with each hair, If 1 fail in 10, do 10 more, divide flow rate at which it passes by 1.25
- Each hair type not to exceed 5lbf
- 18"x23" or smaller (9x11.5) element is placed, centered upon the largest portion of the cover/grate and flow through the fitting is initiated
- Obtain neutral buoyancy with 120lbf force, let go & calculate pull force removal (lbs) for flow rating maximum, perform x3
- Not to exceed between 15 and 120lbs pull force

ASME A112.19.8 Hair Entrapment zero gage, set hair, sweep, pull, measure

ASME A112.19.8 Finger and Limb Entrapment

- 6.1 Does cover have large or small openings pinch points Aperture 1"
- 6.2 Urge probe with 3lbf force into suction fitting openings
- 6.3 Requirement-
  - Small Aperature is permitted when centerline of the 1st articulation joint, (1.18" from the point end), cannot be made to pass beyond an edge or pinch point inside the aperature being tested.
  - Large Aperature is permitted when the centerline of the 2nd articulation joint, (2.36" from the point end), cannot be made to pass beyond an opposed edge or pinch point inside the aperature.
  - Edges and pinch points shall be permitted within the aperature and within range of 1st joint if they are less than 0.311" wide.
  - Edges and pinch points created by molding lines, engraved text, & symbols shall be permitted within the aperature if not over 0.025"

ASME A112.19.8 Marking Requirements

- 7.1 Marking of Suction Fittings
- Text size (min 0.1" tall), Markings visible when installed
- ASME A112.19.8 (NSF requires year of std. ie 2007 or 8+)
- Rated flow (lesser of maximum) in gpm per position
- Type of fitting, Indicated life of fitting components
- Installation position Floor and/or Wall
- Manufacturers Name or Trademark
- Model Designation (NSF specifies Cover and Sump)
- *As of October 2008, CPSC is requiring VGB-2008 as additional marking to communicate compliant products

ASME A112.19.8 Packaging Requirements

- 7.2 Packaging of Suction Fittings
- Type of fitting, Tools required, Service and winterizing
- Max Flow, Connection pipe size, Mount Position(s),
- Suction Outlet model #, part # and list with life span
- Instructions not to locate fitting on seats/backrests
- Statement that if multiple fittings are installed on the same line, it requires 3' separation or different plane
- If applicable, are detailed field built sump design specifications present
- Statement that missing/broken/cracked fittings shall be replaced
- Note that fasteners should be observed for damage, tampering before each use of facility, Note not to exceed max flow rate
- Statement, loose fittings shall be reattached before using the facility
- Statement, to read, then keep instructions for future reference,
- Cautionary note about increasing flow by increasing pump size

Product Specific Requirements: Pipes and Fittings

Pipe and Fittings

- NSF/ANSI Standard 14 [NSF – pw]
- Dimensional, Material Health, Burst, performance (ASTM, ASME, CSA, etc.) and durability requirements

Suction Fittings

- ASME A112.19.8 – Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs
- Materials and corrosion
- Performance testing & Design safety criteria
- Marking and packaging

Other NSF, ASME, IAPMO, UL Standards

- NSF/ANSI Standard 14 – Detailed criteria for plastic pipe, fittings, and materials (w many refs to ASTM stds)
- NSF/ANSI Standard 61 – Detailed drinking water safety
- ASME A112.19.17 – SVRS (similar to ASTM F2387)
- ASME A112.19.8 – Suction Fittings – Drain/Sump
- IAPMO PS 33 – Flexible PVC Spa Hose
- IAPMO SPS 4 – Special Use Suction Fittings (Vacuum)
- UL1081 – Electrical Safety Standard for Chlorinators, Filters, & Pumps
- UL1563 – Similar to above but more conservative, complete, and covers more products Electric Spas, Equipment
- UL1795 – Hydromassage Tubs

Product Specific Requirements: Pumps and Valves

Pumps

- Hydrostatic Pressure tests
- Verification of pump performance curve
- Design criteria for strainers, drain plugs and shaft seals (also RoHS, CEC, UL1081)

Valves

- Hydrostatic and burst pressure tests
- Head loss curve
- Leakage prevention tests

Pump Testing/Certification

- Certification
  - Health Safety - NSF 50, Section 3
    - Materials Extraction Test –Annex A
      - Chemical leachate
      - Color leachate
  - Performance
    - Strainer (various design)
    - Head loss (pressure loss) test
    - Hydrostatic pressure 1.5xWP
    - Self prime test
    - Pump curve test
      - TDHvsDFR
      - NPSHorTDSL
      - Brake horsepower
      - Efficiency vs. perf. curve
  - Electrical Safety (NEC)
    - UL1081, heat rise, thermal protection, etc.
- Testing
  - CEC (California Energy Comm.)
    - Testing similar to NSF 50 for pump curve determination
    - Validate power consumption
  - Sound Emission
    - Testing conducted at multiple distances from pump to document dB of sound emission
  - Other services include
    - NSF/ANSI Standard 61, DWA
    - NSF/ANSI Standard 58, RO

Product Specific Requirements: Filtration Systems

- Sand Type Filters, pressure or sand
  - Task group successfully completed requirements for alternate media, zeolite, next is crushed glass
- Pre-Coat media filters, pressure or vacuum for use with
  - Cellulose fiber
  - Perlite
  - Diatomaceous Earth
- Cartridge Filters
- Other filter types
  - Pre-filters, Hybrid Mixed Media, Chemical / Media systems

Product Specific Requirements: Filtration (Filters) Systems

Health Effects

Marking (dataplate) Requirements

Durability Requirements

- 4.0 WP Design Burst, 2.0x Burst, 1.5x Hydrostatic, and 20,000 cyclic pressure tests 0-30-0psi

Filtration Performance

- Turbidity reduction tests
- Pressure loss/head loss tests
- Verification of cleaning procedures
- Dirt holding capacity

Product Specific Requirements: Filtration System Detailed Example

- Sand Filters
  - Product General Information
  - Material Health
  - Performance (Pressure or Vacuum Tests)

    Burst and cyclic pressure (minimum of 50psi WP)
    - 1.5 x WP for 5 minutes
    - 0-30psi-0 20,000 cycles
    - 2.0 x WP for 60 seconds

    Filtration Validation Testing
    - Head loss or Pressure loss,
    - Turbidity reduction 70%
    - Filtration capacity or dirt holding,
    - Media longevity before backwashing is required

Product Specific Requirements: Filtration Systems

Additional Testing or Claim Verification Requirements

- Alternate filter media in filters
- Turbidity, particulate, or specific item reduction

  ≥10 micron for clarification concerns

  ≥3 micron for cryptosporidum removal
- Ammonia, chloramine reduction filters and media systems
- Stacking, series or parallel, seismic, vacuum, valves, face piping, etc.

Product Specific Requirements: Disinfection Systems

- Mechanical chemical feeders
- Flow through chemical feeders
- Ozone generators
- UV systems
- Electrolytic or batch chlorinators, brominators
- Ion generators (Cu / Ag)

Product Specific Requirements: Disinfection Systems

Flow –through chemical feeders

- Health Effects
- Marking
- Hydrostatic pressure tests
- Chemical resistance tests
- Uniformity of output tests
- Maximum output
- Chemical type, configuration and/or brand must be specified

Product Specific Requirements: Disinfection Systems

UV, Ozone, ion generators, electrolytic chlorinators

- 3000 hour life cycle tests
- UL 1563, 1081, CEC, RoHS (if requested)
- Disinfection efficacy tests*
  - 3 log reduction in challenge organisms
    - P. aeruginosa
    - E. faecium
- Other services such as output testing, power consumption, log reduction with other organisms, MS2, B.S., Poliovirus, Cryptosporidium, Norovirus, Adenovirus, etc.

Industry standards continue to evolve

- Water quality test devices (strips, liquids, probes, 2009)
- Automatic controllers for pumps and feeders (2009)
- Suction fittings, drains (ASME A112.19.8) new version (2008 new UV and loading requirements, 2009 hair tests)
- VR (SVRS) ASME vs. ASTM (further revisions)
- Pool Alarms ASTM F2208 (2008)
- Skimmers, revised UV and load requirements (2008 & 9)
- Chloramine reduction systems (O3, UV & or Zeolite)
- Particulate reduction (sand type, cartridge, pre-coat)
- UV testing for MS2 and Crypto inactivation via testing to the LT2 EPA UV DGM (possibly adenovirus) (2009)
- UV Resistant products (2008+)
- Heaters and heat pumps, solar, and fuel fired (2009+)
- Gages for flow, pressure, and temperature (2009+
- Green requirements/verification (2010+)

Benefits of Certification

Rationale for using systems, products, and materials that are Certified

- **Protection of public health**
- **Compliance with Codes/Laws**
- Certified products are known to perform and meet an acceptable set of requirements
- Adds confidence in design, performance, safety and quality
- Increased acceptance, increased sales
- Reduce liability by showing commitment to safety
- Comprehensive product listings that specify validated specifications

Benefits of Certification Continued

- Trusted source for Recreational Water / Pool and Spa industry
- Provides uniform requirements across regional boundry and in countries that don't yet have standards for certain products (UK, Germany, etc.).
  - Regulators do not have to develop additional requirements for products. Their issues can be addressed by standards committee
  - Builders and contractors can easily source certified products to meet their needs
  - Manufacturers only have to meet one set of requirements. Test/certification to a standard enables them to meet the requirements of a public health safety code.
  - Promote the industry, knowledge, and safety, use tested and certified products

How to Increase awareness via Language in Codes, Bids, Specs, Regs, etc.

- Federal, provincial, state codes can reference or require a product compliance with a standard, code, or law
- Water park, pool, spa owner or managers can make specific reference that only Certified products may be installed for use
- Hotel chains can specify product type, mfr. Etc.
- Engineering firms or builders can sole source in their bid specifications
- Use knowledge of products and standards by your sales staff to help promote you're the industry and your business in particular through use of Certified or Listed products.

North American Regulatory Enforcement

Waterparks, Pools, Spas may be regulated by

- Federal (VGBPSSA)
- State/Province
- County
- City

Type of Inspections

- Typically at County level
- Plan review prior to construction
- Inspections after construction
- On-going annual (opening) inspections

Examples of Regulatory Enforcement in USA

Residential

- Typically plan review and initial inspection from local building officials.
- No on-going annual inspections
- VGBPSSA was 1st Federal action to really impact residential spa/pool products, drains, SVRS,
- States requiring alarms, CEC compliant pumps, heaters

Commercial

- Typically initial plan review per state, county, or city code (LA, Dade, Clark, NY)
- State, county, or city 1 – 2 inspections/yr.
- Opening inspections and possibly another later in year