

CHAPTER 12

Design and Construction Standards for Public Water Supplies

Section 1. Authority.

These standards are promulgated pursuant to ~~W.S. 35-11-101 through 35-11-1207~~ the Wyoming Environmental Quality Act, ~~Specifically, W.S. § 35-11-302 requires the administrator to establish standards for the issuance of permits for construction, installation, or modification of any public water supply.~~

Section 2. ~~Purpose.~~ Applicability.

~~The purpose of these standards is to:~~

~~(a) — Ensure that the design and construction of public water supplies meet the purpose of the Environmental Quality Act.~~

~~(b) — Prevent, reduce and eliminate pollution and enhance the waters of the State of Wyoming by ensuring that the design and construction of public water supplies are capable of the required treatment and distribution providing continued operation to protect the health, safety and welfare of the users and operators.~~

~~These standards pertain only to permits required pursuant to Chapter 3, Wyoming Water Quality Rules and Regulations.~~

(a) This Chapter contains the minimum standards for the design and construction of public water supplies that are required to obtain a permit under Wyoming Statute (W.S.) § 35-11-301(a)(iii) and Water Quality Rules Chapter 3.

(i) All applicants for a Water Quality Rules Chapter 3 permit to construct, install, modify, or operate a public water supply facility shall comply with all minimum standards of this Chapter.

(ii) No permit to construct, install, modify, or operate a public water supply facility shall be issued to a facility that does not comply with the minimum standards of this Chapter.

(iii) All public water supply facilities shall be constructed, installed, and operated in accordance with permits issued pursuant to this Chapter.

(b) The construction, installation, or modification of any component of a public water supply facility requires a permit to construct.

Section 3. ~~Intent~~ Timing of Compliance with These Regulations.

46 ~~The design and construction standards included in these regulations are directed toward~~
47 ~~conventional public water systems. These standards impose limiting values of design for which a~~
48 ~~construction, installation, or modification permit application and plans and specifications can be~~
49 ~~evaluated by the division.~~

50
51 ~~The terms “shall” and “must” are used when practice is sufficiently standardized to permit~~
52 ~~specific delineation of requirements or when safeguarding public health or protection of water~~
53 ~~quality justifies such definite action. Other terms, such as “should”, “recommend”, and~~
54 ~~“preferred” indicate desirable procedures or methods which allow deviations provided the~~
55 ~~purpose of these regulations can be accomplished.~~

56
57 ~~The applicant shall use the date referenced copy of other standards referred to in these~~
58 ~~regulations. Where no date is listed for the referenced standards, the standards used shall be~~
59 ~~those in effect when these regulations become effective.~~

60
61 Any facility covered by an individual or general permit issued pursuant to Water Quality
62 Rules, Chapter 3, prior to the effective date of this Chapter shall remain covered under that
63 permit. New construction or modification of existing permitted facilities must obtain
64 authorization under a new permit, in accordance with Water Quality Rules Chapter 3, Section
65 4(d) or Section 5(e), subject to the requirements of this Chapter.

66
67 **Section 4. ~~Definitions~~ Incorporation By Reference of Recommended Standards**
68 **for Water Works 2018 Edition.**

69
70 ~~(moved to Section 5) The following definitions supplement those contained in W.S. 35-~~
71 ~~11-103 of the Wyoming Environmental Quality Act.~~

72
73 ~~(moved to Section 5(a))(a) —“Auxiliary source of supply” means any water supply on or~~
74 ~~available to the water user’s system other than an approved public water supply acceptable to the~~
75 ~~water supplier.~~

76
77 ~~These auxiliary waters may include water from another supplier’s public potable water supply or~~
78 ~~any natural source(s), such as a well, spring, river, stream, harbor, and so forth; used waters; or~~
79 ~~industrial fluids. These waters may be contaminated or polluted, they may be objectionable or~~
80 ~~they may be from a water source which the water supplier is uncertain of sanitary control.~~

81
82 ~~(moved to Section 5(b))(b) —“Average daily demand” means the total annual water use~~
83 ~~divided by the number of days the system was in operation.~~

84
85 ~~(moved to Section 4(e))(b) —“Backflow” means the undesirable reversal of flow of~~
86 ~~water or mixtures of water and other liquids, gases, or other substances into the distribution~~
87 ~~system of the public water supply from any other source or sources.~~

88
89 ~~(moved to Section 5(d))(c) —“Backflow incident” means any identified backflow to a~~
90 ~~public water supply distribution system or to the potable water piping within the water user’s~~

91 ~~system benefitting from a water service connection to the public water supply distribution~~
92 ~~system.~~

93
94 ~~(moved to Section 5(e))(d) —“Back pressure” means a form of backflow caused when~~
95 ~~the pressure of the water users’ system is greater than that of the water supply system. This could~~
96 ~~be caused by a pump, elevated tank, elevated piping, boiler, pressurized process, pressurized~~
97 ~~irrigation system, air pressure or any other cause of pressure.~~

98
99 ~~(moved to Section 5(f))(e) —“Back siphonage” means a form of backflow caused by~~
100 ~~negative or reduced pressure in the water supply system. This situation can be caused by loss of~~
101 ~~pressure due to high water demands, a line break, excessive fire fighting flows, etc.~~

102
103 ~~(f) —“Containment” means the practice of installing approved backflow prevention~~
104 ~~devices at the water service connection of the water user in order to protect the public water~~
105 ~~supply from any backflow from the water users system.~~

106
107 ~~(moved to Section 5(h))(g) —“Contamination” means an impairment of a public water~~
108 ~~supply by the introduction or admission of any foreign substance which degrades the quality of~~
109 ~~the potable water or creates a health hazard.~~

110
111 ~~(moved to Section 5(i))(h) —“Cross connection” means any actual or potential~~
112 ~~connection between a potable water supply and any other source or system through which it is~~
113 ~~possible to introduce contamination into the system.~~

114
115 ~~(moved to Section 5(j))(i) —“Degree of hazard” means either a high or low hazard~~
116 ~~situation where a substance may be introduced into a public water supply through a cross~~
117 ~~connection. The degree of hazard or threat to public health is determined by a hazard~~
118 ~~classification.~~

119
120 ~~(moved to Section 5(k))(j) —“Domestic services” means services using potable water for~~
121 ~~ordinary living processes and not for commercial or industrial uses, fire protection systems with~~
122 ~~antifreeze or other chemicals, heating systems, etc. Examples may include residences, churches,~~
123 ~~office buildings, schools, etc.~~

124
125 ~~(moved to Section 5(l))(k) —“Dual check” means a device conforming to ASSE~~
126 ~~Standard #1024 consisting of two independently acting check valves. Dual check valves are~~
127 ~~allowed only for residential water service connections that have a low hazard potential with back~~
128 ~~pressure or backsiphonage under continuous pressure.~~

129
130 ~~(moved to Section 5(m))(l) —“Groundwater source” includes all water obtained from~~
131 ~~dug, drilled, bored, jetted or driven wells; springs which are developed so that the water does not~~
132 ~~flow on the ground and protected to preclude the entrance of surface contamination; and~~
133 ~~collection wells.~~

134

135 ~~(moved to Section 5(n))(m) —“Hazard classification” means a determination by a hazard~~
136 ~~classification surveyor as to high hazard or low hazard and the potential cause of backflow as~~
137 ~~either back pressure or back siphonage.~~

138
139 ~~(moved to Section 5(o))(n) —“Hazard classification survey” means inspection of a~~
140 ~~premises to identify the potable water systems, the location of any potential cross connections to~~
141 ~~the potable water systems, the hazard of the potential backflow, the physical identification of any~~
142 ~~backflow devices or methods present and the inspection status of any backflow devices or~~
143 ~~methods. The hazard classification survey results must be recorded and certified by a qualified~~
144 ~~hazard classification surveyor.~~

145
146 ~~(moved to Section 5(p))(o) —“Hazard classification surveyor” means an individual~~
147 ~~certified by the USC Foundation for Cross Connection Control and Hydraulic Research as~~
148 ~~Cross Connection Control Specialist, the American Association of Sanitary Engineers (ASSE) as~~
149 ~~a Cross Connection Control Surveyor, or by another state certification program approved by the~~
150 ~~administrator, or by a water distribution system operator also certified as a backflow device~~
151 ~~tester employed by the public water supplier for the service where the survey is being conducted.~~

152
153 ~~(moved to Section 5(q))(p) —“High hazard” means a situation created when any~~
154 ~~substance which is or may be introduced into a public water supply poses a threat to public~~
155 ~~health through poisoning, the spread of disease or pathogenic organisms, or any other public~~
156 ~~health concern.~~

157
158 ~~(moved to Section 5(r))(q) —“Isolated” when referring to cross connections means the~~
159 ~~proper approved backflow prevention devices have been installed at each point of cross~~
160 ~~connection within the water user's system. This requires the installation of an approved backflow~~
161 ~~protection device at each source of possible contamination. This type of control has the~~
162 ~~advantage of protecting health within the water user's system as well as protecting the public~~
163 ~~water supply.~~

164
165 ~~(moved to Section 5(s))(r) —“Low hazard” means a situation created when any~~
166 ~~substance which is or may be introduced into a public water supply does not pose a threat to~~
167 ~~public health but which does adversely affect the aesthetic quality of the potable water.~~

168
169 ~~(moved to Section 5(t))(s) —“Maximum daily demand” means the demand for water~~
170 ~~exerted on the system over a period of 24 consecutive hours, for the period during which such~~
171 ~~demand is greatest.~~

172
173 ~~(moved to Section 5(u))(t) —“Maximum hour demand” means the highest single hour~~
174 ~~demand exerted on the system. This may or may not occur on the maximum day.~~

175
176 ~~(moved to Section 5(w))(u) —“Mineralized water” means any water containing more than~~
177 ~~500 mg/L total dissolved solids.~~

178
179 ~~(v) —“Offstream reservoir” means a facility into which water is pumped during periods~~
180 ~~of good quality and high stream flow for future release to treatment facilities.~~

181
182 ~~(moved to Section 5(aa))(w) “Surface water source” includes all tributary streams and~~
183 ~~drainage basins, natural lakes and artificial reservoirs or impoundments upstream from the point~~
184 ~~of the water supply intake.~~

185
186 ~~(moved to Section 5(cc))(x) “Water service connection” means any water line or pipe~~
187 ~~connected to a distribution supply main or pipe for the purpose of conveying water to a water~~
188 ~~user’s system.~~

189
190 ~~(moved to Section 5(dd))(y) “Water supplier” means any entity that owns or operates a~~
191 ~~public water supply, whether public or private.~~

192
193 ~~(moved to Section 5(ee))(z) “Water user” means any entity, whether public or private,~~
194 ~~with a water service connection to a public water supply. The water user is also identified as a~~
195 ~~customer of a public water supply.~~

196
197 ~~(moved to Section 5(ff))(aa) “Water user’s system” means that portion of the user’s~~
198 ~~water system between the water service connection and the point of use. This system includes all~~
199 ~~pipes, conduits, tanks, fixtures, and appurtenances used to convey, store or utilize water provided~~
200 ~~by the public water supply.~~

201
202 (a) This Chapter incorporates sections of the Recommended Standards for Water
203 Works, A Report of the Water Supply Committee of the Great Lakes--Upper Mississippi River
204 Board of State and Provincial Public Health and Environmental Managers, 2018 Edition, referred
205 to as “2018 TSS,” as noted in Section 8(a), Section 9(a), Section 10(a), Section 11(a), Section
206 12(a), Section 13(a), Section 14(a), Section 15(a), Section 16(a), Section 17(a), and Section
207 19(a)(lviii) of this Chapter.

208
209 (b) The State term “Administrator” shall replace the term “reviewing authority” used
210 in the Recommended Standards for Water Works 2018 Edition.

211
212 (c) The State term “shall” shall replace the term “should” used in the Recommended
213 Standards for Water Works 2018 Edition.

214
215 **Section 5. ~~Facilities and Systems not Specifically Covered by these Standards~~**
216 **Definitions.**

217
218 ~~(moved to Section 6(a)) This section is provided to encourage new technology and~~
219 ~~equipment and provide a process for evaluating and permitting designs which deviate from these~~
220 ~~regulations. The proposed construction of facilities and processes not in compliance with these~~
221 ~~regulations will be permitted provided that the facility, when constructed, can operate meeting~~
222 ~~the purpose of these regulations.~~

223
224 ~~(moved to Section 6(b))(a) — Each application for a permit to construct a facility under~~
225 ~~this section shall be evaluated on a case-by-case basis using the best available technology. The~~
226 ~~following information should be included with the application:~~

227
228 ~~(moved to Section 6(b)(i)(A))(i) — Data obtained from a full scale, comparable~~
229 ~~installation which demonstrates the acceptability of the design; and/or~~

230
231 ~~(moved to Section 6(b)(i)(B))(ii) — Data obtained from a pilot plant operated~~
232 ~~under the design condition for a sufficient length of time to demonstrate the acceptability of the~~
233 ~~design; and/or~~

234
235 ~~(moved to Section 6(b)(i)(C))(iii) — Data obtained from a theoretical evaluation~~
236 ~~of the design which demonstrates a reasonable probability of the facility meeting the design~~
237 ~~objectives; and~~

238
239 ~~(moved to Section 6(b)(ii))(iv) — An evaluation of the flexibility of making~~
240 ~~corrective changes to the constructed facility in the event it does not function as planned.~~

241
242 ~~(moved to Section 6(c))(b) — If an applicant wishes to construct a pilot plant to provide~~
243 ~~the data necessary to show the design will meet the purpose of the act, a permit to construct must~~
244 ~~be obtained.~~

245
246 ~~(formerly Section 4)(a)~~ The following definitions supplement those contained in W.S. §
247 35-11-103 of the Wyoming Environmental Quality Act.

248
249 ~~(formerly Section 4(a))(b)~~ “Auxiliary source of supply” means any water supply on or
250 available to the water user’s system other than an approved public water supply acceptable to the
251 water supplier. These auxiliary waters may include water from another supplier’s public potable
252 water supply or any natural source(s), such as a well, spring, river, stream, harbor, and so forth;
253 used waters; or industrial fluids. These waters may be contaminated or polluted, they may be
254 objectionable or they may be from a water source ~~which~~ that the water supplier is uncertain of
255 sanitary control.

256
257 ~~(formerly Section 4(b))(c)~~ “Average daily demand” means the total annual water use
258 divided by the number of days the system was in operation.

259
260 ~~(formerly Section 4(b))(d)~~ “Backflow” means the undesirable reversal of flow of
261 water or mixtures of water and other liquids, gases, or other substances into the distribution
262 system of the public water supply from any other source or sources.

263
264 ~~(formerly Section 4(e))(e)~~ “Backflow incident” means any identified backflow to a
265 public water supply distribution system or to the potable water piping within the water user’s
266 system benefitting from a water service connection to the public water supply distribution
267 system.

268
269 ~~(formerly Section 4(d))(f)~~ “Back-pressure” means a form of backflow caused when
270 the pressure of the water users’s system is greater than that of the water supply system. ~~This~~
271 ~~could be~~ whether caused by a pump, elevated tank, elevated piping, boiler, pressurized process,
272 pressurized irrigation system, or air pressure ~~or any other cause of pressure.~~

273
274 ~~(formerly Section 4(e))(g)~~ “Back-siphonage” means a form of backflow caused by
275 negative or reduced pressure in the water supply system. ~~This situation can be~~ whether caused by
276 loss of pressure due to high water demands, a line break, or excessive ~~fire fighting~~ firefighting
277 flows, ~~etc.~~

278
279 ~~(formerly Section 4(f))~~ ~~“Containment” means the practice of installing approved~~
280 ~~backflow prevention devices at the water service connection of the water user in order to protect~~
281 ~~the public water supply from any backflow from the water users system.~~

282
283 (h) “Calculated Dose” means the reduction equivalent dose (RED) calculated using
284 the dose-monitoring equation that was developed through validation testing.

285
286 ~~(formerly Section 4(g))(i)~~ “Contamination” means an impairment of a public water
287 supply by the introduction or admission of any foreign substance ~~which~~ that degrades the quality
288 of the potable water or creates a health hazard.

289
290 ~~(formerly Section 4(h))(j)~~ “Cross-connection” means any actual or potential
291 connection between a potable water supply and any other source or system through which it is
292 possible to introduce contamination into the system.

293
294 ~~(formerly Section 4(i))(k)~~ “Degree of hazard” means either a high or low hazard
295 situation where a substance may be introduced into a public water supply through a cross-
296 connection. The degree of hazard or threat to public health is determined by a hazard
297 classification.

298
299 ~~(formerly Section 4(j))(l)~~ “Domestic services” means services using potable water for
300 ordinary living processes ~~and not for commercial or industrial uses, fire protection systems with~~
301 ~~antifreeze or other chemicals, heating systems, etc. Examples may include residences, churches,~~
302 ~~office buildings, schools, etc.~~

303
304 ~~(formerly Section 4(k))(m)~~ “Dual check” means a device conforming to American
305 Association of Sanitary Engineers (ASSE) Standard #1024 consisting of two independently
306 acting check valves. ~~Dual check valves are allowed only for residential water service connections~~
307 ~~that have a low hazard potential with back pressure or backsiphonage under continuous pressure.~~

308
309 ~~(formerly Section 4(l))(n)~~ “Groundwater source” includes all water obtained from
310 dug, drilled, bored, jetted or driven wells; springs ~~which~~ that are developed so that the water does
311 not flow on the ground and that are protected to preclude the entrance of surface contamination;
312 and collection wells.

313
314 ~~(formerly Section 4(m))(o)~~ “Hazard classification” means a determination by a
315 ~~h~~Hazard ~~e~~Classification ~~s~~Surveyor as to high hazard or low hazard and the potential cause of
316 backflow as either back-pressure or back-siphonage.

317

318 ~~(formerly Section 4(n))(p)~~ “Hazard eClassification sSurvey” means inspection of a
319 premises to identify the potable water systems, the location of any potential cross connections to
320 the potable water systems, the hazard of the potential backflow, the physical identification of any
321 backflow devices or methods present, and the inspection status of any backflow devices or
322 methods. ~~The hazard classification survey results must be~~ recorded and certified by a qualified
323 hHazard eClassification sSurveyor.
324

325 ~~(formerly Section 4(o))(q)~~ “Hazard eClassification sSurveyor” means an individual
326 certified by the USC- Foundation for Cross-Connection Control and Hydraulic Research as
327 Cross Connection Control Specialist, ~~(USC-FCCCHR), the American Association of Sanitary~~
328 ~~Engineers (ASSE)~~ as a Cross-Connection Control Surveyor, or ~~by~~ another state certification
329 program submitted with the permit application and approved by the aAdministrator, or ~~by an~~
330 individual who is a water distribution system operator also certified as a backflow device tester
331 employed by the public water supplier for the service where the survey is being conducted.
332

333 ~~(formerly Section 4(p))(r)~~ “High hazard” means a situation created when any
334 substance ~~which~~ that is or may be introduced into a public water supply poses a threat to public
335 health through poisoning, the spread of disease or pathogenic organisms, or any other public
336 health concern.
337

338 ~~(formerly Section 4(q))(s)~~ “Isolated” when referring to cross connections means the
339 properly approved backflow prevention devices have been installed at each point of cross-
340 connection within the water user's system. ~~This requires the installation of an approved backflow~~
341 ~~protection device at each source of possible contamination. This type of control has the~~
342 ~~advantage of protecting health within the water user's system as well as protecting the public~~
343 ~~water supply.~~
344

345 ~~(formerly Section 4(r))(t)~~ “Low hazard” means a situation created when any
346 substance ~~which~~ that is or may be introduced into a public water supply does not pose a threat to
347 public health but ~~which~~ that does adversely affect the aesthetic quality of the potable water.
348

349 ~~(formerly Section 4(s))(u)~~ “Maximum daily demand” means the demand for water
350 exerted on the system over a period of 24 consecutive hours, for the period during which such
351 demand is greatest.
352

353 ~~(formerly Section 4(t))(v)~~ “Maximum hourly demand” means the highest single-hour
354 demand exerted on the system. This may or may not occur on the maximum day.
355

356 (w) “Mechanical sludge equipment” means the equipment used to physically remove
357 solids from a water treatment process. This may include mechanical drives that use scrapers or
358 differential water levels to collect the sludge.
359

360 ~~(formerly Section 4(u))(x)~~ “Mineralized water” means any water containing more than
361 500 mg/L total dissolved solids.
362

363 (y) “Minor field change” means any in-field adjustment due to previously unknown
364 physical constraints of the project site that do not affect the project’s scope. Minor field changes
365 still allow full compliance with the requirements of this Chapter and are shown on the submitted,
366 post-construction as-built plan set for the Division in red.

367
368 (zz) “Primary disinfection” means disinfection that kills or inactivates bacteria,
369 viruses, and other potentially harmful organisms in drinking water.

370
371 (aa) “Reduction Equivalent Dose” means the ultraviolet (UV) dose derived by entering
372 the log inactivation measured during full-scale reactor testing into the UV dose-response curve
373 that was derived through collimated beam testing. RED values are always specific to the
374 challenge microorganism used during experimental testing and the validation test conditions for
375 full-scale reactor testing.

376
377 (bb) “Required Dose” means the UV dose in units of mJ/cm² req needed to achieve
378 the target log inactivation for the target pathogen.

379
380 (cc) “Secondary disinfection” means disinfection that provides longer lasting water
381 treatment as the water moves through pipes to consumers.

382
383 (dd) “Stabilized drawdown” means a water level that has not fluctuated by more than
384 plus or minus 0.5 foot for each 100 feet of water in the well over at least a six-hour period of
385 constant pumping flow rate. The water column is measured from pre-test static water level to the
386 top of the deepest water bearing fracture that contributes at least 10 percent of total well yield,
387 and plotted measurements that have not shown a trend of decreasing water level.

388
389 ~~(formerly Section 4(w))~~(ee) “Surface water source” includes all tributary streams and
390 drainage basins, natural lakes, and artificial reservoirs or impoundments upstream from the point
391 of the water supply intake.

392
393 (ff) “Validated Dose” means the UV dose in units of mJ/cm² delivered by the UV
394 reactor as determined through validation testing that is compared to the required dose to
395 determine log inactivation credit.

396
397 ~~(formerly Section 4(x))~~(gg) “Water service connection” means any water line or pipe
398 connected to a distribution supply main or pipe for the purpose of conveying water to a water
399 user’s system.

400
401 ~~(formerly Section 4(y))~~(hh) “Water supplier” means any entity that owns or operates a
402 public water supply, whether public or private.

403
404 ~~(formerly Section 4(z))~~(ii) “Water user” means any entity, whether public or private,
405 with a water service connection to a public water supply. ~~The water user is also identified as a~~
406 and includes customers of a public water supply~~ier.~~

407

408 ~~(formerly Section 4(aa))(jj)~~ “Water user’s system” means that portion of the user’s
409 water system between the water service connection and the point of use. This system includes all
410 pipes, conduits, tanks, fixtures, and appurtenances used to convey, store, or ~~utilize~~ use water
411 provided by the public water supply.

412
413 **Section 6. ~~Engineering Design Report~~ Facilities and Systems not Specifically**
414 **Covered by these Standards.**

415
416 ~~(moved to Section 9(b))(a) — Scope and purpose. An engineering design report shall be~~
417 ~~submitted with each application. The purpose of the report shall be to describe and provide~~
418 ~~technical justification for all aspects of the proposed construction, modifications and/or~~
419 ~~installations. The report should address existing conditions (if any), known or suspected~~
420 ~~problems, proposed actions, and the reasoning used to arrive at those proposed actions. There is~~
421 ~~no minimum or maximum size for the report, provided it meets the purpose of this section.~~

422
423 ~~(moved to Section 9(c))(b) — Water distribution (water works) systems. The engineering~~
424 ~~design report for all new water distribution system extensions shall include:~~

425
426 ~~(moved to Section 9(c)(ii))(i) A description of the service area including sealed~~
427 ~~vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations,~~
428 ~~and topographic features.~~

429
430 ~~(moved to Section 9(c)(iii))(ii) — Current and projected system water demand~~
431 ~~for average day, maximum day, maximum hour, needed fire flows and per capita maximum daily~~
432 ~~flows.~~

433
434 ~~(moved to Section 9(c)(iv))(iii) — Information on fire protection and fire flow~~
435 ~~capabilities of the proposed system.~~

436
437 ~~(iv) — Description of high service pumping systems and finished water storage~~
438 ~~facilities.~~

439
440 ~~(moved to Section 9(d))(c) — Treatment facilities. The engineering design report shall~~
441 ~~include:~~

442
443 ~~(moved to Section 9(d)(ii))(i) A description of the facility site and location,~~
444 ~~including a sealed site plan, and:~~

445
446 ~~(moved to Section 9(d)(ii)(A))(A) — Present and projected facility~~
447 ~~property boundaries.~~

448
449 ~~(moved to Section 9(d)(ii)(B))(B) — Flood protection indicating predicted~~
450 ~~elevation of 25- and 100-year flood stages. The facility shall be protected from damage and be~~
451 ~~capable of being operated during the 100-year flood or maximum flood of record, whichever is~~
452 ~~greater. Flooding resulting from ice jams shall be considered.~~

453

454 ~~(moved to Section 9(d)(ii)(C))(C) — Present and proposed access.~~

455
456 ~~(moved to Section 9(d)(ii)(D))(D) — Distances from current habitation,~~
457 ~~the closest major treated water transmission line, the closest treated water storage facility, and~~
458 ~~the water source.~~

459
460 ~~(moved to Section 9(d)(ii)(E))(E) — Fencing and/or security.~~

461
462 ~~(moved to Section 9(d)(ii)(F))(F) — Topographic features and contours~~
463 ~~with indicated datum.~~

464
465 ~~(moved to Section 9(d)(ii)(G))(G) — Soil and subsurface geological~~
466 ~~characteristics. Provide a soils investigation report of the proposed site suitable for structural~~
467 ~~design of the proposed facilities.~~

468
469 ~~(moved to Section 9(d)(iii))(ii) — A detailed description of the service area for~~
470 ~~the project including a scaled plan showing land use and boundaries.~~

471
472 ~~(moved to Section 9(d)(iv))(iii) — A detailed description of the recycle flows~~
473 ~~and procedures for reclamation of recycle streams.~~

474
475 ~~(moved to Section 9(d)(v))(iv) — A detailed description of disposal techniques~~
476 ~~for settled solids, including a description of the ultimate disposal of sludge.~~

477
478 ~~(v) — Sources of water supply shall be described to include:~~

479
480 ~~(moved to Section 9(f))(A) — Groundwater sources.~~

481
482 ~~(moved to Section 9(f)(ii))(I) — Geology of aquifer and overlying~~
483 ~~strata.~~

484
485 ~~(II) — Summary of source exploration data, including test well~~
486 ~~depth and method of construction; test pumping rates and duration; and water levels and specific~~
487 ~~yield.~~

488
489 ~~(moved to Section 9(f)(iii)) — Water quality, including biological, radiological and chemical~~
490 ~~quality data sufficient to determine necessary treatment processes and compliance with all~~
491 ~~drinking water standards as determined by the administrator. The same water quality data for all~~
492 ~~secondary sources shall also be provided.~~

493
494 ~~(III) — Sources of possible contamination around well and in any~~
495 ~~known recharge areas, including location of any waste sites, industrial facilities and wastewater~~
496 ~~disposal areas.~~

497
498 ~~(B) — Surface water sources.~~

499

- 500 ~~(moved to Section 9(e)(ii))(I) Safe annual yield, the quantity of~~
501 ~~water available from the source during the average and driest years of record.~~
502
- 503 ~~(moved to Section 9(e)(ii)(A))(II) Hydrological data, stream~~
504 ~~flows and diversion records.~~
505
- 506 ~~(moved to Section 9(e)(iii)(III) Representative water quality~~
507 ~~data, including bacteriological, radiological, chemical and physical data. These data shall be~~
508 ~~sufficient to determine the necessary process and the ability to meet water quality standards.~~
509
- 510 ~~(IV) Description of the watershed noting sources of potential~~
511 ~~contamination.~~
512
- 513 ~~(V) Description of any anticipated changes in water quality.~~
514
- 515 ~~(moved to Section 9(e)(ii)(B))(VI) Description of any diversion~~
516 ~~dams, impoundments or reservoirs and appurtenances.~~
517
- 518 ~~(vi) Plant design conditions, including:~~
519
- 520 ~~(A) Historical and design population.~~
521
- 522 ~~(B) Existing and projected maximum daily demand flows and demand~~
523 ~~variations.~~
524
- 525 ~~(C) Complete description of existing facilities.~~
526
- 527 ~~(D) Where applicable, a complete description of proposed treatment~~
528 ~~process including:~~
529
- 530 ~~(I) Unit process design criteria addressing flash mixing,~~
531 ~~flocculation and settling basin size and equipment description; retention times; unit loadings and~~
532 ~~overflow rates; filter area and proposed filtration rate; backwash rate and volume requirements;~~
533 ~~chemical feeder capacities and ranges; and disinfection feeder capacities and ranges.~~
534
- 535 ~~(II) Chemical requirements, including dosages and feed rates.~~
536 ~~(III) Chemical delivery, handling, and storage systems.~~
537
- 538 ~~(IV) Waste generation including types and volumes.~~
539
- 540 ~~(V) Waste stream recycling, including holding basin capacities,~~
541 ~~pump sizes and recycle rates.~~
542
- 543 ~~(VI) Methods of ultimate waste disposal.~~
544
- 545 ~~(VII) Low service pumping facilities.~~

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~~(E) — Description of on-site restrooms and sanitary sewer facilities.~~

~~(vii) — Summary of automatic operation and control systems, including basic operation, manual override operation, and maintenance requirements.~~

~~(viii) — Description of the on-site laboratory facilities and a summary of those tests to be conducted on-site. If no on-site laboratory is provided, a description of plant control and water quality testing requirements, and where the testing will be conducted shall be included. Description of cross-control measures to be provided at chemical feed tanks, filters, washdown taps, direct connection to sewer or other relevant protection.~~

~~(moved to Section 9(b)(iv))(d) — Hazard classification. The engineering design report shall include a hazard classification or specify the default classification identified in Section 14 (i) (i) (B) which shall be applicable to the project. A hazard classification shall include the following:~~

~~(i) — A determination of the degree of hazard of all water service connections to be connected to the proposed project.~~

~~(ii) — A determination of the potential cause of backflow for all water service connections.~~

~~(formerly Section 5) This section is provided to encourage new technology and equipment and provide a process for evaluating and permitting designs which deviate from these regulations. The proposed construction of facilities and processes not in compliance with these regulations will be permitted provided that the facility, when constructed, can operate meeting the purpose of these regulations.~~

~~(formerly Section 5)(a)~~ Each application for a permit to construct a facility under this section shall be evaluated on a case-by-case basis using the best available technology. ~~The following information should be included with the application:~~ The Administrator may approve applications demonstrating the constructed facility can meet the purpose of the Wyoming Environmental Quality Act and this Chapter.

(b) The following information shall be included with the application for a permit to construct, install, modify, or operate a public water supply facility not specifically covered by these standards:

~~(formerly Section 5(a)(i))(i)~~ (i) Data obtained from a full-scale, comparable installation which demonstrates the acceptability of the design; and/or:

(A) a full scale, comparable installation ~~which~~ that demonstrates the acceptability of the design; ~~and/or~~

591 ~~(formerly Section 5(a)(ii))(B) Data obtained from a~~ pilot plant operated
592 under the design condition for a sufficient length of time to demonstrate the acceptability of the
593 design; ~~and/or~~

594
595 ~~(formerly Section 5(a)(iii))(C) _____ Data obtained from a~~ theoretical
596 evaluation of the design ~~which~~ demonstrates a reasonable probability ~~of that~~ the facility ~~will~~
597 ~~meeting~~ the design objectives; ~~and.~~

598
599 ~~(formerly Section 5(a)(iv))(ii)~~ An evaluation of the flexibility of making corrective
600 changes to the constructed facility in the event it does not function as planned.

601
602 ~~(formerly Section 5(b))(c)~~ If an applicant wishes to construct a pilot plant to provide
603 the data necessary to ~~show the design will~~ meet the ~~purpose~~ requirements of ~~the act~~ this Section,
604 the applicant must obtain a permit to construct ~~must be obtained~~.

605
606 **Section 7. ~~Plans and Specifications Content~~ Permits, Permit Application, and**
607 **Recordkeeping Requirements.**

608
609 ~~(moved to Section 8(b))(a) — All plans for water works and treatment facilities shall have~~
610 ~~a suitable title showing the following:~~

611
612 ~~(moved to Section 8(b))(i) — Name of owner and location of project.~~

613
614 ~~(ii) — North arrow and drawing scale.~~

615
616 ~~(iii) — Name, Wyoming registration number, and seal or signature of the~~
617 ~~engineer.~~

618
619 ~~(b) — All plans shall contain a site plan of the proposed project with topography and~~
620 ~~boundaries of the project. Datum used shall be indicated.~~

621
622 ~~(moved to Section 8(c))(c) — Water lines. Plans for transmission and distribution lines~~
623 ~~shall include:~~

624
625 ~~(moved to Section 8(c)(i)(i) — A detailed plan view at a legible scale of each reach~~
626 ~~of the water line showing all existing and proposed streets, adjacent structures, physical features,~~
627 ~~and existing locations of utilities. The location and size of all water lines, valves, access~~
628 ~~manholes, air vacuum release stations, thrust blocking, and other appurtenances shall be~~
629 ~~indicated. Pertinent elevations shall be indicated on all appurtenances.~~

630
631 ~~(moved to Section 8(c)(ii))(ii) Profiles of all water lines shall be shown on the~~
632 ~~same sheet as the plan view at legible horizontal and vertical scales, with a profile of existing and~~
633 ~~finished surfaces, pipe size and material, valve size, material and type. The location of all special~~
634 ~~features such as access manholes, concrete encasements, casing pipes, blowoff valves, and~~
635 ~~airvacuum relief valves, etc., shall be shown.~~

636

637 ~~(moved to Section 8(e)(iii))(iii) — Special detail drawings scaled and~~
638 ~~dimensioned to show the following:~~

639
640 ~~(moved to Section 8(e)(iii)(A))(A) — The bottom of the stream, the~~
641 ~~elevation of the high and low water levels, and other topographical features at all locations~~
642 ~~where the water line is near or crosses streams or lakes.~~

643
644 ~~(moved to Section 8(e)(iii)(B))(B) — Cross-section drawing of the pipe~~
645 ~~bedding.~~

646
647 ~~(moved to Section 8(e)(iii)(C))(C) — Additional features not otherwise~~
648 ~~covered by specifications.~~

649
650 ~~(moved to Section 8(e)(iv)(iv) — Location of any sewer lines within 30 feet (9~~
651 ~~m) horizontally. Sewers that cross water lines shall be shown on the profile drawings.~~

652
653 ~~(moved to Section 8(d))(d) — Storage tanks, pumping stations and treatment facilities.~~
654 ~~Plans shall be submitted showing the relation of the proposed project to the remainder of the~~
655 ~~system. Layouts and detail plans shall show the following:~~

656
657 ~~(moved to Section 8(d)(i))(i) — Site location and layout including topographic and~~
658 ~~physical features, proposed arrangement of pumping or treatment units, existing facilities,~~
659 ~~existing and proposed piping and valving arrangements, access drive, power supply, fencing,~~
660 ~~embankments, clearwells, waste and sludge ponds, etc.~~

661
662 ~~(moved to Section 8(d)(ii))(ii) — Schematic flow diagram(s) and hydraulic~~
663 ~~profile(s) for facility treated water, and flow diagram for sludge and wastewater flows.~~

664
665 ~~(moved to Section 8(d)(iv))(iii) — Plan(s) and section view(s) of each~~
666 ~~treatment facility process unit with specific construction details, features and pertinent~~
667 ~~elevations. Details of each unit should include, but are not limited to: inlet and outlet devices,~~
668 ~~baffles, valves, arrangement of automatic control devices, mixers, motors, chemical feeders,~~
669 ~~sludge scrapers, sludge disposal, or other mechanical devices.~~

670
671 ~~(moved to Section 8(e))(e) — Wells. Plan and profile drawings of well construction shall~~
672 ~~be submitted showing diameter and depth of drill holes, casing and liner diameters and depths,~~
673 ~~grouting depths, elevation and designation of geological formations, water levels, and other~~
674 ~~details to describe the proposed well completely.~~

675
676 ~~(moved to Section 8(f))(f) — Specifications. Technical specifications shall accompany~~
677 ~~the plans for new water lines, pump stations, treatment facilities, wells, or~~
678 ~~additions/modifications to existing systems or facilities. Where plans are for extensions to water~~
679 ~~distribution systems, the specifications may be omitted, provided it is stated that the work is to be~~
680 ~~constructed under specifications authorized by the Water Quality Division. Specifications on file~~
681 ~~must conform to this standard. The specifications accompanying construction drawings shall~~
682 ~~include:~~

- 683
684 ~~(moved to Section 8(f)(i))(i) Identification of construction materials.~~
685
686 ~~(moved to Section 8(f)(iii))(ii) The type, size, strength, operating~~
687 ~~characteristics, rating or requirements for all mechanical and electrical equipment, including~~
688 ~~machinery, valves, piping, electrical apparatus, wiring and meters; laboratory fixtures and~~
689 ~~equipment; operating tools; special appurtenances; and chemicals, when applicable.~~
690
691 ~~(moved to Section 8(f)(iv))(iii) Construction and installation procedure for~~
692 ~~materials and equipment.~~
693
694 ~~(moved to Section 8(f)(v))(iv) Requirements and tests of materials and~~
695 ~~equipment to meet design standards.~~
696
697 ~~(moved to Section 8(f)(vi))(v) Performance tests for operation of~~
698 ~~completed works and component units.~~
699
700 ~~(moved to Section 8(f)(vii))(vi) Specialized requirements for tests, analyses,~~
701 ~~disinfection techniques, and other special needs.~~
702
703 ~~(vii) Requirements for well construction and testing. The collection of the~~
704 ~~following must be recorded and reported to the Wyoming Department of Environmental Quality,~~
705 ~~Water Quality Division.~~
706
707 ~~(A) Geological data.~~
708
709 ~~(B) Well construction data. Well construction data shall include screen~~
710 ~~locations, size of screen openings, screen intervals, accurate records of drill hole diameters and~~
711 ~~depths, assembled order, size and length of casing and liners, casing wall thickness, grouting~~
712 ~~depths, formations penetrated, water levels, and location of any blast charges.~~
713
714 ~~(C) Well test data. Well test data shall include test pump capacity-~~
715 ~~head characteristics; static water level; depth of test pump setting; time of starting and ending~~
716 ~~each test cycle; pumping rate; pumping water level; drawdown; and water recovery rate and~~
717 ~~levels.~~
718
719 ~~(moved to Section 8(f)(viii))(g) Technical specifications shall require that all water~~
720 ~~service connections will be provided with backflow prevention devices in accordance with the~~
721 ~~requirements of Section 14 (i) of these regulations.~~
722
723 (a) Applications for a permit to construct, install, modify, or operate a public water
724 supply shall comply with the requirements of Water Quality Rules Chapter 3, Section 6.
725
726 (b) The application shall include the following components:
727

- 728 (i) An engineering design report that meets the requirements of Section 9 of
729 this Chapter;
730
- 731 (ii) A construction plan that meets the applicable requirements of Sections 8,
732 10, 11, 12, 13, 14, 15, 16, and 17 of this Chapter;
733
- 734 (iii) An operation and maintenance plan that meets the requirements of Section
735 18 of this Chapter; and
736
- 737 (iv) Any additional information required by the Administrator.
738
- 739 (c) The application and components required by this Chapter shall be submitted to the
740 Division in a format required by the Administrator.
741
- 742 (d) The application shall include certification under penalty of perjury that the
743 applicant has secured and will maintain permission for Department personnel and their invitees
744 to access the facility, including permission to:
745
- 746 (i) Access the land where the facility is located;
747
- 748 (ii) Collect resource data as defined by W.S. § 6-3-414(e)(iv); and
749
- 750 (iii) Enter and cross all properties necessary to access the facility if the facility
751 cannot be directly accessed from a public road.
752
- 753 (e) Sections of permit applications that represent engineering work shall be sealed,
754 signed, and dated by a licensed professional engineer as required by W.S. § 33-29-601.
755
- 756 (f) Sections of permit applications that represent geologic work shall be sealed,
757 signed, and dated by a licensed professional geologist as required by W.S. § 33-41-115.
758
- 759 (g) The Administrator may allow an alternative two-step permitting and application
760 procedure for wells and water storage tank project applicants that meet the following
761 requirements:
762
- 763 (ii) For applications that include wells, the Department will issue one permit
764 with the following phased authorizations:
765
- 766 (A) The issued permit will authorize the well to be constructed,
767 developed, and tested;
768
- 769 (B) Applicants shall then submit well test data and water quality data
770 for Administrator review; and
771

772 (C) Upon the Administrator’s approval of the well test data and water
773 quality data, the Director shall modify the issued permit to authorize connection of the
774 distribution system to the well.

775
776 (iii) Applicants for water storage tanks may follow an alternative procedure
777 when the final plans and specifications for the tank cannot be submitted with the initial permit
778 application due to project bidding constraints. In these instances, the Department will issue a
779 permit through the following phased authorizations:

780
781 (A) The issued permit will authorize the project to initiate the bidding
782 process. Applicants shall ensure the project bidding documentation includes a requirement that
783 the final water storage tank design complies with the requirements of this Chapter.

784
785 (B) Applicants shall then submit final documentation and
786 specifications for the water storage tank that demonstrate the design is consistent with the
787 requirements of this Chapter. Upon the Administrator’s approval of the final tank documentation
788 specifications, the Director shall modify the issued permit to authorize the construction of the
789 water storage tank and foundation.

790
791 (iv) Applicants that use phased authorization procedures in this paragraph (g)
792 shall request a pre-application meeting with the applicable Division district engineer prior to
793 submission of the permit application package to ensure efficient coordination of the submittals of
794 all reports, plans, and specifications, and Division review timelines.

795 **Section 8. ~~General Design Considerations~~ Plans and Specifications.**

796
797
798 ~~(moved to Section 10(b))(a)—Design basis. The capacity of the water treatment or water~~
799 ~~production system shall be designed for the maximum daily demand at the design year. Where~~
800 ~~water use records are not available to establish water use, the equivalent per capita water use~~
801 ~~shall be at least 125 gpd (475 liters per day) and 340 gpd (1,285 liters per day) to size facilities~~
802 ~~for average and maximum daily water demand, respectively.~~

803
804 ~~(b)—Siting requirements.~~

805
806 ~~(moved to Section 10(d)(ii))(i)—Location. Treatment facilities shall be~~
807 ~~located such that no sources of pollution may affect the quality of the water supply or treatment~~
808 ~~system. The facilities shall not be located within 500 feet of landfills, garbage dumps, or~~
809 ~~wastewater treatment systems.~~

810
811 ~~(moved to Section 10(d)(iii))(ii)—Flood protection. All treatment process~~
812 ~~structures, mechanical equipment, and electrical equipment shall be protected from the~~
813 ~~maximum flood of record or the 100-year flood, whichever is greater. The treatment facilities~~
814 ~~shall remain fully operational and accessible during the 100-year flood.~~

815

816 ~~(moved to Section 10(e))(c)—Level of treatment. Treatment shall be provided to~~
817 ~~produce a potable water that is bacteriologically, chemically, radiologically, and physically safe~~
818 ~~as determined by the administrator.~~

819 ~~(i)—Surface supplies. Treatment shall include:~~

820 ~~(A)—Chemical addition/coagulation, flocculation, sedimentation,~~
821 ~~filtration and disinfection; or~~

822 ~~(B)—Where the raw water maximum turbidity is less than 50 TU and is~~
823 ~~not attributable to clay and maximum color is less than 30 TU, treatment facilities may include~~
824 ~~slow sand filtration and disinfection; or~~

825 ~~(C)—Where the maximum monthly average raw water turbidity is less~~
826 ~~than 25 TU, the color is less than 30 TU and fecal coliform organisms are less than 100 mpn/100~~
827 ~~ml, treatment facilities may be diatomaceous earth filters and disinfection.~~

828 ~~(ii)—Groundwater supplies. Groundwater supply facilities shall provide~~
829 ~~disinfection equipment and connections, as a minimum.~~

830 ~~(d)—Hydraulic and treatment reliability.~~

831 ~~(moved to Section 10(f))(i)—Multiple units. Treatment facilities with 100,000~~
832 ~~gallons per day (gpd) (378.5 m³/day) capacity and over shall provide duplicate units, as a~~
833 ~~minimum, for chemical feed, flocculation, sedimentation, filtration and disinfection. (moved to~~
834 ~~Section 10(g))Treatment facilities under 100,000 gpd (378.5 m³/day) capacity shall provide~~
835 ~~duplicate units as described above or may provide finished water system storage equal to twice~~
836 ~~the maximum daily demand.~~

837 ~~(moved to Section 10(h))(ii)—Multiple equipment. All treatment facility pumping~~
838 ~~shall provide the maximum daily flow with the largest single unit not in service. Finished water~~
839 ~~pumping in combination with finished water storage that floats on the distribution systems shall~~
840 ~~provide the maximum hour flow with the single largest unit not in service. When fire protection~~
841 ~~is provided, pumping and finished water storage that floats on the system shall provide the fire~~
842 ~~demand plus the maximum daily demand, or the maximum hour demand, whichever is greater.~~

843 ~~(moved to Section 10(i))(iii)—Alternative power source. Where the finished water~~
844 ~~storage volume that floats on the distribution system is not capable of supplying the maximum~~
845 ~~daily demand, an alternative power shall be provided for the finished water pumps. The~~
846 ~~combined finished water storage volume and pumping capacity supplied by alternative power~~
847 ~~shall be at least adequate to provide the maximum daily demand. Acceptable alternative power~~
848 ~~sources include an engine generator, engine drive pumps, or a second independent electrical~~
849 ~~supply.~~

860 ~~(moved to Section 10(j))(e) — Housing. Process equipment, including filters and~~
861 ~~appurtenances, disinfection, chemical feed and storage, electrical and controls, and pipe galleries~~
862 ~~shall be housed.~~

863
864 ~~(f) — Electrical.~~

865
866 ~~(moved to Section 10(s))(i) — Equipment location. Service transformers and other~~
867 ~~critical electrical equipment shall be located above the 100-year flood and above grade.~~
868 ~~Transformers shall be located so that they are remote or protected by substantial barriers from~~
869 ~~traffic. Motor controls shall be located in superstructures and in rooms that do not contain~~
870 ~~corrosive atmospheres.~~

871
872 ~~(ii) — Code requirements. Electrical design shall comply with the National~~
873 ~~Electrical Code as enacted and amended by the Wyoming Department of Fire Prevention and~~
874 ~~Electrical Safety. Areas in which the occurrence of explosive concentrations of hazardous~~
875 ~~gases, flammable fluids, or explosive dusts can occur shall be designed for hazardous locations~~
876 ~~in accordance with the National Electrical Code Class 1, Groups C and D, Division 1 locations.~~

877
878 ~~(g) — Structural.~~

879
880 ~~(moved to Section 8(n))(i) — Construction materials. Construction materials~~
881 ~~shall be selected, apportioned, and/or protected to provide water tightness, corrosion protection,~~
882 ~~and resistance to weather variations.~~

883
884 ~~(moved to Section 8(o))(ii) — Coatings. Coatings used to protect structures,~~
885 ~~equipment, and piping shall be suitable for atmospheres containing moisture and low~~
886 ~~concentrations of chlorine. Surfaces exposed in chemical areas shall be protected from chemical~~
887 ~~attack. Paints shall not contain lead, mercury, or other toxic metals or chemicals.~~

888
889 ~~(moved to Section 8(e))(iii) — Geological conditions. Structural design shall~~
890 ~~consider the seismic zone, groundwater, and soil support. Soils investigations shall be made, or~~
891 ~~adequate previous soils investigations shall be available to develop structural design.~~

892
893 ~~(h) — Safety. The Wyoming Occupational Health and Safety (OHS) Rules and~~
894 ~~Regulations shall be complied with. The following items shall also be provided:~~

895
896 ~~(i) — Instruction manuals. Instruction manuals shall be provided for all~~
897 ~~mechanical and electrical equipment describing operation, maintenance, and safety.~~

898
899 ~~(ii) — Handrails. In addition to all Wyoming OHS requirements, barriers~~
900 ~~around treatment basins shall be provided.~~

901
902 ~~(iii) — Warning signs. Warning signs for pipes or hose bibs containing~~
903 ~~nontreated water, electrical hazards, mechanical hazards, chemical hazards, or other unsafe~~
904 ~~features shall be provided. Warning signs shall be permanently attached to the structure or~~
905 ~~appropriate equipment.~~

906
907 ~~(iv) — Equipment guards. Shields to protect operators from rotating or moving~~
908 ~~machinery shall be provided.~~

909
910 ~~(v) — Lighting. Provisions shall be made to light walkways, paths, and other~~
911 ~~accessways around basins, in buildings and on the site. All areas shall be lit in a manner that the~~
912 ~~failure of one lighting fixture will not cause an area to be dark, or the loss of power will not~~
913 ~~cause a room or enclosed area to be dark.~~

914
915 ~~(vi) — Climate conditions. Design of facilities such as exposed stairs, walkways,~~
916 ~~and sidewalks shall include nonskid surfaces.~~

917
918 ~~(i) — Instrumentation.~~

919
920 ~~(moved to Section 10(t))(i) — Metering. The treatment facility shall have a flow~~
921 ~~measuring device provided for raw water influent and clear well effluent. The accuracy of the~~
922 ~~device shall be at least plus or minus two percent of span.~~

923
924 ~~(moved to Section 10(t)(ii))(ii) — Type. All flow meters shall provide~~
925 ~~totalized flow. For plants with a maximum daily flow of 50,000 gpd (189 m³/d) or more, the~~
926 ~~meter shall also include recording of instantaneous flow rate.~~

927
928 ~~(moved to Section 10(t)(i))(iii) — Controls. Automatic controls shall be~~
929 ~~designed to permit manual override.~~

930
931 ~~(moved to Section 13(c))(iv) — Alarms. High effluent turbidity and chlorine leaks~~
932 ~~(when chlorine gas is used) shall be alarmed at an attended location.~~

933
934 ~~(j) — Sample taps. Sample taps shall be provided so that water samples can be obtained~~
935 ~~from each water source and from appropriate locations in each unit operation of treatment. Taps~~
936 ~~shall be consistent with sampling needs and shall not be of the petcock type. Taps used for~~
937 ~~obtaining samples for bacteriological analysis shall be of the smooth-nosed type without interior~~
938 ~~or exterior threads, shall not be of the mixing type, and shall not have a screen, aerator, or other~~
939 ~~such appurtenance.~~

940
941 ~~(moved to Section 10(r))(k) — Ventilation. All enclosed spaces shall be provided with~~
942 ~~forced ventilation, except pumping station wetwells or clearwells. In areas where there are open~~
943 ~~treatment units exposed to the room, ventilation shall be provided to limit relative humidity to~~
944 ~~less than 85 percent but not less than 6 air changes per hour. In electrical and equipment rooms,~~
945 ~~ventilation shall be provided to limit the temperature rise in the room to less than 15° F (8° C)~~
946 ~~above ambient, but not less than 6 air changes per hour. Rooms housing chlorine storage and/or~~
947 ~~feeders shall have provisions for exhausting the room contents in 2 minutes and continuous~~
948 ~~ventilation to provide not less than~~
949 ~~12 air changes per hour.~~

950

951 ~~(l) — Dewatering of treatment units. All treatment units, channels, basins, clearwells~~
952 ~~and wetwells shall be provided with drains or sumps that facilitate draining the unit for access~~
953 ~~and maintenance. Drainage shall be to the process waste system, filter washwater system or~~
954 ~~sanitary sewer. (moved to Section 10(l)) Basin slabs shall be designed to successfully resist the~~
955 ~~hydrostatic uplift pressure or an area dewatering system shall be provided. Considerations must~~
956 ~~be given in structural design to long span breakage in basins designed to resist uplift.~~

957
958 ~~(moved to Section 10(k))(m) Cold weather protection. All equipment not required to be~~
959 ~~in or on open basins (such as clarifier drives and flocculator) shall be housed in heated, lighted,~~
960 ~~and ventilated structures. (moved to Section 10(m)) Structure entrances shall be above grade.~~
961 ~~(moved to Section 10(l)) Piping shall be buried below frost level, placed in heated structures, or~~
962 ~~provided with heat and insulated.~~

963
964 ~~(n) — Chemical storage. All chemical storage shall be housed or buried. Areas~~
965 ~~designated for storage of specific chemicals shall be separated from areas designated for other~~
966 ~~reactive chemicals. Liquid storage containers shall be isolated from other portions of the~~
967 ~~structure by a curb that will contain ruptured tank contents. Concrete floors, walls, and curbs in~~
968 ~~chemical storage and feed areas shall be coated to protect the concrete from aggressive~~
969 ~~chemicals. Floors in polymer feed and storage areas shall be provided with nonslip surfaces.~~
970 ~~Rooms for chlorine storage and feed equipment shall be gastight and be provided with entry~~
971 ~~from outdoors. All toxic chemical storage areas shall be provided with lighting and ventilation~~
972 ~~switched from outside the room near the door. All toxic chemical storage areas shall be provided~~
973 ~~with windows either in the door or near the door to permit viewing the room from outside.~~
974 ~~Explosive chemicals shall be stored to protect operations personnel and equipment from injury or~~
975 ~~damage.~~

976
977 ~~(o) — Facility water supply. The facility water supply service line and the plant finished~~
978 ~~water sample tap shall be supplied from a source of finished water at a point where all chemicals~~
979 ~~have been thoroughly mixed, and the required disinfectant contact time has been achieved.~~
980 ~~There shall be no cross-connections between the facility water supply service line and any~~
981 ~~piping, troughs, tanks, or other treatment units containing wastewater, treatment chemicals, raw~~
982 ~~or partially treated water. The potable plant water supply line shall have provisions to prevent~~
983 ~~backflow.~~

984
985 ~~(moved to Section 10(b)(ii))(p) — Design capacities. The plant capacity shall include~~
986 ~~maximum daily water demand, filter backwash quantities, and industrial water use. In the~~
987 ~~absence of data, filter backwash quantity shall be five percent of the maximum daily demand.~~

988
989 ~~(moved to Section 10(v))(q) — Monitoring equipment. Water treatment plants having a~~
990 ~~capacity of 0.5 mgd (1892.6 m³/d) or more shall be provided with continuous finished water~~
991 ~~turbidimeters (including recorders).~~

992
993 ~~(r) — Labels. All process piping shall be labeled to identify materials being conveyed.~~
994

995 (a) 2018 TSS, part 1.2-1.2.2(r), plans; 1.3-1.3(e), specifications; 1.4-1.4(m), design
996 criteria; 1.5, revisions to approved plans; and 1.6, additional information required; are herein
997 incorporated by reference.

998
999 ~~(formerly Section 7(a))(b)~~ All plans for waterworks and treatment facilities shall ~~have~~
1000 ~~a suitable title showing the following also include~~ the name of the real estate owner, ~~(formerly~~
1001 ~~Section 7(a)(i)) Name of the~~ owner of the project, and the location of the project.

1002
1003 ~~(formerly Section 7(e))(c) Water lines.~~ Plans for transmission and distribution lines
1004 shall include:

1005
1006 (i) The information required in paragraph (a) of this Section;

1007
1008 ~~(formerly Section 7(e)(i))(ii)~~ A detailed plan view at a legible scale of each reach
1009 of the water line showing all existing and proposed streets, adjacent structures, physical features,
1010 and existing locations of utilities. ~~The location and size of all water lines, valves, access~~
1011 ~~manholes, air vacuum release stations, thrust blocking, and other appurtenances shall be~~
1012 ~~indicated. Pertinent elevations shall be indicated on all appurtenances. that indicates:~~

1013
1014 ~~(formerly Section 7(e)(i))(A)~~ The location and size of all water lines,
1015 valves, access manholes, air-vacuum release stations, thrust blocking, and other appurtenances
1016 ~~shall be indicated.; and~~

1017
1018 ~~(formerly Section 7(e)(i))(B)~~ Pertinent elevations ~~shall be indicated on all~~
1019 ~~appurtenances.~~

1020
1021 ~~(formerly Section 7(e)(i))(ii)~~ Profiles of all water lines ~~shall be that are~~ shown on
1022 the same sheet as the plan view at legible horizontal and vertical scales; and that show ~~with a~~
1023 ~~profile of existing and finished surfaces, pipe size and material, valve size, material and type.~~
1024 ~~The location of all special features such as access manholes, concrete encasements, casing pipes,~~
1025 ~~blowoff valves, and air vacuum relief valves, etc., shall be shown.;~~

1026
1027 ~~(formerly Section 7(e)(i))(A)~~ pProfiles of:

1028
1029 ~~(formerly Section 7(e)(i))(I)~~ eExisting and finished surfaces.;

1030
1031 ~~(formerly Section 7(e)(i))(II)~~ pPipe size and material.;

1032
1033 ~~(formerly Section 7(e)(i))(III)~~ vValve size, material and
1034 type.

1035
1036 ~~(formerly Section 7(e)(i))(B)~~ The location of all special features such as
1037 access manholes, concrete encasements, casing pipes, blowoff valves, and air vacuum relief
1038 valves, ~~etc., shall be shown.~~

1040 ~~(formerly Section 7(e)(iii))~~(iv) Special detail drawings scaled and
1041 dimensioned to show the following:

1042
1043 ~~(formerly Section 7(e)(iii)(A))~~(A) The bottom of the stream, the
1044 elevation of the high- and low water levels, and other topographical features ~~at all locations~~
1045 ~~where the water line is near or crosses streams or lakes,~~ at points where the water line:

1046
1047 (I) Is located within 10 feet of streams or lakes; or

1048
1049 (II) Crosses streams or lakes.

1050
1051 ~~(formerly Section 7(e)(iii)(B))~~(B) ~~A~~ C cross-section drawing of the pipe
1052 bedding; and

1053
1054 ~~(formerly Section 7(e)(iii)(C))~~(C) Additional features of the pipe or its
1055 installation that are not otherwise covered by specifications.

1056
1057 ~~(formerly Section 7(e)(iv))~~(iv) The ~~L~~ location of any sewer lines within 30
1058 feet ~~(9-m)~~ horizontally of water lines. Sewers that cross water lines shall be shown on the profile
1059 drawings.

1060
1061 ~~(formerly Section 7(d))~~(d) Plans for ~~S~~ storage tanks, pumping stations, and water
1062 treatment facilities. ~~Plans shall be submitted~~ showing the relation of the proposed project to the
1063 remainder of the system. Layouts and detail plans shall ~~show the following~~ include:

1064
1065 (i) The information required in paragraph (a) of this Section;

1066
1067 (ii) The seal and signature of the Wyoming Professional Engineer providing
1068 the design;

1069
1070 ~~(formerly Section 7(d)(i))~~(iii) The ~~S~~ site location and layout including: ~~topographic~~
1071 ~~and physical features, proposed arrangement of pumping or treatment units, existing facilities,~~
1072 ~~existing and proposed piping and valving arrangements, access drive, power supply, fencing,~~
1073 ~~embankments, clearwells, waste and sludge ponds, etc.~~

1074
1075 ~~(formerly Section 7(d)(i))~~(A) ~~t~~ Topographic and physical features,
1076 including embankments;

1077
1078 ~~(formerly Section 7(d)(i))~~(B) The proposed arrangement of pumping or
1079 treatment units; ;

1080
1081 ~~(formerly Section 7(d)(i))~~(C) ~~e~~ Existing facilities; ;

1082
1083 ~~(formerly Section 7(d)(i))~~(D) ~~e~~ Existing and proposed piping and valving
1084 arrangements; ;

1085

1086 ~~(formerly Section 7(d)(i))(E) access drive,~~ The route to access the facility;
1087
1088 ~~(formerly Section 7(d)(i))(F) The power supply;~~
1089
1090 ~~(formerly Section 7(d)(i))(G) Fencing;~~ and
1091
1092 ~~(formerly Section 7(d)(i))(H) The proposed location of embankments,~~
1093 clearwells, waste ponds, and sludge ponds, ~~etc.~~
1094
1095 ~~(formerly Section 7(d)(ii))(iv) Schematic flow diagram(s) and hydraulic profile(s)~~
1096 ~~for facility treated water, and flow diagram for sludge and wastewater flows;~~
1097
1098 ~~(formerly Section 7(d)(ii))(v) A flow diagram for sludge and wastewater flows;~~
1099 and
1100
1101 ~~(formerly Section 7(d)(iii))(vi)~~ Plan(s) and section view(s) of each
1102 treatment facility process unit with specific construction details, features, and pertinent
1103 elevations. ~~Details of each unit should include, including~~ but ~~are~~ not limited to the following:
1104 ~~inlet and outlet devices, baffles, valves, arrangement of automatic control devices, mixers,~~
1105 ~~motors, chemical feeders, sludge scrapers, sludge disposal, or other mechanical devices.~~
1106
1107 ~~(formerly Section 7(d)(iii))(A)~~ iInlet and outlet devices;
1108
1109 ~~(formerly Section 7(d)(iii))(B)~~ bBaffles;
1110
1111 ~~(formerly Section 7(d)(iii))(C)~~ vValves;
1112
1113 ~~(formerly Section 7(d)(iii))(D)~~ aArrangement of automatic control
1114 devices;
1115
1116 ~~(formerly Section 7(d)(iii))(E)~~ mMixers;
1117
1118 ~~(formerly Section 7(d)(iii))(F)~~ mMotors;
1119
1120 ~~(formerly Section 7(d)(iii))(G)~~ eChemical feeders;
1121
1122 ~~(formerly Section 7(d)(iii))(H)~~ sSludge scrapers;
1123
1124 ~~(formerly Section 7(d)(iii))(I)~~ sSludge disposal; or
1125
1126 ~~(formerly Section 7(d)(iii))(J)~~ oOther mechanical devices.
1127
1128 ~~(formerly Section 7(e))(e)~~ Wells. Plans ~~and profile drawings of~~ for well construction
1129 shall ~~be submitted~~ include: showing diameter and depth of drill holes, casing and liner diameters
1130 and depths, grouting depths, elevation and designation of geological formations, water levels,
1131 ~~and other details to describe the proposed well completely.~~

- 1132
- 1133 (i) The information required in paragraph (a) of this Section;
- 1134
- 1135 (ii) Assembled order, size, and length of casing and liners;
- 1136
- 1137 ~~(formerly Section 9(b)(ii)(B))(iii) Plumbness and alignment requirements.~~
- 1138 ~~Every well shall be tested for plumbness and alignment in accordance with AWWA A-100. The~~
- 1139 ~~well test method and allowable tolerance shall be stated in the specifications.;~~
- 1140
- 1141 ~~(formerly Section 9(b)(iii)(B)(V)(1.))(iv) The l~~Locations of all caisson
- 1142 construction joints and porthole assemblies ~~shall be indicated~~ on drawings, if a radial water
- 1143 collector is proposed.; ~~The caisson wall shall be reinforced to withstand the forces to which it~~
- 1144 ~~will be subjected. The top of the caisson shall be covered with a watertight floor. The pump~~
- 1145 ~~discharge piping shall not be placed through the caisson walls.~~
- 1146
- 1147 ~~(formerly Section 7(e))(v) From the ground surface to the total depth of the~~
- 1148 drilled borehole, the elevation and designation of geological formations, water levels, formations
- 1149 penetrated, and other details to describe the proposed well completely.;
- 1150
- 1151 ~~(formerly Section 7(f)(vii)(B))(vi) Well construction data. Well construction~~
- 1152 ~~data shall include s~~Screen locations, size of screen openings, and screen intervals.;
- 1153 ~~accurate records of drill hole diameters and depths, assembled order, size and length of casing and liners,~~
- 1154 ~~casing wall thickness, grouting depths, formations penetrated, water levels, and location of any~~
- 1155 ~~blast charges~~
- 1156
- 1157 ~~(formerly Section 7(f)(vii)(B))(vii) The location of any blast charges., if~~
- 1158 available; and
- 1159
- 1160 ~~(formerly Section 7(f)(vii)(e))(viii) (C) — Well test data. Existing W~~well test
- 1161 ~~data shall include including: test pump capacity head characteristics; static water level; depth of~~
- 1162 ~~test pump setting; time of starting and ending each test cycle; pumping rate; pumping water~~
- 1163 ~~level; drawdown; and water recovery rate and levels.~~
- 1164
- 1165 ~~(formerly Section 7(f)(vii)(C)(A) T~~test pump capacity-head
- 1166 characteristics;
- 1167
- 1168 ~~(formerly Section 7(f)(vii)(C)(B) s~~Static water level;
- 1169
- 1170 ~~(formerly Section 7(f)(vii)(C)(C) d~~Depth of test pump setting;
- 1171
- 1172 ~~(formerly Section 7(f)(vii)(C)(D) †~~Time of starting and ending each
- 1173 test cycle;
- 1174
- 1175 ~~(formerly Section 7(f)(vii)(C)(E) p~~Pumping rate;
- 1176
- 1177 ~~(formerly Section 7(f)(vii)(C)(F) p~~Pumping water level;

1178
1179 ~~(formerly Section 7(f)(vii)(C)(G))~~ dDrawdown; and
1180
1181 ~~(formerly Section 7(f)(vii)(C)(H))~~ wWater recovery rate and levels.
1182
1183 ~~(formerly Section 7(f))~~(f) Specifications. Technical specifications shall accompany
1184 ~~the p~~Plans for ~~new~~ water lines, pump stations, treatment facilities, wells, storage, or
1185 additions/modifications to existing systems or facilities. ~~Where plans are for extensions to water~~
1186 ~~distribution systems, the specifications may be omitted, provided it is stated that the work is to be~~
1187 ~~constructed under specifications authorized by the Water Quality Division. Specifications on file~~
1188 ~~must conform to this standard. The specifications accompanying construction drawings shall~~
1189 shall be accompanied by technical specifications that include:
1190
1191 (i) The information required in paragraph (a) of this Section;
1192
1193 ~~(formerly Section 7(f)(i))~~(ii) Identification of construction materials. ~~;~~
1194
1195 ~~(formerly Section 7(f)(ii))~~(iii) When applicable, Tthe type, size, strength,
1196 operating characteristics, rating or requirements for all mechanical and electrical equipment,
1197 including machinery, valves, piping, electrical apparatus, wiring, and meters; laboratory fixtures
1198 and equipment; operating tools; special appurtenances; and chemicals, ~~when applicable.;~~
1199
1200 ~~(formerly Section 7(f)(iii))~~(iv) Construction and installation procedure for
1201 materials and equipment. ~~;~~
1202
1203 ~~(formerly Section 7(f)(iv))~~(v) Requirements and tests of materials and equipment
1204 to meet design standards. ~~;~~
1205
1206 ~~(formerly Section 7(f)(v))~~(vi) Performance tests for the operation of completed
1207 works and component units. ~~;~~
1208
1209 ~~(formerly Section 7(f)(vi))~~(vii) Specialized requirements for tests, analyses,
1210 disinfection techniques, and other special needs. ~~;~~
1211
1212 ~~(formerly Section 7(g))~~(viii) Technical specifications shall require A
1213 demonstration that all water service connections will be provided with backflow prevention
1214 devices in accordance with the requirements of Section ~~14 (i)~~ 16 (m) of ~~these regulations~~ this
1215 Chapter; and
1216
1217 (ix) If technical specifications have been independently permitted by the
1218 Department for statewide use, the title, date, and permit approval identification number in lieu of
1219 providing technical specifications.
1220

1221 **Section 9 Engineering Design Report.**

1222
1223 ~~(a) — Surface water.~~

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~~(i) Structures.~~

~~(A) Design of reservoir or river intake structures.~~

~~(I) Facilities for withdrawal of water from more than one level shall be provided in impoundments if the maximum water depth at the intake is greater than 20 feet (6.1 m). All ports or intake gates shall be located above the bottom of the stream, lake, or impoundment. The lowest intake point shall be located at sufficient depth to be kept submerged at low water levels.~~

~~(II) Where water temperatures are 34° F (1° C) or less, the velocity of flow into the intake structure shall not exceed 0.5 feet per second (.152 m/s). Where intakes are located in shady reaches of a stream, facilities shall be available to diffuse air into the flow stream at a point in front of the intake pipe.~~

~~(III) Inspection manholes shall be located a maximum of every 1,000 feet (304.8 m) for pipe sizes 24 inches (0.61 m) and larger. Where pipelines operate by gravity and the hydraulic gradeline is below the ground surface, concrete manholes may be used. Where the pipeline is pressurized or the hydraulic gradeline is above ground, bolted and gasketed access ways shall be used.~~

~~(IV) Devices shall be provided to minimize entry of fish and debris from the intake structure.~~

~~(B) Offstream reservoir. Offstream reservoirs shall be constructed to assure that:~~

~~(I) Water quality is protected by controlling runoff into the reservoir.~~

~~(II) Dikes are structurally sound and protected against wave action and erosion.~~

~~(ii) Impoundments and reservoirs. The site of any impoundment or reservoir shall be cleared of all brush, trees, and other vegetation to the high water elevation.~~

~~(moved to Section 11(d))(iii) Raw water supply piping. No customer service connection shall be provided from the raw water transmission line to the treatment plant, unless there are provisions to treat the water to meet these standards, or the sole purpose of the service is for irrigation or agricultural water use.~~

~~(moved to Section 11(e))(b) Groundwater.~~

~~(moved to Section 11(e)(i))(i) Number and capacity. The total developed groundwater source, along with other water sources, shall provide a combined capacity that shall~~

1270 equal or exceed the design maximum daily demand. A minimum of 2 wells, or 1 well and
1271 finished water storage equal to twice the maximum daily demand shall be provided. Where 2
1272 wells are provided, the sources shall be capable of equaling or exceeding the design average
1273 daily demand with the largest producing well out of service.

1274
1275 (A) ~~General considerations.~~

1276
1277 (I) ~~Every well shall be protected from and remain operational~~
1278 ~~during the 100-year flood or the largest flood of record, whichever is greater.~~

1279
1280 (II) ~~All wells shall be disinfected after construction, repair, or~~
1281 ~~when work is done on the pump, before the well is placed in service. Disinfection procedures~~
1282 ~~shall be those specified in AWWA A 100 for disinfection of wells.~~

1283
1284 (moved to Section 11(e)(ii)(B))(B) ~~Relation to sources of pollution.~~
1285 ~~Every well shall be located further from any of the sources of pollution listed below. The~~
1286 ~~isolation distances listed below apply when domestic wastewater is the only wastewater present.~~

1287
1288 (moved to Section 11(e)(ii)(A))(I) ~~If the domestic sewage flow~~
1289 ~~is less than 2,000 gallons per day (7,560 L/day), the following minimum isolation distance shall~~
1290 ~~be maintained:~~

1291
1292 Moved to Section 11(e)(ii)(A)

<u>Source of Domestic Wastewater</u>	<u>Minimum Distance to Well</u>
Sewer	50 feet (15.2 m)
Septic tank	50 feet (15.2 m)
Disposal field	100 feet (30.5 m)
Seepage pit	100 feet (30.5 m)
Cesspool	100 feet (30.5 m)

1293
1294 Moved to Section 11(e)(ii)(B))(II)

1295 (II) ~~If the domestic sewage flow is greater than 2,000 gpd (7,560 L/day) but less than 10,000~~
1296 ~~gpd (37,800 L/day), the following minimum isolation distances shall be maintained:~~

1297

<u>Source of Domestic Wastewater</u>	<u>Minimum Distance to Well</u>
Sewer	50 feet (15.2 m)
Septic tank	50 feet (15.2 m)
Disposal field	200 feet (61 m)
Seepage pit	200 feet (61 m)
Cesspool	200 feet (61 m)

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~~Moved to Section 11(e)(ii)(C))(III)—For systems larger than 10,000 gallons per day (37,800 L/day), the isolation distance shall be determined by a hydrogeological study, in accordance with the requirements of Section 15 of Chapter 3 Water Quality Rules and Regulations, but shall not be less than those listed above.~~

~~(IV)—For wastewaters other than domestic wastewater, the isolation distance required shall be determined by a hydrogeological study, in accordance with the requirements of Section 15 of Chapter 3 Water Quality Rules and Regulations.~~

~~Moved to Section 11(e)(iii)(C)—Relation to buildings.~~

~~Moved to Section 11(e)(iii)(A))(I)—When a well is adjacent to the building, the well shall be located so that the centerline, extended vertically, will clear any projection from the building by not less than 3 feet (0.91 m), and will clear any power line by not less than 10 feet (3.05 m).~~

~~Moved to Section 11(e)(iii)(B))(II)—When a well is to be located inside a building, the top of the casing and any other well opening shall not terminate in the basement of the building, or in any pit or space that is below natural ground surface unless the well is completed with a properly protected submersible pump. Wells located in a structure must be accessible to pull the casing or the pump. The structure shall have overhead access.~~

~~Moved to Section 11(e)(iii)(C))(D)—Relation to property lines. Every well shall be located at least 10 feet (3.05 m) from any property line.~~

~~Moved to Section 11(e)(iv))(ii)—Testing and records.~~

~~Moved to Section 11(e)(iv)(A))(A)—Yield and drawdown tests. Yield and drawdown tests shall be performed on every production well after construction or subsequent treatment and prior to placement of the permanent pump. The test methods shall be clearly indicated in the specifications. The test pump capacity, at maximum anticipated drawdown, shall be at least 1.5 times the design rate anticipated. The test shall provide for continuous pumping for at least 24 hours or until stabilized drawdown has continued for at least 6 hours when test pumped at 1.5 times the design pumping rate.~~

~~(moved to Section 11(e)(iv)(B))(B)—Plumbness and alignment requirements. Every well shall be tested for plumbness and alignment in accordance with AWWA A-100. The test method and allowable tolerance shall be stated in the specifications.~~

~~(iii)—Well construction.~~

~~(moved to Section 11(e)(vi))(A)—Protection during construction. During any well construction or modification, the well and surrounding area must be adequately protected to prevent any groundwater contamination. Surface water must be diverted away from the construction area.~~

~~(moved to Section 11(e)(vii))(B) — Well types and construction~~

~~methods.~~

~~moved to Section 11(e)(vii)(A)(I) — Dug wells. Dug wells shall be used only where geological conditions preclude the possibility of developing an acceptable drilled well.~~

~~(1.) — Every dug well, other than the buried slab type, shall be constructed with a surface curbing of concrete, brick, tile or metal, extending from the aquifer to above the ground surface. Concrete grout, at least 6 inches (0.15 m) thick, shall be placed between the excavated hole and the curbing for a minimum depth of 10 feet (3.05 m) below original or final ground elevation, whichever is lower, or to the bottom of the hole, if it is less than 10 feet (3.05 m).~~

~~(2.) — The well lining in the producing zone shall readily admit water, and shall be structurally sound to withstand external pressures.~~

~~(3.) — The well cover or platform shall be reinforced concrete with a minimum thickness of 4 inches (10 cm). The top of the platform shall be sloped to drain to all sides. The platform shall rest on and overlap the well curbing by at least 2 inches (5 cm), or it may be cast with the curbing or the concrete grout. Adequately sized pipe sleeve(s) shall be cast in place in the platform to accommodate the type of pump, pump piping or wiring proposed for the well. Pump discharge piping shall not be placed through the well casing or wall.~~

~~(4.) — A buried slab type of construction may be used if the dug well is greater than 10 feet (3.05 m) deep. The well lining shall be terminated a minimum of 10 feet (3.05 m) below the original or final ground elevation, whichever is lower. A steel reinforced concrete slab or platform, at least 4 inches (10 cm) thick, shall rest on and overlap the lining. A standard unperforated well casing shall extend from the concrete slab to at least 12 inches (30 cm) above the original or final ground surface, whichever is higher. This casing shall be firmly imbedded in the slab or connected to a pipe cast in the slab to ensure that the connection is watertight. The excavation above the slab shall be backfilled with a bentonite slurry or clean earth thoroughly tamped to minimize settling.~~

~~(II) — Drilled, driven, jetted, or bored wells.~~

~~(1.) — A drilled well may be constructed through an existing dug well provided that an unperforated casing extends to at least 12 inches (30 cm) above the original ground or final surface, whichever is higher. A seal of concrete, at least 2 feet (0.61 m) thick, shall be placed in the bottom of the dug well to prevent the direct movement of water from the dug well into the drilled well. The original dug well shall be adequately protected from contamination as described above.~~

~~(moved to Section 11(e)(vii)(B))(2.) Every drilled, driven, jetted, or bored well shall have an unperforated casing that extends from a minimum of 12 inches~~

1391 ~~(30 cm) above ground surface to at least 10 feet (3.05 m) below ground surface. In~~
1392 ~~unconsolidated formations, this casing shall extend to the water table or below. In consolidated~~
1393 ~~formations, the casing may be terminated in rock or watertight clay above the water table.~~
1394

1395 (III) ~~— Sand or gravel wells. If clay or hard pan is encountered~~
1396 ~~above the waterbearing formation, the permanent casing and grout shall extend through such~~
1397 ~~materials. If a sand or gravel aquifer is overlaid only by permeable soils, the permanent casing~~
1398 ~~and grout shall extend to at least 20 feet (6.1 m) below original or final ground elevation,~~
1399 ~~whichever is lower. If a temporary outer casing is used, it shall be completely withdrawn as~~
1400 ~~grout is applied.~~
1401

1402 (IV) ~~— Gravel pack wells. The diameter of an oversized drill hole~~
1403 ~~designed for the placement of an artificial gravel pack shall allow a thickness of gravel or sand~~
1404 ~~outside the casing sufficient to block the movement of natural materials into the well. The size~~
1405 ~~of the openings in the casing or screen shall be based on the size of the gravel or sand used in the~~
1406 ~~gravel pack.~~
1407

1408 (1.) ~~— Gravel pack shall be well rounded particles, 95~~
1409 ~~percent siliceous material, that are smooth and uniform, free of foreign material, properly sized,~~
1410 ~~washed, and then disinfected immediately prior to or during placement. Gravel pack shall be~~
1411 ~~placed in one uniformly continuous operation.~~
1412

1413 (2.) ~~— After completion, the well shall be overpumped,~~
1414 ~~surged, or otherwise developed to ensure free entry of water without sediment. A gravel packed~~
1415 ~~well shall be sealed in one of two ways to prevent pollution to the groundwater supply:~~
1416

1417 ~~(moved to Section 11(e)(vii)(C)(I))(2.) — If a permanent surface casing is not~~
1418 ~~installed, the annular opening between the casing and the drill hole shall be sealed in the top 10~~
1419 ~~feet (3.05 m) with concrete or cement grout.~~
1420

1421 ~~(moved to Section 11(e)(vii)(C)(II))(2.) — If a permanent surface casing is installed, it~~
1422 ~~shall extend to a depth of at least 10 feet (3.05 m). The annular opening between this outer~~
1423 ~~casing and the inner casing shall be covered with a metal or cement seal.~~
1424

1425 (3.) ~~— Gravel refill pipes, when used, shall be Schedule 40~~
1426 ~~steel pipe incorporated within the pump foundation and terminated with screwed or welded caps~~
1427 ~~at least 12 inches (30 cm) above the pump house floor or concrete apron. Gravel refill pipes~~
1428 ~~located in the grouted annular opening shall be surrounded by a minimum of 1-1/2 inches (3.8~~
1429 ~~cm) of grout. Protection from leakage of grout into the gravel pack or screen shall be provided.~~
1430

1431 (V) ~~— Radial water collector.~~
1432

1433 ~~(moved to Section 8(e)(iv))(1.) — Locations of all~~
1434 ~~caisson construction joints and porthole assemblies shall be indicated on drawings. The caisson~~
1435 ~~wall shall be reinforced to withstand the forces to which it will be subjected. The top of the~~

1436 caisson shall be covered with a watertight floor. The pump discharge piping shall not be placed
1437 through the caisson walls.

1438
1439 (2.)—Provisions shall be made to assure that radial
1440 collectors are essentially horizontal.

1441
1442 (3.)—All openings in the floor shall be curbed and
1443 protected from entrance of foreign material.

1444
1445 (VI)—Infiltration lines. Where an infiltration line is used, the
1446 source shall be considered a surface source requiring treatment defined in Section 8(c) (i) unless,
1447 (1) the water system owner is in complete control of the surrounding property for a distance of
1448 500 feet around the periphery of the infiltration system; (2) the area is fenced to exclude trespass;
1449 and (3) the infiltration collection lines are a minimum of 40 inches below the ground surface at
1450 all points within the infiltration collection system.

1451
1452 (VII)—Limestone or sandstone wells. In consolidated formations,
1453 casing shall be driven a minimum of 5 feet into firm bedrock and cemented into place.

1454
1455 (VIII)—Artesian wells.

1456
1457 (moved to Section 11(e)(vii)(D))(1.)—When artesian water
1458 is encountered in a well, unperforated casing shall extend into the confining layer overlying the
1459 artesian zone. This casing shall be adequately sealed with cement grout into the confining zone
1460 to prevent both surface and subsurface leakage from the artesian zone. The method of
1461 construction shall be such that during the placing of the grout and the time required for it to set,
1462 no water shall flow through or around the annular space outside the casing, and no water
1463 pressure sufficient to disturb the grout prior to final set shall occur. After the grout has set
1464 completely, drilling operations may be continued into the artesian zone. If leakage occurs
1465 around the well casing or adjacent to the well, the well shall be recompleted with any seals,
1466 packers or casing necessary to eliminate the leakage completely.

1467
1468 (2.)—If water flows at the surface, the well shall be
1469 equipped with valved pipe connections, watertight pump connections, or receiving reservoirs set
1470 at an altitude so that flow can be stopped completely. There shall be no direct connection
1471 between any discharge pipe and a sewer or other source of pollution.

1472
1473 (moved to Section 11(e)(vii)(E)(I)(IX))—Wells that penetrate
1474 more than one aquifer.

1475
1476 (moved to Section 11(e)(vii)(E)(I)(1.))—Where a well
1477 penetrates more than one aquifer or water bearing strata, every aquifer and/or strata shall be
1478 sealed off to prevent migration of water from one aquifer or strata to another. Strata shall be
1479 sealed off by placing impervious material opposite the strata and opposite the confining
1480 formation(s). The seal shall extend above and below the strata no less than 10 feet. The sealing
1481 material shall fill the annular space in the interval to be sealed, and the surrounding void spaces

1482 ~~which might absorb the sealing material. The sealing material shall be placed from the bottom to~~
1483 ~~the top of the interval to be sealed.~~

1484
1485 ~~(2.)—Sealing material shall consist of neat cement, cement~~
1486 ~~grout, or bentonite clay.~~

1487
1488 ~~(moved to Section 11(e)(vii)(E)(X)—Wells that encounter~~
1489 ~~mineralized or polluted water.~~

1490
1491 ~~(moved to Section 11(e)(vii)(E)(1.)—Any time during the~~
1492 ~~construction of a well that mineralized water or water known to be polluted is encountered, the~~
1493 ~~aquifer or aquifers containing such inferior quality water shall be adequately cased or sealed off~~
1494 ~~so that water shall not enter the well, nor will it move up or down the annular space outside the~~
1495 ~~well casing. If necessary, special seals or packers shall be installed to prevent movement of~~
1496 ~~inferior quality water. Mineralized water may be used if it can be properly treated to meet all~~
1497 ~~drinking water quality standards as determined by the administrator. When mineralized water is~~
1498 ~~encountered, it shall not be mixed with any other waters from different aquifers within the well.~~
1499 ~~If a well is penetrating multiple aquifers, mineralized water shall be excluded from the well if~~
1500 ~~water is taken from other non-mineralized aquifers.~~

1501
1502 ~~(moved to Section 11(e)(vii)(C)(2.)—In gravel packed~~
1503 ~~wells, aquifers containing inferior quality water shall be sealed by pressure grouting, or with~~
1504 ~~special packers or seals, to prevent such water from moving vertically in gravel packed portions~~
1505 ~~of the well.~~

1506
1507 ~~(XI)—Conversion of existing oil or gas wells, or exploration test~~
1508 ~~holes, into water wells.~~

1509
1510 ~~(moved to Section 11(e)(vii)(F)(1.)—Existing oil and gas~~
1511 ~~wells, seismic test holes, or mineral exploration holes may be converted for use as water wells~~
1512 ~~provided that the wells can be completed to conform to the minimum construction standards~~
1513 ~~cited in this chapter. This does not relieve the applicant from obtaining appropriate permits.~~

1514
1515 ~~(2.)—Information on the geologic conditions encountered~~
1516 ~~in the well at the time of the original drilling shall be used to determine what special construction~~
1517 ~~standards shall be met in order to eliminate all movement of pollutants into the well or along the~~
1518 ~~annular space surrounding the casing. If no original geologic information is available, an electric~~
1519 ~~or other geophysical log is required to supplement known information.~~

1520
1521 ~~(C)—Construction materials.~~

1522
1523 ~~(I)—Casing. The casing shall provide structural stability to~~
1524 ~~prevent casing collapse during installation as well as drill hole wall integrity when installed, be~~
1525 ~~of required size to convey liquid at a specified injection/recovery rate and pressure, and be of~~
1526 ~~required size to allow for sampling.~~

1527

1528 ~~(1.)—Temporary steel casing. Temporary steel casing~~
1529 ~~used for construction shall be capable of withstanding the structural load imposed during its~~
1530 ~~installation and removal.~~

1531
1532 ~~(2.)—Permanent steel casing. Permanent steel casing~~
1533 ~~pipe shall be new pipe meeting AWWA Standard A-100 specifications for water well~~
1534 ~~construction. The casing shall have full circumferential welds or threaded coupling joints to~~
1535 ~~assure a watertight construction.~~

1536
1537 ~~a.——Standard and line pipe. This material shall~~
1538 ~~meet one of the following specifications:~~

1539
1540 ~~API Std. 5L, "Specifications for Line Pipe."~~

1541
1542 ~~API Std. 5LX, "Specifications for High Test~~
1543 ~~Line Pipe."~~

1544
1545 ~~ASTM A53 "Standard Specification for Pipe~~
1546 ~~Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless."~~

1547
1548 ~~ASTM A120 "Standard Specifications for~~
1549 ~~Pipe, Steel, Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless, for~~
1550 ~~Ordinary Uses."~~

1551
1552 ~~ASTM A134 "Standards Specifications for~~
1553 ~~Electric Fusion (arc) Welded Steel Plate Pipe (sizes NPS 16 inches and over)."~~

1554
1555 ~~ASTM A135 "Standard Specifications for~~
1556 ~~Electric Resistance Welded Steel Pipe." ASTM A139 "Standard Specification for Electric~~
1557 ~~Fusion (arc) Welded Steel Pipe (Sizes 4" and over)."~~

1558
1559 ~~ASTM A211 "Standard Specifications for~~
1560 ~~Spiral Welded Steel or Iron Pipe." AWWA C200 "AWWA Standard for Steel Water Pipe 6~~
1561 ~~inches and Larger."~~

1562
1563 ~~b.——Structural steel. This material shall meet one of the~~
1564 ~~following specifications:~~

1565
1566 ~~ASTM A36 "Standard Specification for Structural~~
1567 ~~Steel."~~

1568
1569 ~~ASTM A242 "Standard Specifications for High~~
1570 ~~Strength Low Alloy Structural Steel." ASTM A283 "Standard Specification for Low and~~
1571 ~~Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars of Structural Quality."~~

1572

1573 ~~ASTM A441 "Tentative Specifications for High-~~
1574 ~~Strength Low Alloy Structural Manganese Vanadium Steel."~~

1575
1576 ~~ASTM A570 "Standard Specification for Hot-~~
1577 ~~Rolled Carbon Steel Sheet and Strip, Structural Quality."~~

1578
1579 ~~e. — High strength carbon steel sheets or "well casing~~
1580 ~~steel". Each sheet of material shall contain mill markings which will identify the manufacturer~~
1581 ~~and specify that the material is well casing steel which complies with the chemical and physical~~
1582 ~~properties published by the manufacturer.~~

1583
1584 ~~d. — Stainless steel casing shall meet the~~
1585 ~~provisions of ASTM A409 "Standard Specification for Welded Large Diameter Austenitic Steel~~
1586 ~~Pipe for Corrosive or High Temperature Service".~~

1587
1588 ~~3. — Nonferrous casing materials. Nonferrous or plastic~~
1589 ~~material may be used as a well casing. It must be resistant to the corrosiveness of the water and~~
1590 ~~to the stresses to which it will be subjected during installation, grouting, and operation. The~~
1591 ~~material shall be nontoxic. All joints shall be durable and watertight.~~

1592
1593 ~~a. — Thermoplastics. This material shall meet the~~
1594 ~~requirements of ASTM F 480 "Standard Specification for Thermoplastic Water Well Casing~~
1595 ~~Pipe and Couplings made in Standard Dimension Ratios (SDR)".~~

1596
1597 ~~b. — Thermosets. This material shall meet the~~
1598 ~~requirements of the following specifications:~~

1599
1600 ~~b. — ASTM D2996 "Standard Specification for~~
1601 ~~Filament Wound Reinforced Thermosetting Resin Pipe."~~

1602
1603 ~~b. — ASTM D2997 "Standard Specification for~~
1604 ~~Centrifugally Cast Reinforced Thermosetting Resin Pipe."~~

1605
1606 ~~b. ASTM D3517 "Standard Specification for~~
1607 ~~Reinforced Plastic Mortar Pressure Pipe." AWWA C950 "AWWA Standards for Glass Fiber~~
1608 ~~Reinforced Thermosetting Resin Pressure Pipe."~~

1609
1610 ~~e. — Concrete pipe used for casing should conform to~~
1611 ~~one of the following specifications:~~

1612
1613 ~~e. — ASTM C14 "Standard Specifications for~~
1614 ~~Concrete Sewer, Storm Drain, and Culvert Pipe."~~

1615
1616 ~~e. — ASTM C76 "Standard Specification for~~
1617 ~~Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe."~~

1619 e. ~~AWWA C300 "AWWA Standards for~~
1620 ~~Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids."~~

1621
1622 e. ~~AWWA C301 "AWWA Standards for~~
1623 ~~Prestressed Concrete Pressure Pipe, Steel Cylinder~~
1624 ~~Type, for Water and Other Liquids."~~

1625
1626 4. ~~Casing diameter. The casing diameter (inside diameter)~~
1627 ~~shall be a minimum of one size larger than the largest dimension/diameter of the pump or~~
1628 ~~pumping structure. If a reduction in casing diameter is made, there shall be adequate overlap of~~
1629 ~~the casing to prevent misalignment and to prevent the movement of unstable sediment into the~~
1630 ~~well. To prevent the migration of mineralized, polluted, or otherwise inferior quality water, lead~~
1631 ~~or neoprene packers shall be installed to seal the annular space between casings.~~

1632
1633 (II) ~~Packers. Packers shall be material that will not impart taste, odor,~~
1634 ~~toxic substance, or bacterial contamination to the well water.~~

1635
1636 (III) ~~Screens.~~

1637
1638 (1.) ~~Screens shall be constructed of materials resistant to~~
1639 ~~damage by chemical action of groundwater or cleaning operations, and have size of openings~~
1640 ~~based on sieve analysis of formation and/or gravel pack materials. The screen shall have~~
1641 ~~sufficient diameter to provide adequate specific capacity and low aperture entrance velocity. The~~
1642 ~~entrance velocity shall not exceed 0.1 feet per second (3 cm/sec).~~

1643
1644 (2.) ~~The screen shall be installed so that the pumping water~~
1645 ~~level remains above the screen under all operating conditions, and shall be provided with a~~
1646 ~~bottom plate or washdown bottom fitting of the same material as the screen.~~

1647
1648 (3.) ~~For a nonhomogeneous aquifer having a uniformity~~
1649 ~~coefficient less than 3.0 and an effective grain size less than 0.01 inches, an artificial filter or~~
1650 ~~screen shall be used.~~

1651
1652 (IV) ~~Grout and grouting requirements. All permanent well casing,~~
1653 ~~except driven Schedule 40 steel casing, shall be surrounded by a minimum of 2 inches (5.1 cm)~~
1654 ~~of grout. All temporary construction casings shall be removed. Where removal is not possible~~
1655 ~~or practical, the casing shall be withdrawn at least 5 feet to ensure grout contact with the native~~
1656 ~~formation.~~

1657
1658 (1.) ~~Neat cement grout. Cement conforming to ASTM Standard~~
1659 ~~C150 and water, with not more than 6 gallons (13.62 L) of water per sack of cement, must be~~
1660 ~~used for 2 inch (5.1 cm) openings. Additives used to increase fluidity must meet ASTM C494.~~

1661
1662 (2.) ~~Concrete grout. Equal parts of cement conforming to~~
1663 ~~ASTM Standard C150 and sand, with not more than 6 gallons (13.62 L) of water per sack of~~
1664 ~~cement, may be used for openings larger than 2 inches (5.1 cm). Where an annular opening~~

1665 ~~larger than 4 inches (10 cm) is available, gravel not larger than 1/2 inch (1.27 cm) in size may be~~
1666 ~~added.~~

1667
1668 (3.) ~~Clay seal. Where an annular opening greater than 6~~
1669 ~~inches (15.2 cm) is available a clay seal of clean local clay mixed with at least 10 percent~~
1670 ~~swelling bentonite may be used.~~

1671
1672 (4.) ~~Application. Prior to grouting through creviced or~~
1673 ~~fractured formations, bentonite or similar materials may be added to the annular opening in the~~
1674 ~~manner indicated for grouting. After cement grouting is applied, work on the well shall be~~
1675 ~~discontinued until the cement or concrete grout has properly set.~~

1676
1677 ~~Sufficient annular opening shall be provided to permit a minimum of 2 inches (5.1 cm) of~~
1678 ~~grout around permanent casings, including couplings.~~

1679
1680 ~~When the annular opening is 4 or more inches (10 cm) and less than 100 feet (30.5 m) in~~
1681 ~~depth and concrete grout is used, the grout may be placed by gravity through a grout pipe~~
1682 ~~installed to the bottom of the annular opening in one continuous operation until the annular~~
1683 ~~opening is filled.~~

1684
1685 ~~When the annular opening exceeds 6 inches (15.2 cm), and less than 100 feet (30.5 m) in~~
1686 ~~depth and a clay seal is used, it may be placed by gravity.~~

1687
1688 (5.) ~~Guides. The casing must be provided with sufficient guides~~
1689 ~~welded to the casing to permit unobstructed flow and uniform thickness of grout.~~

1690
1691 (V) ~~Upper terminal well construction.~~

1692
1693 (1.) ~~Permanent casing for all groundwater sources shall project~~
1694 ~~at least 12 inches (30.5 cm) above the pumphouse floor or concrete apron surface and at least 18~~
1695 ~~inches (0.46 m) above final ground surface. The concrete floor or apron shall slope away from~~
1696 ~~the casing at a slope of 1 inch per foot (8.33 cm/m).~~

1697
1698 (2.) ~~Where a well house is constructed, the floor surface shall~~
1699 ~~be at least 6 inches (15.2 cm) above the final ground elevation and shall slope away from the~~
1700 ~~casing at a slope of 1/2 inch per foot (4.16 cm/m).~~

1701
1702 (3.) ~~Sites subject to flooding shall be provided with an earthen~~
1703 ~~berm surrounding the casing and terminating at an elevation at least 2 feet (0.61 m) above the~~
1704 ~~highest known flood elevation, or other suitable protection shall be provided.~~

1705
1706 (4.) ~~The top of the well casing at sites subject to flooding shall~~
1707 ~~terminate at least 3 feet (0.91 m) above the 100-year flood level or the highest known flood~~
1708 ~~elevation, whichever is higher.~~

1709

1710 ~~(5.)—The casing and/or well house shall be protected from~~
1711 ~~entrance by animals.~~

1712
1713 ~~(VI)—Development.~~

1714
1715 ~~(1.)—Every well shall be developed to remove the native silts~~
1716 ~~and clays, drilling mud or finer fraction of the gravel pack. Development shall continue until the~~
1717 ~~maximum specific capacity is obtained from the completed well.~~

1718
1719 ~~(2.)—Where chemical conditioning is required, the specifications~~
1720 ~~shall include provisions for blasting and cleaning. Special attention shall be given to assure that~~
1721 ~~the grouting and casing are not damaged by the blasting.~~

1722
1723 ~~(VII)—Capping requirements. A welded metal plate or a threaded cap~~
1724 ~~shall be used for capping a well. A properly fitted, firmly driven, solid wooden plug may be~~
1725 ~~used for capping a well until pumping equipment is installed. At all times during the progress of~~
1726 ~~work, the contractor shall provide protection to prevent tampering with the well or entrance of~~
1727 ~~surface water or foreign materials.~~

1728
1729 ~~(D)—Well pumps, discharge piping and appurtenances.~~

1730
1731 ~~(I)—Line shaft pumps. Wells equipped with line shaft pumps shall~~
1732 ~~have the casing firmly connected to the pump structure or have the casing inserted into a recess~~
1733 ~~extending at least 1/2 inch into the pump base, have the pump foundation and base designed to~~
1734 ~~prevent water from coming into contact with the joint, and avoid the use of oil lubrication at~~
1735 ~~pump settings less than 400 feet (122 m).~~

1736
1737 ~~(moved to Section 11(e)(xii))(II)—Submersible pumps. Where a~~
1738 ~~submersible pump is used, the top of the casing shall be effectively sealed against the entrance of~~
1739 ~~water under all conditions of vibration or movement of conductors or cables. The electrical~~
1740 ~~cable shall be firmly attached to the rise pipe at 20 foot (6.1 m) intervals or less, and the pump~~
1741 ~~shall be located at a point above the top of the well screen.~~

1742
1743 ~~(III)—Discharge piping.~~

1744
1745 ~~(1.)—The discharge piping shall have control valves and~~
1746 ~~appurtenances located above the wellhouse floor. The piping shall be protected against the~~
1747 ~~entrance of contamination and be equipped with a check valve, a shutoff valve, a pressure gauge,~~
1748 ~~a means of measuring flow, and a smooth-nosed sampling tap located at a point where positive~~
1749 ~~pressure is maintained. Where a submersible pump is used, a check valve shall be located in the~~
1750 ~~casing in addition to the check valve located above ground to prevent negative pressures on the~~
1751 ~~discharge piping.~~

1752
1753 ~~(2.)—For pipes equipped with an air release vacuum relief valve,~~
1754 ~~the valve shall be located upstream from the check valve, with exhaust/relief piping terminating~~
1755 ~~in a downturned position at least 18 inches (0.46 m) above the floor and covered with a 24 mesh~~

1756 ~~corrosion-resistant screen. The discharge piping shall be valved to permit test pumping and~~
1757 ~~control of each well.~~

1758
1759 (3.) ~~All exposed piping, valves and appurtenances shall be~~
1760 ~~protected against physical damage and freezing.~~

1761
1762 (4.) ~~The piping shall be properly anchored to prevent~~
1763 ~~movement, and shall be protected against surge or water hammer.~~

1764
1765 (5.) ~~The discharge piping shall be provided with a means of~~
1766 ~~pumping to waste, but shall not be directly connected to a sewer.~~

1767
1768 ~~(moved to Section 11(e)(xxiv))(IV) Pitless well units. A pitless adaptor~~
1769 ~~or well house shall be used where needed to protect the water system from freezing. moved to~~
1770 ~~Section 11(e)(xxiv) A frost pit may be used only in conjunction with a properly protected pitless~~
1771 ~~adaptor.~~

1772
1773 (1.) ~~All pitless units shall be shop fabricated from the point of~~
1774 ~~connection with the well casing to the unit cap or cover. They shall be threaded or welded to the~~
1775 ~~well casing, and be of watertight construction throughout. The materials and weight shall be at~~
1776 ~~least equivalent and compatible to the casing.~~

1777
1778 (2.) ~~Pitless units shall have field connection to the lateral~~
1779 ~~discharge from the pitless unit of threaded, flanged or mechanical joint connection, and the top~~
1780 ~~of the pitless unit shall terminate at least 18 inches (0.46 m) above final ground elevation or 3~~
1781 ~~feet above the 100-year flood level or the highest known flood elevation, whichever is higher.~~

1782
1783 (3.) ~~Provisions shall be made to disinfect the well. The unit~~
1784 ~~shall have facilities to measure water levels in the well; a cover at the upper terminal of the well~~
1785 ~~that will prevent the entrance of contamination; a contamination proof entrance connection for~~
1786 ~~electrical cable; an inside diameter as great as that of the well casing, up to and including casing~~
1787 ~~diameters of 12 inches (30.5 cm), to facilitate work and repair on the well, pump, or well screen;~~
1788 ~~and at least one check valve within the well casing.~~

1789
1790 (V) ~~Casing vent. Provisions shall be made for venting the well casing~~
1791 ~~to atmosphere. The vent shall terminate in a downturned position, at or above the top of the~~
1792 ~~casing or pitless unit in a minimum 1 1/2 inch (3.8 cm) diameter opening covered with a 24~~
1793 ~~mesh corrosion-resistant screen. The pipe connecting the casing to the vent shall be of adequate~~
1794 ~~size to provide rapid venting of the casing.~~

1795
1796 ~~(moved to Section 11(e)(xv))(vi) Water level management. Every~~
1797 ~~well greater than 4 inches (10 cm) in diameter shall be equipped with an access port that will~~
1798 ~~allow for the measurement of the depth to the water surface; or in the case of a flowing artesian~~
1799 ~~well, with a pressure gauge that will indicate pressure. An air line used for level measurement~~
1800 ~~shall be provided on all wells greater than 4 inches (10 cm) in diameter. Installation of water~~

1801 ~~level measuring equipment shall be made using corrosion resistant materials attached firmly to~~
1802 ~~the drop pipe or pump column and in such a manner as to prevent entrance of foreign materials.~~

1803
1804 ~~(moved to Section 11(e)(xvi))(VII) Discharge measuring device. Every~~
1805 ~~well shall be piped so that a device capable of measuring the total well discharge can be placed~~
1806 ~~in operation at the well for well testing. Every well field (or when only one well is present,~~
1807 ~~every well) shall have a device capable of measuring the total discharge.~~

1808
1809 ~~(VIII) Observation wells. Observation wells shall be constructed in~~
1810 ~~accordance with the requirements for permanent wells if they are to remain in service after~~
1811 ~~completion of a water supply well. They shall be protected at the upper terminal to preclude~~
1812 ~~entrance of foreign materials.~~

1813
1814 ~~moved to Section 11(e)(xvi))(IX) Well abandonment. Test wells and~~
1815 ~~groundwater sources which are not in use shall be sealed in accordance with requirements of~~
1816 ~~Chapter 26, Water Quality Rules and Regulations.~~

1817
1818 ~~(moved to Section 11(e)(xvi))(IX) Wells shall be sealed by filling with neat cement grout.~~
1819 ~~The filling materials shall be applied to the well hole through a pipe, tremie, or bailer.~~

1820
1821 (a) 2018 TSS, parts 1.1.1-1.1.1(d), engineers report, general information; 1.1.2-
1822 1.1.2(c), engineers report, extent of water works system; 1.1.4-1.1.4(c), engineers report, soil,
1823 groundwater conditions, and foundation problems; 1.1.5-1.1.5(f), engineers report, water use
1824 data; 1.1.6-1.1.6(b), engineers report, flow requirements; 1.1.7.1-1.1.7.1(f), engineers report,
1825 surface water sources; 1.1.7.2-1.1.7.2(g), engineers report, groundwater; 1.1.8, engineers report,
1826 proposed treatment processes; 1.1.9, engineers report, sewerage system available; 1.1.10,
1827 engineers report, waste disposal; 1.1.15-1.1.15(d), engineers report, pumping facilities; 1.1.16-
1828 1.1.16(c), engineers report, storage facilities; and 1.1.17-1.1.17(d), engineers report, security,
1829 contingency planning, and emergency preparedness; are herein incorporated by reference.

1830
1831 ~~(formerly Section 6(a))(b) Scope and purpose. An engineering design report shall be~~
1832 ~~submitted with each application. The purpose of the report shall be to describe and provide~~
1833 ~~technical justification for all aspects of the proposed construction, modifications and/or~~
1834 ~~installations. The report should address existing conditions (if any), known or suspected~~
1835 ~~problems, proposed actions, and the reasoning used to arrive at those proposed actions. There is~~
1836 ~~no minimum or maximum size for the report, provided it meets the purpose of this section. and~~
1837 ~~shall include the following required elements:~~

1838
1839 (i) The information required in paragraph (a) of this Section;

1840
1841 (ii) A description by narrative, analyses, and calculations of the project
1842 purpose and intent in order to support the project plans and specifications;

1843
1844 (iii) A description of known or suspected problems, needs, or requirements,
1845 and the reasoning used to arrive at the proposed solution;

1847 (iv) An identification of problems and solutions related to but not limited to
1848 the following:

1849
1850 (A) Water quantity and quality;

1851
1852 (B) Compliance with the Safe Drinking Water Act, 42 U.S.C. §300f et
1853 seq.; and

1854
1855 (C) Operational requirements, redundancy, maintenance, and
1856 reliability.

1857
1858 ~~(formerly 6(d))(v) Hazard classification. The engineering design report shall~~
1859 ~~include a~~ A determination of the degree of hazard of all known or anticipated water service
1860 connections to be connected to the proposed project. A hazard classification shall be identified
1861 for each connection and recommended mitigation measures shall be described for each hazard.

1862 ~~_____ . hazard classification or specify the default classification identified in Section 14 (i) (i)~~
1863 ~~(B) which shall be applicable to the project. A hazard classification shall include the following:~~

1864
1865 ~~(moved to Section 9(b)(iv))(i) A determination of the degree of hazard of all water~~
1866 ~~service connections to be connected to the proposed project.~~

1867
1868 ~~(moved to Section 9(b)(iv))(ii) _____ A determination of the potential cause of~~
1869 ~~backflow for all water service connections.~~

1870
1871 ~~(formerly Section 6(b))(c) Water distribution (water works) systems.~~ The engineering
1872 design report for all new water distribution system extensions shall include the following
1873 required elements:

1874
1875 (i) The information required in paragraph (a) of this Section;

1876
1877 ~~(formerly Section 6(b)(i))(ii)~~ (ii) A description of the service area including scaled
1878 vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations,
1879 and topographic features;

1880
1881 ~~(formerly Section 6(b)(ii))(iii)~~ (iii) Current and projected system water demand
1882 for average day; use data and flow requirements to include maximum day-, maximum hour
1883 hourly demand; needed fire flows and per capita maximum daily flows; and

1884
1885 ~~(formerly Section 6(b)(iii))(iv)~~ (iv) Information on fire protection and fire flow
1886 capabilities of the proposed system.

1887
1888 ~~(formerly Section 6(b)(iv))~~ Description of high service pumping systems and
1889 finished water storage facilities.

1890
1891 ~~(formerly Section 6(e))(d)~~ (d) Treatment facilities. The engineering design report for all
1892 treatment facilities shall include the following required elements:

1893
1894 (i) The information required in paragraph (a) of this Section;
1895
1896 ~~(formerly Section 6(e)(i))~~(ii) A description of the facility site and location,
1897 including a scaled site plan, and:
1898
1899 ~~(formerly Section 6(e)(i)(A))~~(A) Present and projected facility
1900 property boundaries;
1901
1902 ~~(formerly Section 6(e)(i)(B))~~(B) Flood protection indicating predicted
1903 elevation of 25- and 100-year flood stages. ~~The facility shall be protected from damage and be~~
1904 ~~capable of being operated during the 100-year flood or maximum flood of record, whichever is~~
1905 ~~greater. Flooding resulting from ice jams shall be considered.~~
1906
1907 ~~(formerly Section 6(e)(i)(C))~~(C) Present and proposed access. ~~for the~~
1908 purpose of operation, maintenance, and compliance inspection;
1909
1910 ~~(formerly Section 6(e)(i)(D))~~(D) Distances from: ~~current habitation,~~
1911 ~~the closest major treated water transmission line, the closest treated water storage facility, and~~
1912 ~~the water source.~~
1913
1914 ~~(formerly Section 6(e)(i)(D))~~(I) ~~e~~Current habitation;
1915
1916 ~~(formerly Section 6(e)(i)(D))~~(II) ~~†~~The closest major treated
1917 water transmission line;
1918
1919 ~~(formerly Section 6(e)(i)(D))~~(III) ~~†~~The closest treated water
1920 storage facility; and
1921
1922 ~~(formerly Section 6(e)(i)(D))~~(IV) ~~†~~The water source.
1923
1924 ~~(formerly Section 6(e)(i)(E))~~(E) Fencing and ~~or~~ security;
1925
1926 ~~(formerly Section 6(e)(i)(F))~~(F) Topographic features and contours
1927 with indicated datum; and
1928
1929 ~~(formerly Section 6(e)(i)(G))~~(G) Soil and subsurface geological
1930 characteristics; including Provide a soils investigation report of the proposed site suitable for
1931 structural design of the proposed facilities.
1932
1933 ~~(formerly Section 6(e)(ii))~~(iii) A ~~detailed~~ description of the service area, ~~for the~~
1934 ~~project~~ including a scaled vicinity plan ~~showing land use and boundaries~~ map(s) of the project
1935 with regard to adjacent and proposed development, elevations, and topographic features .
1936
1937 ~~(formerly Section 6(e)(iii))~~(iv) A detailed description of the recycle flows
1938 and procedures for reclamation of recycle streams; and

1939
1940 ~~(formerly Section 6(e)(iv))(v)~~ A detailed description of disposal techniques for
1941 settled solids, including a description of the ultimate disposal of sludge.

1942
1943 ~~(formerly Section 6(e)(v)(B))(e)~~ Engineering design reports for new Ssurface water
1944 sources shall include the following required elements:

1945
1946 (i) The information required in paragraph (a) of this Section;

1947
1948 ~~(formerly Section 6(e)(v)(B)(I))(ii)~~ Safe annual yield, A description of the quantity of water
1949 quantity available ~~from the source~~ during ~~the~~ average and driest years of record: that contains
1950 details of:

1951
1952 ~~(formerly Section 6(e)(v)(B)(H))(A)~~ Hydrological data, stream flows and
1953 Any diversion records; and

1954
1955 ~~(formerly Section 6(e)(v)(B)(VI))(B)~~ Description of any diversion dams,
1956 impoundments or reservoirs ~~and appurtenances~~ that may impact design considerations or long-
1957 term water availability.

1958
1959 ~~(formerly Section 6(e)(v)(B)(III))(iii)~~ A tabulation of Representative water quality
1960 data; that describes the including bacteriological biological, radiological, and chemical and
1961 physical data. water quality ~~These data shall be~~ sufficient to determine ~~the~~ necessary treatment
1962 processes and the ability to meet water quality standards. that:

1963
1964 (A) For surface water source testing, include at least one sampling
1965 event during spring runoff and at least one sampling event during late summer or early fall low
1966 flow; and

1967
1968 (B) Includes data that are sufficient for the Division to determine that
1969 the processes safely and reliably comply with water quality standards required by 40 CFR Part
1970 141.

1971
1972 ~~(formerly Section 6(e)(v)(A))(f)~~ Engineering design reports for new Ggroundwater
1973 sources shall include:

1974
1975 (i) The information required in paragraph (a) of this Section;

1976
1977 ~~(formerly Section 6(e)(v)(A)(I))(ii)~~ A description of the Ggeology of the
1978 aquifer(s) and overlying strata:

1979
1980 ~~(formerly Section 6(e)(v)(A)(II))(iii)~~ Tabulated Wwater quality; testing data
1981 including for biological, radiological and chemical water quality data sufficient to determine
1982 necessary treatment processes ~~and compliance with all drinking water standards as determined~~
1983 ~~by the administrator. The same water quality data for all secondary sources shall also be~~

1984 ~~provided~~ and sufficient for the Administrator to determine that the processes safely and reliably
1985 meet water quality standards required by 40 CFR Part 141;

1986
1987 (iv) If known, a summary of the likely drilling and completion challenges that
1988 will be faced, including a description of the engineering design, management, monitoring, and
1989 drilling and completion practices that will be used to successfully construct the well in
1990 accordance with this Chapter; and

1991
1992 (v) For wells that will be drilled through multiple aquifers, applicants shall
1993 request a pre-application meeting with the applicable Division district engineer to discuss:

1994
1995 (A) The boring advancement, well sealing, well development, and
1996 methods used to determine the adequacy of the well seal; and

1997
1998 (B) The methods that will be used to overcome lost circulation, bore
1999 instability, and deviations from vertical alignment.

2000
2001 (g) Engineering design reports for conversion of an existing well into a public water
2002 supply well shall include the following required elements:

2003
2004 (i) The information required in paragraph (a) of this Section;

2005
2006 (ii) The information required in paragraph (f) of this Section;

2007
2008 (iii) The submission of the State Engineer's Office (SEO) Statement of
2009 Completion and Description of Well; and

2010
2011 (iv) A video log of the well inspection accompanied by a written description of
2012 the location, shape, and estimated size of any holes, breaches, corroded areas in the casing, if
2013 any, that includes:

2014
2015 (A) If any damage to the casing is found, a description of how
2016 defective areas will be repaired and if there is a need for additional well bond logging; or

2017
2018 (B) If well bond logging is not recommended, a description of the
2019 technical justification and an alternative means of certifying the adequacy of the well seal to
2020 protect the water source.

2021
2022 (h) Engineering design reports for new water treatment facilities shall include the
2023 following required elements:

2024
2025 (i) The information required in paragraph (a) of this Section;

2026
2027 (ii) A description of all water treatment chemical requirements, including
2028 dosage and feed rates, delivery, handling, and storage;

2029

2030 (iii) A description of automatic operation and control systems, including basic
2031 operation, manual override operation, and maintenance requirements; and
2032

2033 (iv) A description of the on-site laboratory facilities and a summary of those
2034 tests to be conducted on-site. If no on-site laboratory is provided, a description of plant control
2035 and water quality testing requirements, and where the testing will be conducted shall be included.
2036

2037 (i) Engineering design reports for water treatment facility modifications shall
2038 describe:
2039

2040 (i) The information required in paragraph (a) of this Section;
2041

2042 (ii) The purpose of the facility modification;
2043

2044 (iii) All proposed new equipment, tankage, and chemical treatment processes,
2045 including a description of the modification's effect on treatment system reliability, water
2046 quantity and quality; and
2047

2048 (iv) A listing of the new equipment design criteria and the associated
2049 chemicals.
2050

2051 (j) Engineering design reports for water main upsizing or looping projects shall
2052 describe the purpose of the water main upsizing or looping project and shall include the
2053 following required elements:
2054

2055 (i) The information required in paragraph (a) of this Section;
2056

2057 (ii) Hydraulic analysis that demonstrates how peak hour, average day,
2058 maximum day, and maximum day plus fire flows, if fire flows are available, will be improved by
2059 upsizing; and
2060

2061 (iii) A table that summarizes the hydraulic model results.
2062

2063 (k) Engineering design reports for water main removal and replacements shall
2064 describe the purpose of the replacement and identify the existing main size, material type, and
2065 condition, and shall include the following required elements:
2066

2067 (i) The information required in paragraph (a) of this Section;
2068

2069 (ii) For any main replacement(s), the replacement main size, material type,
2070 and dimension ratio;
2071

2072 (iii) For projects that consist of main replacements in multiple discrete
2073 locations, an aerial image that shows all replacement pipeline segments, including new valves,
2074 with called-out pipe diameters and lengths;
2075

2076 (iv) A description of the protective measures that will be taken at locations
2077 where the new water main will cross a sewer or storm sewer when standard horizontal and
2078 vertical separations cannot be met; and

2079 (v) For projects where asbestos cement may be encountered, a discussion of
2080 the disposal, or abandonment method to be used.

2081 (l) Engineering design reports for new water mains shall describe the purpose of the
2082 new water main and shall include the information required in paragraph (a) of this Section. If the
2083 water main will provide service to a new development the engineering design report shall include
2084 the following required elements:

2085 (i) The modeling result from a hydraulic analysis that demonstrates that the
2086 design will meet the requirements of Section 16(d)(i-ii) of this Chapter;

2087 (ii) A demonstration that the hydraulic model was calibrated based on existing
2088 fire hydrant test flow data, when available, or based on modeling; and

2089 (iii) Identification of any impacts the new fire flow demand will have on
2090 finished storage and pumping systems over the required fire flow duration.

2091 **Section 10. ~~Treatment~~ Design Requirements for Preliminary Treatment and**
2092 **Redundancy.**

2093 ~~(moved to Section 12(b))(a) Design capacity. The capacity of the water treatment or~~
2094 ~~water production system shall be designed for the maximum daily demand at the design year.~~

2095 ~~(moved to Section 12(c))(b) Presedimentation. Raw waters which have episodes~~
2096 ~~of turbidity in excess of 1,000 TU for a period of one week or longer shall be presettled.~~

2097 ~~(moved to Section 12(d)(i))(i) Detention time. Basins without mechanical sludge~~
2098 ~~collection equipment shall have a minimum detention time of three days. Basins with mechanical~~
2099 ~~sludge collection equipment shall have a minimum detention time of three hours.~~

2100 ~~(ii) Inlet. Inlet flow shall be evenly dispersed along the inlet of the basin.~~

2101 ~~(moved to Section 12(b)(iv))(iii) Drains. Basins shall have a minimum of one~~
2102 ~~8-inch (20 cm) drain line to completely dewater the facility.~~

2103 ~~(moved to Section 12(b)(iii))(iv) Bottom slope. Basins shall have a bottom~~
2104 ~~slope to drain of 1/4 inch per foot (20 mm/m) without mechanical sludge collection equipment~~
2105 ~~and 2 inches per foot (16 cm/m) with mechanical sludge collection equipment.~~

2106 ~~(v) Bypass. Basin bypass provisions shall be included in the process piping.~~

2121 ~~(moved to Section 12(e))(c) — Rapid mix. Rapid dispersal of chemicals throughout the~~
2122 ~~water shall be accomplished by mechanical mixers, jet mixers, static mixers, or hydraulic jump.~~

2123
2124 ~~(moved to Section 12(e)(i))(i) Mixing intensity. For mechanical mixers, the~~
2125 ~~minimum Gt (velocity gradient (sec⁻¹) x t (sec)) provided at maximum daily flow shall be~~
2126 ~~27,000.~~

2127
2128 ~~(moved to Section 12(e)(ii))(ii) — Mixing time. The detention time in a flash~~
2129 ~~mixing chamber shall not exceed 30 seconds at maximum daily flow conditions.~~

2130
2131 ~~(moved to Section 12(e)(iii))(iii) — Drain. The basin shall have a drain.~~

2132
2133 ~~(moved to Section 12(f))(d) — Flocculation. The low velocity agitation of chemically~~
2134 ~~treated water shall be accomplished by mechanical flocculators.~~

2135
2136 ~~(moved to Section 12(f)(ii))(i) — Detention time. A minimum of 10 minutes~~
2137 ~~detention time shall be provided.~~

2138
2139 ~~(moved to Section 12(f)(iv))(ii) — Mixing intensity. The velocity gradient (G~~
2140 ~~value) imposed shall be adjustable by providing variable speed drives or shall be designed to be~~
2141 ~~30 sec⁻¹ if a single basin is provided, 20 sec⁻¹ in the final basin of a two stage system, and 10~~
2142 ~~sec⁻¹ in the final basin of a three stage system. For a single speed drive system, the tip speed of~~
2143 ~~the mixer shall not exceed 3 feet per second (0.91 m/sec). Variable speed drives shall provide tip~~
2144 ~~speeds of 0.5 to 3.0 feet per second (0.15-0.91 m/sec).~~

2145
2146 ~~(moved to Section 12(f)(iii))(iii) — Drains. Flocculation basins shall have a~~
2147 ~~minimum of one drain line to dewater the facility.~~

2148
2149 ~~(moved to Section 12(f)(vi))(iv) — Piping. The velocity of flocculated water~~
2150 ~~through pipes or conduits to settling basins shall not be less than 0.5 or greater than 1.5 feet per~~
2151 ~~second (0.15-0.46 m/sec).~~

2152
2153 ~~(moved to Section 12(g))(e) — Sedimentation basins.~~

2154
2155 ~~(moved to Section 12(g)(i))(i) Diameter. The maximum diameter in circular basins~~
2156 ~~shall be 80 feet.~~

2157
2158 ~~(moved to Section 12(g)(v))(ii) — Overflow rate. The basin overflow rate shall~~
2159 ~~not exceed 1,000 gpd/ft² (41 m³/m²d) at design conditions.~~

2160
2161 ~~(iii) — Weir loading rate. Weir loading rates shall not exceed 20,000 gpd/ft (2480~~
2162 ~~m³md) of length. The weir length shall be computed as the length of the centerline of the~~
2163 ~~launder. Where the weir is located at 3/4 the radius, the weir may be loaded at 36,000 gpd/ft~~
2164 ~~(4464 m³/m-d).~~

2166 ~~(moved to Section 12(g)(ii))(iv) — Side water depth. The minimum basin side~~
2167 ~~water depth shall be 8 feet (2.43 m) if mechanical sludge collection equipment is provided or~~
2168 ~~basins or basin sludge hopper segments are less than 100 square feet (9.3 m²) in surface area and~~
2169 ~~15 feet (4.6 m) if basins are manually cleaned. Mechanical sludge collection equipment includes~~
2170 ~~mechanically driven drives that use scrapers or differential water level to collect the sludge.~~

2171
2172 ~~(moved to Section 12(g)(iii))(v) — Freeboard. The outer walls of settling basins~~
2173 ~~shall extend at least 12 inches (30.5 cm) above the surrounding ground and provide at least 12~~
2174 ~~inches (30.5 cm) of freeboard to the water surface. Where basin walls are less than 4 feet (1.22~~
2175 ~~m) above the surrounding ground, a fence or other debris barrier shall be provided on the wall.~~

2176
2177 ~~(vi) — Inlet devices. Inlets shall be designed to distribute the water equally and at~~
2178 ~~uniform velocities. Open ports, submerged ports, and similar entrance arrangements are required.~~
2179 ~~A baffle should be constructed across the basin close to the inlet end and should project several~~
2180 ~~feet below the water surface to dissipate inlet velocities and provide uniform flows across the~~
2181 ~~basin.~~

2182
2183 ~~(vii) — Velocity. The velocity through settling basins shall not exceed 0.5 feet per~~
2184 ~~minute (0.15 m/min). The basins must be designed to minimize short-circuiting.~~

2185
2186 ~~(moved to Section 12(g)(vi))(viii) — Sludge collection. If settleable organics are~~
2187 ~~present in the water or if there is a history of organically related taste and odor problems,~~
2188 ~~mechanical sludge collection shall be provided.~~

2189
2190 ~~(moved to Section 12(g)(vii))(ix) — Sludge removal. Sludge removal design~~
2191 ~~shall provide that sludge pipes shall be not less than 6 inches (15.2 cm) in diameter and arranged~~
2192 ~~to facilitate cleaning. Valves on the sludge line shall be located outside the tank.~~

2193
2194 ~~(x) — Flushing lines. Flushing lines or hydrants shall be provided near the~~
2195 ~~basins.~~

2196
2197 ~~(moved to Section 12(e)(iv))(xi) — Drainage. Basin bottoms shall slope toward~~
2198 ~~the drain at not less than 1 inch per foot (8 cm/m) where mechanical sludge collection equipment~~
2199 ~~is provided and 1/4 inch per foot (2 cm/m) where no mechanical sludge collection equipment is~~
2200 ~~provided.~~

2201
2202 ~~(moved to Section 12(h))(f) — Softening sedimentation — clarification. Conventional~~
2203 ~~sedimentation — clarification as described above shall be provided in softening operations, except~~
2204 ~~for softening a groundwater supply of constant quality. Where a groundwater supply is softened,~~
2205 ~~the requirements may be modified as follows:~~

2206
2207 ~~(moved to Section 12(h)(i))(i) Overflow rate. The basin overflow rate at the design~~
2208 ~~flow shall not exceed 2,100 gpd/ft² (86 m³/m²·d).~~

2210 ~~(moved to Section 12(h)(ii))(ii) — Sludge. Mechanical sludge removal shall be~~
2211 ~~provided and shall be designed to handle a load of 40 lbs/foot (60 kg/m) of collector-scraper arm~~
2212 ~~length.~~

2213
2214 ~~(iii) — Other design considerations shall be the same as conventional~~
2215 ~~sedimentation—clarification.~~

2216
2217 ~~(moved to Section 12(l))(g) — Solids contact units. These treatment units are acceptable~~
2218 ~~for combined softening and clarification of well water where water quality characteristics are not~~
2219 ~~variable and flow rates are uniform. The units shall be designed to meet the criteria detailed~~
2220 ~~previously.~~

2221
2222 ~~(moved to Section 12(l)(i))(i) Such units may be considered for use as clarifiers~~
2223 ~~without softening when they are designed to meet the criteria detailed in the conventional~~
2224 ~~sedimentation—clarification.~~

2225
2226 ~~(moved to Section 12(l)(ii))(ii) — These units may also be used for other~~
2227 ~~treatment purposes, such as rapid mixing, flocculation, etc., when the individual components of~~
2228 ~~the solids contact units are designed in accordance with the design criteria for that individual~~
2229 ~~treatment process as described above.~~

2230
2231 ~~(moved to Section 12(j))(h) — Settling tube clarifiers. Shallow depth sedimentation~~
2232 ~~devices or tube clarifier systems of the essentially horizontal or steeply inclined types may be~~
2233 ~~used when designed as follows:~~

2234
2235 ~~(moved to Section 12(j)(iii))(i) — Sludge removal. Sludge shall be removed~~
2236 ~~using 45 or steeper hoppers bottoms, or mechanical devices that move the sludge to hoppers, or~~
2237 ~~devices that remove settled sludge from the basin floor using differential hydraulic level.~~

2238
2239 ~~(moved to Section 12(j)(iv))(ii) — Tube cleaning. A method of tube cleaning~~
2240 ~~shall be provided. This may include a provision for obtaining a rapid reduction in clarifier water~~
2241 ~~surface elevation, a water jet spray system, or an air scour system. Where cleaning is automatic,~~
2242 ~~controls shall be provided to cease clarifier operation during tube cleaning and a 20-minute rest~~
2243 ~~period.~~

2244
2245 ~~(moved to Section 12(j)(ii))(iii) — Tube placement. Tops of tubes shall be more~~
2246 ~~than 12 inches (0.3 m) from the underside of the launder and more than 18 inches (0.46 m) from~~
2247 ~~the water surface.~~

2248
2249 ~~(moved to Section 12(j)(i))(iv) — Loading rates. The maximum overflow rate~~
2250 ~~shall be less than 2.0 gpm/sq ft (62.7 m³/m²-d) based on the surface area of the basin covered by~~
2251 ~~the tubes.~~

2252
2253 ~~(moved to Section 12(j)(ii))(v) — Effluent launderers. The spacing between~~
2254 ~~effluent launderers shall not exceed three times the distance from the water surface to the top of~~
2255 ~~the tube modules.~~

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~~(moved to Section 12(k))(i)—Filtration.~~

~~(moved to Section 12(k)(i))(i) Pressure granular media filters. Vertical or horizontal pressure filters shall not be used for filtration of surface waters. Pressure filters may be used for groundwater filtration, including iron and manganese removal.~~

~~(ii)—Gravity filters.~~

~~(moved to Section 12(k)(i)(A))(A)—Slow rate sand filters. These types of filters may be used when maximum raw water turbidity is less than 50 TUs and the turbidity present is not attributable to colloidal clay. Maximum color shall not exceed 30 units.~~

~~(I)—Loading rates. The allowable loading rates at maximum daily demands shall not exceed 0.1 gpm/ft² (5.9 m³/m².d) unless satisfactory pilot testing is completed prior to design which shows a higher rate is appropriate.~~

~~(II)—Number of filters. At least two units shall be provided. Where only two units are provided, each shall be capable of meeting the plant design capacity at the maximum filtration rate. Where more than two filter units are provided, the filters shall be capable of meeting the plant design at the maximum filtration rate with one filter removed from service.~~

~~(III)—Underdrains. Each filter unit shall be equipped with a main drain and an adequate number of lateral underdrains to collect the filtered water. The underdrains shall be so spaced that the maximum velocity of the water flow in the lateral underdrain will not exceed 0.75 feet per second (0.22 m/sec). The maximum spacing of the laterals shall not exceed 12 feet (3.7 m).~~

~~(IV)—Filter material. Filter sand shall be placed on graded gravel layers for a minimum sand depth of 30 inches (0.76 m). The effective size shall be between 0.15 mm and 0.35 mm. The uniformity coefficient shall not exceed 2.0. The sand shall be clean and free from foreign matter. The supporting gravel shall conform to the size and depth distribution provided for rapid rate gravity filters.~~

~~(V)—Depth of water on filter beds. Design shall provide a depth of at least 3 feet (0.91 m) of water over the sand. Influent water shall enter the water surface at a velocity of less than 2 feet per second (0.61 m/sec). An overflow shall be provided at the maximum water surface elevation.~~

~~(VI)—Appurtenances. Each filter shall be equipped with loss of head gauge; an orifice, Venturi meter, or other suitable metering device installed on each filter to control the rate of filtration; and an effluent pipe designed to maintain the water level above the top of the filter sand.~~

2301 ~~(VII) Covers. When covers are provided for temperature or~~
2302 ~~sunlight control, they shall be designed to allow adequate headroom above the top of the sand~~
2303 ~~and adequate access ports or manholes.~~

2304
2305 ~~(B) Rapid rate filters.~~

2306
2307 ~~(I) Loading rates. The maximum allowable loading rates at~~
2308 ~~maximum daily demands shall not exceed 3 gpm/ft² (177 m³/m²·d) for single media filters or 5~~
2309 ~~gpm/ft² (295 m³/m²·d) for dual or mixed media filters. Each filter shall have a rate limiting~~
2310 ~~device to prevent the filter from exceeding the maximum rate.~~

2311
2312 ~~(II) Filter compartment design. The filter media compartment~~
2313 ~~shall be constructed of durable material not subject to corrosion or decay and structurally capable~~
2314 ~~of supporting the loads to which it will be subjected.~~

2315
2316 ~~(1.) There shall be an atmospheric break between~~
2317 ~~filtered and non-filtered water, accomplished by double wall construction.~~

2318
2319 ~~(2.) The compartment walls shall be vertical and shall~~
2320 ~~not protrude into the filter media.~~

2321
2322 ~~(3.) There shall be a minimum of 2½ feet (0.76 m) of~~
2323 ~~headroom above the top of the filter compartment walls.~~

2324
2325 ~~(4.) Neither floor nor roof drainage shall enter the filter.~~
2326 ~~If the top of the filter compartment is at floor level, a minimum 4 inch curb shall be constructed~~
2327 ~~around the box.~~

2328
2329 ~~(5.) Walkways or observation platforms shall be~~
2330 ~~provided for each filter compartment. Walk ways around the filter shall be a minimum of 24~~
2331 ~~inches wide.~~

2332
2333 ~~(6.) Effluent line shall be trapped or submerged below~~
2334 ~~the low water level in the clearwell to prevent air from entering the filter bottom. The velocity in~~
2335 ~~the filter influent line shall not exceed 4 feet per second (1.2 m/sec). An overflow from the~~
2336 ~~influent of the filter compartment shall be provided.~~

2337
2338 ~~(7.) The distance between the operating water level in~~
2339 ~~the filter and the high water level in the clearwell or effluent trap shall be 10 feet (3.05 m)~~
2340 ~~minimum. The minimum operating water level over the media shall be 3 feet (0.91 m), and the~~
2341 ~~minimum depth of the filter box shall be 8 1/2 feet (2.6 m).~~

2342
2343 ~~(III) Washwater troughs. (moved to Section 12(k)(ii)(A)) Washwater~~
2344 ~~troughs shall be constructed to provide for not more than 6 feet (1.8 m) clear distance between~~
2345 ~~troughs. The troughs shall not cover more than 25 percent of filter area.~~

2346

2347 ~~(moved to Section 12(k)(ii)(B))(1.)—Minimum clearance~~
2348 ~~between the bottom of trough and top of unexpanded media shall be 12 inches (30.5 cm).~~

2349
2350 ~~(moved to Section 12(k)(ii)(C))(2.)—Minimum distance~~
2351 ~~between the weir of the trough and the unexpanded media shall be 30 inches (0.76 m).~~

2352
2353 ~~(moved to Section 12(k)(ii)(E))(3.)—The trough and~~
2354 ~~washwater waste line shall be sized to carry a filter backwash rate of 20 gpm/ft² (1181 m³/m²-d)~~
2355 ~~plus a surface wash rate of 2.0 gpm/ft² (118 m³/m²-d).~~

2356
2357 ~~(IV)—Backwash system.~~

2358
2359 ~~(moved to Section 12(k)(ii)(F))(1.)—The backwash system shall~~
2360 ~~be sized to provide a minimum backwash flow rate of 20 gpm/ft² (1181 m³/m²-d). Washwater~~
2361 ~~storage shall be designed to provide two 20 minute washes in rapid succession. Where multiple~~
2362 ~~units are not required and only one filter compartment is present, backwash storage capabilities~~
2363 ~~may be reduced to provide one 20 minute backwash. Where pumps are used to provide backwash~~
2364 ~~to the filter or to supply water to a washwater tank, the washwater pumps shall be in duplicate.~~

2365
2366 ~~(moved to Section 12(k)(ii)(H))(2.)—The backwash and~~
2367 ~~surface wash washwater supply shall be filtered and disinfected.~~

2368
2369 ~~(moved to Section 12(k)(ii)(I))(3.)—Washwater rate shall~~
2370 ~~be controlled by a separate valve, manual or automatic, on the main washwater line. Washwater~~
2371 ~~flow rates shall be metered and indicated.~~

2372
2373 ~~(moved to Section 12(k)(ii)(J))(4.)—Air assisted backwash~~
2374 ~~systems may be used when the design precludes disturbing the gravel support.~~

2375
2376 ~~(moved to Section 12(k)(ii)(K))(5.)—A surface wash~~
2377 ~~system shall be provided. The system shall be capable of supplying 0.5 gpm/ft² (29.5 m³/m²-d)~~
2378 ~~for system with rotating arms and 2.0 gpm/ft² (118 m³/m²-d) with fixed nozzles, at a minimum~~
2379 ~~pressure of 50 psi (344 kPa). The surface wash shall use filtered and disinfected water or air and~~
2380 ~~filtered disinfected water. The supply system shall be provided with adequate backflow~~
2381 ~~prevention.~~

2382
2383 ~~(V)—Filter materials. For rapid rate filters, coarse to fine beds of~~
2384 ~~mixed or dual media or fine to coarse single media beds may be used.~~

2385
2386 ~~1.—Types of filter media:~~

2387 ~~a.—Anthracite. Clean crushed anthracite, or a~~
2388 ~~combination of anthracite and other media shall have an effective size of 0.45 mm–0.55 mm~~
2389 ~~with uniformity coefficient not greater than 1.65 when used alone, or an effective size of 0.8 mm~~
2390 ~~–1.2 mm with a uniformity coefficient not greater than 1.65 when used as a cap. The anthracite~~
2391 ~~shall meet the requirements of AWWA B100.~~

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~~b.——Sand. Sand shall have an effective size of 0.45 mm to 0.55 mm, a uniformity coefficient of not greater than 1.65, and shall meet the requirements of AWWA B100.~~

~~(c.)——Granular activated carbon (GAC). Granular activated carbon media may be used in place of anthracite. There must be means for periodic treatment of granular activated carbon filter material for control of bacterial and other growths. Provisions must be made for replacement or regeneration if GAC is used for filtration.~~

~~(d.)——Torpedo sand or garnet. A layer of torpedo sand or garnet shall be used as a supporting media for filter sand.~~

~~2.——Sand for single media beds. The media shall be clean silica sand having a depth of not less than 24 inches (0.61 m), an effective size of from 0.45 mm to 0.55 mm, and a uniformity coefficient not greater than 1.65. A 3 inch (7.6 cm) layer of torpedo sand or other high density material shall be used as a supporting media for the filter sand. The material shall have an effective size of 0.8 mm to 2.0 mm, and a uniformity coefficient not greater than 1.7.~~

~~(moved to Section 12(k)(iii)) 3.——Anthracite for single media beds. Clean crushed anthracite or a combination of sand and anthracite may be used. Such media shall have an effective size from 0.45 mm to 0.55 mm, and a uniformity coefficient not greater than 1.65.~~

~~(moved to Section 12(k)(iii)(A)) 4.Gravel. When used as a supporting media, gravel shall consist of coarse aggregate in which a high proportion of the particles are rounded and tend toward a generally spherical or equidimensional shape. (moved to It shall possess sufficient strength and hardness to resist degradation during handling and use, be substantially free of harmful materials, and exceed the minimum density requirement. The gravel shall meet the requirements of AWWA B100.~~

~~(moved to Section 12(k)(ix)) 5.Multi-media. Filter beds of this type shall contain a depth of fine media made up of anthracite coal, specific gravity 1.5; silica sand, specific gravity 2.6; and garnet sand or ilemite, specific gravity 4.2—4.5.~~

~~(moved to Section 12(k)(ix)(A)) a.——Bed depths and distribution of the media shall be determined by the water quality, but shall not be less than 10 inches (0.25 m) of fine sand and 24 inches (0.61 m) of coal. The relative size of the particles shall be such that hydraulic grading of the material during backwash will result in a filter bed with pore space graded progressively from coarse to fine in the direction of filtration (down).~~

~~(moved to Section 12(k)(ix)(B)) b.——The multi-media shall be supported on two layers of special high density gravel placed above the~~

2439 ~~conventional silica gravel supporting bed. The special gravel shall have a specific gravity not~~
2440 ~~less than 4.2. The bottom layer shall consist of particles passing No. 5 and retained on No. 12~~
2441 ~~U.S. mesh sieves and shall be 1-1/2 inches (3.8 cm) thick. The top layer shall consist of particles~~
2442 ~~passing No. 12 and retained on No. 20 U.S. mesh sieves, and shall be 1-1/2 inches (3.8 cm)~~
2443 ~~thick.~~

2444
2445 ~~(moved to Section 12(i)(iv)) 6. — Dual media. Coal sand filters~~
2446 ~~shall consist of a coarse coal layer above a layer of fine sand. The media shall consist of not less~~
2447 ~~than 8 inches (20 cm) of sand and 15 inches (0.38 m) of coal on a torpedo sand or garnet layer~~
2448 ~~support of not less than 3 inches (7.8 cm) on the gravel support.~~

2449
2450 ~~(moved to Section 12(k)(v))(VI) — Filter bottoms. Acceptable~~
2451 ~~filter bottoms and strainer systems shall be limited to pipe, perforated pipe laterals, tile block and~~
2452 ~~perforated tile block. Perforated plate bottoms or plastic nozzles shall not be used.~~

2453
2454 ~~(moved to Section 12(k)(vi))(VII) — Appurtenances. Every filter~~
2455 ~~shall have influent and effluent sampling taps; indicating loss of head gauge; indicating effluent~~
2456 ~~turbidimeter; a waste drain for draining the filter compartment to waste; and a filter rate flow~~
2457 ~~meter. Every filter shall provide polymer feed facilities including polymer mixing and storage~~
2458 ~~tank and at least one feed pump for each filter compartment. On plants having a capacity in~~
2459 ~~excess of 0.5 MGD, recorders shall be provided on the turbidimeters.~~

2460
2461 ~~(moved to Section 12(k)(vii))(VIII) Filter rate control. Filter rate~~
2462 ~~control shall be such that the filter is not surged. Filter rate of flow shall not change at a rate~~
2463 ~~greater than 0.3 gpm/ft² (17.7 m³/m²-d) per minute. Filters that stop and restart during a cycle~~
2464 ~~shall have a filter to waste system installed. Declining flow rate filters shall not be used unless~~
2465 ~~the flow rate for each filter is controlled to rates less than allowed in 10 (i)(ii)(B) and there are~~
2466 ~~four or more individual filters.~~

2467
2468 ~~(moved to Section 12(k)(viii))(IX) — A filter to waste cycle shall~~
2469 ~~be provided after the filter backwash operation. The filter to waste cycle shall be at least 10~~
2470 ~~minutes.~~

2471
2472 ~~(moved to Section 12(k)(x))(j) — Diatomaceous earth filtration. These types~~
2473 ~~of filters may be used as the filtration process to remove turbidity from surface waters where~~
2474 ~~turbidities entering the filters do not exceed 25 TU and where total raw water coliforms do not~~
2475 ~~exceed 100 organisms/100 ml. These filters may be used where the raw water quality exceeds the~~
2476 ~~above limits when flocculation and sedimentation are used preceding the filters. Diatomaceous~~
2477 ~~earth filters may also be used for removal of iron from groundwaters.~~

2478
2479 ~~(moved to Section 12(k)(x)(B))(i) — Types of filters. Pressure or vacuum~~
2480 ~~diatomaceous earth filtration units will be considered for approval.~~

2481
2482 ~~(moved to Section 12(k)(ix)(C))(ii) — Precoat. A precoating system shall be~~
2483 ~~provided.~~

2484

2485 (A) ~~—A uniform precoat shall be applied hydraulically to each septum by~~
2486 ~~introducing a precoat slurry to the filter influent line and employing a filter to waste or~~
2487 ~~recirculation system.~~

2488
2489 (B) ~~—Feed capabilities. Diatomaceous earth in the amount of 0.20 lb/ft²~~
2490 ~~(1 Kg/m²) minimum of filter area shall be used with recirculation. When precoating is~~
2491 ~~accomplished with a filter to waste system, 0.3 lbs/ft² (1.5 Kg/m²) minimum shall be provided.~~

2492
2493 (iii) ~~—Body feed. A body feed system to apply diatomaceous earth slurry~~
2494 ~~continuously during the filter run shall be provided. Continuous mixing of the body feed slurry~~
2495 ~~tank during the filter cycle shall be provided.~~

2496
2497 (iv) ~~—Filtration.~~

2498
2499 (A) ~~—Rate of filtration. The maximum rate of filtration shall not exceed~~
2500 ~~1.5 gpm/ft² (88.6 m³/m²-d) of septum area. The filtration rate shall be controlled by a positive~~
2501 ~~means.~~

2502
2503 (B) ~~—Head loss. The head loss shall not exceed 30 psi (206 kPa) for~~
2504 ~~pressure diatomaceous earth filters, or a vacuum of 15 inches of mercury (50.8 kPa) for vacuum~~
2505 ~~system.~~

2506
2507 (C) ~~—Recirculation. A recirculation or holding pump shall be provided to~~
2508 ~~maintain differential pressure across the filter when the unit is not in operation in order to~~
2509 ~~prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1~~
2510 ~~gallons per minute per square foot (5.9 m³/m²-d) of filter area shall be provided. The filter~~
2511 ~~control system shall prevent automatic restart after power failure.~~

2512
2513 (D) ~~—Septum or filter element. The filter elements shall be structurally~~
2514 ~~capable of withstanding maximum pressure and velocity variations during filtration and cleaning~~
2515 ~~cycles, and shall be spaced so that not less than 2 inches (5.1 cm) are provided between elements~~
2516 ~~or between any element and a wall.~~

2517
2518 (E) ~~—Inlet design. The filter influent shall be designed to prevent scour~~
2519 ~~of the diatomaceous earth from the filter element.~~

2520
2521 (v) ~~—Appurtenances. Every filter shall provide sampling taps for raw and~~
2522 ~~filtered water; loss of head or differential pressure gauge; rate of flow indicator, with totalizer;~~
2523 ~~and a throttling valve used to reduce rates during adverse raw water conditions.~~

2524
2525 (vi) ~~—Monitoring. A continuous monitoring turbidimeter is required on the filter~~
2526 ~~effluent from each filter unit for plants treating surface water.~~

2527
2528 (moved to Section 12(1))(k) ~~—Disinfection. Chlorine, chlorine dioxide, ozone or other~~
2529 ~~disinfectant as approved by the administrator may be used for disinfection. Where the primary~~
2530 ~~disinfectant is ozone, chlorination equipment shall be provided to enable maintaining a residual~~

2531 ~~disinfectant throughout the distribution system. Automatic proportioning of disinfectant feed to~~
2532 ~~flow rate is required where the plant flow control is automatic.~~

2533
2534 ~~(moved to Section 12(1)(i))(i) Chlorination equipment.~~

2535
2536 ~~(moved to Section 12(1)(i)(A)(A) Type. Solution feed gas chlorinators~~
2537 ~~or hypochlorite feeders of the positive displacement type shall be provided.~~

2538
2539 ~~(B) Capacity. The chlorinator capacity shall be such that a minimum 5~~
2540 ~~mg/L disinfection dose can be added on the maximum day. The equipment shall be of such~~
2541 ~~design that it will operate accurately over the desired feeding range.~~

2542
2543 ~~(moved to Section 12(1)(i)(E))(C) Standby equipment. Standby~~
2544 ~~equipment of sufficient capacity shall be available to replace the largest chlorinator unit, except~~
2545 ~~for a well water system providing no treatment other than disinfection.~~

2546
2547 ~~(D) Automatic switchover. Automatic switch-over of chlorine~~
2548 ~~cylinders shall be provided.~~

2549
2550 ~~(moved to Section 12(1)(i)(B))(E) Diffuser. The chlorine solution~~
2551 ~~injection/diffuser shall provide a rapid and thorough mix with all the water being treated. If the~~
2552 ~~application point is to a pipeline discharging to a clearwell, the chlorine shall be added to the~~
2553 ~~center of the pipe at least 10 pipe diameters upstream of the discharge into the clearwell.~~

2554
2555 ~~(moved to Section 12(1)(i)(D)(I))(F) Injector/Eductor. For gas feed~~
2556 ~~chlorinators, the injector/eductor shall be selected based on solution water pressure, injector~~
2557 ~~waterflow rate, feed point backpressure, and chlorine solution line length and size. The~~
2558 ~~maximum feed point backpressure shall not exceed 110 psi (759 kPa). Where backpressure~~
2559 ~~exceeds 110 psi (750 kPa), a chlorine solution pump shall be used. Gauges shall be provided for~~
2560 ~~chlorine solution pressure, feed water pressure and chlorine gas pressure, or vacuum.~~

2561
2562 ~~(moved to Section 12(1)(ii))(ii) Points of application and contact time.~~

2563
2564 ~~(A) At plants treating surface water, provisions shall be made for~~
2565 ~~applying disinfectant to the raw water, filter influent, and filtered water.~~

2566
2567 ~~(B) For plants treating groundwater, provisions shall be made for~~
2568 ~~applying disinfectant to a point in the finished water supply line prior to any commercial,~~
2569 ~~industrial, or municipal user. Agricultural users may remove water from the supply line prior to~~
2570 ~~disinfectant application point.~~

2571
2572 ~~(C) Where free chlorine residual is provided, 1/2 hour contact time~~
2573 ~~shall be provided for groundwaters and 2 hours for surface waters. Where combined residual~~
2574 ~~chlorination is provided, 2 hours contact time for groundwater and 3 hours contact for surface~~
2575 ~~water shall be provided.~~

2576

2577 ~~(D)——When chlorine is applied to a groundwater source for the purpose~~
2578 ~~of maintaining a residual, no contact time is required.~~

2579
2580 ~~(iii)——Testing equipment. Chlorine residual test equipment recognized in the~~
2581 ~~15th Edition of Standard Methods for the Examination of Water and Wastewater shall be~~
2582 ~~provided and shall be capable of measuring residuals to the nearest 0.1 mg/L in the range below~~
2583 ~~0.5 mg/L, to the nearest 0.3 mg/L between 0.5 mg/L and 1.0 mg/L and to the nearest 0.5 mg/L~~
2584 ~~between 1.0 mg/L and 2.0 mg/L.~~

2585
2586 ~~(iv)——Chlorinator piping.~~

2587
2588 ~~(A)——Cross-connection protection. The chlorinator water supply piping~~
2589 ~~shall be designed to prevent contamination of the treated water supply. At all facilities treating~~
2590 ~~surface water, pre- and post-chlorination systems shall be independent to prevent possible~~
2591 ~~siphoning of partially treated water into the clearwell. The water supply to each eductor shall~~
2592 ~~have a separate shutoff valve. No master shutoff will be allowed. Chlorine solution feed water~~
2593 ~~shall be finished water.~~

2594
2595 ~~(B)——Pipe material. The pipes carrying liquid or gaseous chlorine shall~~
2596 ~~be Schedule 80 black steel pipe with forged steel fittings. Bushings shall not be used. Vacuum~~
2597 ~~piping for gaseous chlorine may be polyethylene tubing. Gas piping between the chlorine~~
2598 ~~pressure reducing valve of the chlorinator and the ejector shall be PVC or polyethylene. Piping~~
2599 ~~for aqueous solutions of chlorine beyond the ejector shall be PVC, fiberglass or steel pipe lined~~
2600 ~~with PVC or saran.~~

2601
2602 ~~(v)——Maximum withdrawal. The maximum withdrawal rate of gaseous chlorine~~
2603 ~~shall be limited to 40 lbs/day (18.1 kg/day) for 100 or 150 lb (45.4 or 68.0 kg) cylinders and 400~~
2604 ~~lbs/day (181 kg/day) for 2,000 lb (907 kg) cylinders, unless chlorine evaporators are employed.~~

2605
2606 ~~(vi)——Ozonation equipment.~~

2607
2608 ~~(A)——Capacity. The ozonator capacity shall be such that an applied dose~~
2609 ~~of at least 10 mg/L can be attained at the maximum daily flows. The equipment shall be of such~~
2610 ~~design that it will operate 5 percent over the desired feeding range.~~

2611
2612 ~~(B)——Piping. Injection equipment and piping in contact with ozonated air~~
2613 ~~and air-water emulsions shall be of stainless steel, teflon or other material resistant to ozone.~~
2614 ~~Valves carrying ozonized air shall be made of metal coated with ozone-resistant materials.~~

2615
2616 ~~(C)——Application. Ozone may be applied to the water directly as a gas or~~
2617 ~~by an injector system similar to a chlorine injector system. In gas applications, depth of~~
2618 ~~submergence of the diffusers shall be a minimum of 10 feet (3.05 m). Diffusion shall be fine~~
2619 ~~bubble or mixed.~~

2620
2621 ~~(D)——Contact time and point of application. Ozone shall be applied at a~~
2622 ~~point which will provide contact time not less than 30 minutes. At plants treating surface water,~~

2623 ~~provisions should be made for applying a disinfectant to the raw water, filter influent, filtered~~
2624 ~~water and final contact basin. At plants treating groundwater, provisions should be made for~~
2625 ~~applying ozone to the clear well inlet.~~

2626
2627 ~~(E) — Testing equipment. Testing equipment shall enable measurement~~
2628 ~~of residuals to the nearest 0.1 mg/L in the range below 0.5 mg/L and to the nearest 0.2 mg/L~~
2629 ~~above 0.5 mg/L.~~

2630
2631 ~~(F) — Ozone destruct. An ozone destruct device shall be provided to~~
2632 ~~destruct all ozone contractor off gases.~~

2633
2634 ~~(G) — The use of ozone for disinfection will be allowed only if a chlorine~~
2635 ~~or combined chlorine residual is provided in the distribution system.~~

2636
2637 ~~(I) — Softening.~~

2638
2639 ~~(i) — Lime or lime soda process. Design standards for rapid mix, flocculation~~
2640 ~~and sedimentation are the same as for conventional treatment previously outlined. Lime or lime~~
2641 ~~soda softened effluent shall be filtered.~~

2642
2643 ~~(A) — Hydraulics. When split treatment is used, the bypass line shall be~~
2644 ~~sized to carry total plant flow, and a means of measuring and splitting the flow shall be provided.~~

2645
2646 ~~(B) — Chemical feed point. Lime and recycled sludge shall be fed~~
2647 ~~directly into the rapid mix basin.~~

2648
2649 ~~(C) — Stabilization. Provisions shall be made to chemically stabilize~~
2650 ~~waters softened by the lime or lime soda process.~~

2651
2652 ~~(D) — Sludge collection. Mechanical sludge removal equipment shall be~~
2653 ~~provided in the sedimentation basin. Sludge recycling to the rapid mix shall be provided.~~

2654
2655 ~~(E) — Disinfection. The use of excess lime shall not be considered a~~
2656 ~~substitute for disinfection. Disinfection, as previously outlined, shall be provided.~~

2657
2658 ~~(ii) — Cation exchange process.~~

2659
2660 ~~(A) — Pretreatment requirements. Pretreatment is required when the~~
2661 ~~content of iron, manganese, or a combination of the two, is 1 mg/L or more. Water with 5 units~~
2662 ~~or more turbidity shall not be applied directly to the cation exchange softener.~~

2663
2664 ~~(B) — Design. The units may be of pressure or gravity type, of either an~~
2665 ~~upflow or downflow design. Automatic regeneration based on volume of water softened shall be~~
2666 ~~used. A manual override shall be provided on all automatic controls.~~

2667

2668 ~~(C) Exchange capacity. The design capacity for hardness removal shall~~
2669 ~~not exceed 20,000 grains per cubic foot (45,880 g/L) when resin is regenerated with 0.3 pounds~~
2670 ~~(.14 kg) of salt per kilograin (2.29 g/L) of hardness removed.~~

2671
2672 ~~(D) Depth of resin. The depth of the exchange resin shall not be less~~
2673 ~~than 2 feet (0.6 m).~~

2674
2675 ~~(E) Flow rates. The flow applied to the softening unit shall not~~
2676 ~~exceed 7 gpm/ft² (413 m³/m²-d) of bed area. The minimum backwash rate shall be 6 gpm/ft²~~
2677 ~~(354 m³/m²-d) of bed area or shall provide a minimum of 150 percent bed expansion at winter~~
2678 ~~water temperatures. A positive means of controlling flow must be present.~~

2679
2680 ~~(F) Underdrains and supporting gravel. The bottoms, strainer systems~~
2681 ~~and support for the exchange resin shall conform to criteria provided for rapid rate gravity filters.~~

2682
2683 ~~(G) Brine distribution. Facilities shall be included for even distribution~~
2684 ~~of the brine over the entire surface of both upflow and downflow units.~~

2685
2686 ~~(H) Cross-connection control. Backwash, rinse and air relief discharge~~
2687 ~~pipes shall be installed in such a manner as to prevent any possibility of back siphonage.~~

2688
2689 ~~(I) Bypass piping and equipment. A by-pass shall be provided around~~
2690 ~~softening units to produce a blended water of desirable hardness. Totalizing meters must be~~
2691 ~~installed on the bypass line and on each softener unit. An automatic proportioning or regulating~~
2692 ~~device and shutoff valve shall be provided on the bypass line.~~

2693
2694 ~~(J) Additional limitations.~~

2695
2696 ~~(I) Silica gel resins shall not be used for waters having a pH~~
2697 ~~above 8.4 or containing less than 6 mg/L silica and shall not be used when iron is present.~~

2698
2699 ~~(II) When the applied water contains a chlorine residual, the~~
2700 ~~cation-exchange resin shall be a type that is not damaged by residual chlorine.~~

2701
2702 ~~(III) Phenolic resin shall not be used.~~

2703
2704 ~~(K) Brine and salt storage tanks.~~

2705
2706 ~~(I) Salt dissolving or brine tanks and wet salt storage tanks~~
2707 ~~shall be covered and constructed of corrosion-resistant materials.~~

2708
2709 ~~(II) The makeup water inlet shall be protected from back~~
2710 ~~siphonage. Water for filling the tank shall be distributed over the entire surface by pipes above~~
2711 ~~the maximum brine level in the tank. The tanks shall be provided with an automatic declining~~
2712 ~~level control system on the makeup water line.~~

2713

2714 ~~(III) — Wet salt storage basins shall be equipped with manholes or~~
2715 ~~hatchways for access and for direct dumping of salt from truck or railcar. Openings shall be~~
2716 ~~provided with raised curbs and watertight covers having overlapping edges similar to those~~
2717 ~~required for finished water reservoirs.~~

2718
2719 ~~(IV) — Overflows, if provided, must be turned down, have a proper~~
2720 ~~free fall discharge and be protected with corrosion resistant screens or self closing flap valves.~~

2721
2722 ~~(V) — Two wet salt storage tanks or compartments designed to~~
2723 ~~operate independently shall be provided.~~

2724
2725 ~~(VI) — The salt shall be supported on graduated layers of gravel~~
2726 ~~under which is a suitable means of collecting the brine.~~

2727
2728 ~~(L) — Salt and brine storage capacity. Total salt storage capacity shall~~
2729 ~~provide for at least 30 days of operation.~~

2730
2731 ~~(M) — Brine pump or eductor. An eductor may be used to transfer brine~~
2732 ~~from the brine tank to the softeners. If a pump is used, a brine measuring tank or means of~~
2733 ~~metering shall be provided to obtain proper dilution.~~

2734
2735 ~~(N) — Stabilization. Facilities for stabilizing corrosion control shall be~~
2736 ~~provided.~~

2737
2738 ~~(O) — Construction materials. Pipes and contact materials shall be~~
2739 ~~resistant to the aggressiveness of salt. Plastic and red brass are acceptable piping materials. Steel~~
2740 ~~and concrete shall be coated with a non leaching protective coating which is compatible with salt~~
2741 ~~and brine.~~

2742
2743 ~~(P) — Housing. Bagged salt and dry bulk salt storage shall be enclosed~~
2744 ~~and separated from other operating areas in order to prevent damage to equipment.~~

2745
2746 ~~(m) — Aeration. Aeration may be used to help remove tastes and odors due to dissolved~~
2747 ~~gases from decomposing organic matter; to reduce or remove objectionable amounts of carbon~~
2748 ~~dioxide, hydrogen sulfide, etc.; to introduce oxygen to assist in iron and/or manganese removal;~~
2749 ~~and to strip volatile organic compounds for controlling the formation of trihalomethanes by~~
2750 ~~removing the trihalomethane precursors.~~

2751
2752 ~~(i) — Natural draft aeration — tray type. The design shall provide perforations in~~
2753 ~~the distribution pan to provide uniform distribution of water over the top tray. The discharge~~
2754 ~~shall be through a series of three or more trays. Tray material shall be resistant to aggressiveness~~
2755 ~~of the water and dissolved gases. The loading rate shall not exceed five gpm/ft² (203 L/m²) of~~
2756 ~~total tray area.~~

2757
2758 ~~(ii) — Forced or induced draft aeration. Devices shall:~~
2759

- 2760 (A) ~~—Be constructed and located so that air introduced into the column~~
2761 ~~shall be free from obnoxious fumes, dust, and dirt. All sections of the aerator shall be easily~~
2762 ~~reached or removed for maintenance.~~
- 2763
- 2764 (B) ~~—Provide distribution of water uniformly over the top tray and~~
2765 ~~discharge through a series of five or more trays.~~
- 2766
- 2767 (C) ~~—Be constructed so that the water outlet is adequately sealed to~~
2768 ~~prevent unwarranted loss of air. Material shall be resistant to the aggressiveness of the water and~~
2769 ~~dissolved gases. Loading shall be provided at a rate not to exceed five gpm/ft² (203 L/m²) of~~
2770 ~~total tray area.~~
- 2771
- 2772 (iii) ~~—Pressure aeration. Pressure aeration may be used for oxidation purposes~~
2773 ~~only; it is not acceptable for removing dissolved gases.~~
- 2774
- 2775 (iv) ~~—Protection of aerators. All aerators except those discharging to lime~~
2776 ~~softening or clarification plants shall be protected from contamination by birds and insects by~~
2777 ~~using louvers and 24 mesh screen.~~
- 2778
- 2779 (v) ~~—Disinfection. Disinfection must be provided as a final treatment to all~~
2780 ~~waters receiving aeration treatment.~~
- 2781
- 2782 (vi) ~~—Bypass. A bypass shall be provided around all aeration units.~~
- 2783
- 2784 (vii) ~~—Volatile organics removal. Volatile organic compounds may be stripped~~
2785 ~~by packed tower or diffused aeration methods.~~
- 2786
- 2787 (n) ~~—Iron and manganese control. Iron and manganese control, as used here, refers~~
2788 ~~solely to treatment processes designed specifically for this purpose.~~
- 2789
- 2790 (i) ~~—Removal by oxidation, detention, and filtration.~~
- 2791
- 2792 (A) ~~—Oxidation. Oxidation may be accomplished by aeration or by~~
2793 ~~chemical oxidation using chlorine, potassium permanganate, ozone, hydrogen peroxide, or~~
2794 ~~chlorine dioxide.~~
- 2795
- 2796 (B) ~~—Detention following aeration. A minimum detention time of 20~~
2797 ~~minutes shall be provided following aeration. The detention basin shall be designed as a holding~~
2798 ~~tank with sufficient baffling to prevent short-circuiting. Sedimentation basins shall be provided~~
2799 ~~when treating water with iron and/or manganese above 2 mg/L, or where chemical coagulation is~~
2800 ~~used to reduce the load on the filters. Provisions for sludge removal shall be made.~~
- 2801
- 2802 (C) ~~—Filtration. Gravity or pressure filters shall be provided. Where~~
2803 ~~pressure filters are used, the following criteria supplements that found in Section 10(i).~~
- 2804

2805 ~~(I) Rate of filtration. The rate shall not exceed 3 gpm/ft² (176~~
2806 ~~m³/m²-d) of filter area.~~

2807
2808 ~~(H) Design criteria. The filters shall have a minimum side wall~~
2809 ~~shell height of 5 feet, and an air release valve on the highest point of each filter. Each filter shall~~
2810 ~~have a means to observe the wastewater during backwashing and also a manhole to facilitate~~
2811 ~~inspection and repairs.~~

2812
2813 ~~(ii) Removal by the lime-soda softening process. These processes shall~~
2814 ~~conform to the lime-soda process in Section 10(i).~~

2815
2816 ~~(iii) Removal by manganese greensand filtration. Provide feed capability of~~
2817 ~~potassium permanganate to the influent of a manganese greensand filter.~~

2818
2819 ~~(A) An anthracite media cap of at least 6 inches (0.15 m) shall be~~
2820 ~~provided over manganese green sand.~~

2821
2822 ~~(B) The filtration rate shall not exceed 4 gpm/ft² (236 m³/m²-d).~~

2823
2824 ~~(C) Provide a minimum backwash capability of 12 gpm/ft² (708~~
2825 ~~m³/m²-d), with a rate control device.~~

2826
2827 ~~(D) Air washing or surface washing is required.~~

2828
2829 ~~(iv) Removal by ion exchange. This process of iron and manganese removal~~
2830 ~~shall not be used for water containing more than 0.3 mg/L of iron, manganese or combination of~~
2831 ~~the two. This process is not acceptable where either the raw water or washwater contains~~
2832 ~~dissolved oxygen.~~

2833
2834 ~~(v) Sequestration by polyphosphates. This process shall not be used when~~
2835 ~~iron, manganese or a combination of the two as exceeds 1.0 mg/L. The total phosphate applied~~
2836 ~~shall not exceed 10 mg/L as PO₄. Where phosphate treatment is used, facilities shall be provided~~
2837 ~~for maintaining a 0.5 mg/L free or combined chlorine residual at remote points in the distribution~~
2838 ~~system.~~

2839
2840 ~~(A) The stock phosphate solution tank shall be covered. Facilities shall~~
2841 ~~be provided for disinfecting the solution tank. The facilities shall be capable of providing a~~
2842 ~~minimum of 10 mg/L free chlorine residual.~~

2843
2844 ~~(B) Polyphosphates shall not be applied ahead of iron and manganese~~
2845 ~~removal treatment. The point of application shall be prior to any aeration, oxidation or~~
2846 ~~disinfection if no iron or manganese removal treatment is provided.~~

2847
2848 ~~(vi) Sequestration by sodium silicates. Sodium silicate sequestration of iron~~
2849 ~~and manganese shall be used for groundwater supplies prior to air contact. Rapid oxidation of the~~
2850 ~~metal ions by chlorine, chlorine dioxide, ozone, hydrogen peroxide, or other strong oxidant must~~

2851 ~~accompany or closely precede the sodium silicate addition. Injection of sodium silicate shall not~~
2852 ~~occur at a point more than 15 seconds after oxidation feed point. Feed and dilution equipment~~
2853 ~~shall be sized on the basis of feed solutions stronger than 5 percent silica as SiO₂. Sodium silicate~~
2854 ~~addition may be used only on water containing up to 2 mg/L of iron, manganese or a~~
2855 ~~combination of the two. Sodium silicate addition shall not be used on waters where 20 mg/L or~~
2856 ~~more SiO₂ is required or where the amount of added and naturally occurring silicate will exceed~~
2857 ~~60 mg/L as SiO₂.~~

2858
2859 ~~(A) Facilities shall be provided for maintaining a chlorine residual of~~
2860 ~~0.5 mg/L throughout the distribution system.~~

2861
2862 ~~(B) Sodium silicate shall not be applied ahead of iron or manganese~~
2863 ~~removal treatment.~~

2864
2865 ~~(vii) Testing equipment. Testing equipment shall be provided for all iron and~~
2866 ~~manganese control plants.~~

2867
2868 ~~(A) The equipment should have the capacity to measure the iron~~
2869 ~~content to a minimum of 0.1 mg/L and the manganese content to a minimum of 0.05 mg/L.~~

2870
2871 ~~(B) Where polyphosphate sequestration is practiced, phosphate testing~~
2872 ~~equipment shall be provided.~~

2873
2874 ~~(moved to Section 12(n))(o) Fluoridation and defluoridation.~~

2875
2876 ~~(moved to Section 12(n)(i))(i) Fluoride compound storage. Storage tanks shall be~~
2877 ~~covered; all storage shall be inside a building. Storage tanks for hydrofluosilic acid shall be~~
2878 ~~vented to the atmosphere at a point outside the building.~~

2879
2880 ~~(moved to Section 12(n)(ii))(ii) Chemical feed equipment. Fluoride feed~~
2881 ~~equipment shall meet the following requirements.~~

2882
2883 ~~(moved to Section 12(n)(ii)(A))(A) Scales or loss of weight recorders~~
2884 ~~shall be provided for dry chemical feeds. Feeders shall be accurate to within five percent of any~~
2885 ~~desired feed rate.~~

2886
2887 ~~(moved to Section 12(n)(ii)(B))(B) The point of application of~~
2888 ~~hydrofluosilic acid, if into a horizontal pipe, shall be in the lower half of the pipe. Fluoride~~
2889 ~~compound shall not be added before lime soda softening or ion exchange softening.~~

2890
2891 ~~(moved to Section 12(n)(ii)(D))(C) A fluoride solution shall be applied~~
2892 ~~by a positive displacement pump having a stroke rate not less than 20 nor more than 95 strokes~~
2893 ~~per minute. Fluoride solutions shall not be injected to a point of negative pressure.~~

2894

2895 ~~(moved to Section 12(n)(ii)(F))(D)—All fluoride feed lines and dilution~~
2896 ~~water lines shall be isolated from potable water supplies by either an air gap above the solution~~
2897 ~~tank or a reduced pressure principal backflow preventor.~~
2898

2899 ~~(moved to Section 12(n)(ii)(G))(E)—Water used for sodium fluoride~~
2900 ~~dissolution shall have a hardness not exceeding 50 mg/L. Softening shall be provided for the~~
2901 ~~solution water where hardness exceeds 45 mg/L.~~
2902

2903 ~~(moved to Section 12(n)(ii)(H))(F)—Flow meters for treated flow rate and~~
2904 ~~fluoride solution water shall be provided.~~
2905

2906 ~~(iii)—Protective equipment. Protective equipment, including air purifying~~
2907 ~~respirators approved by the National Institute of Occupational Safety and Health and emergency~~
2908 ~~showers, shall be provided for operators handling fluoride compounds.~~
2909

2910 ~~(iv)—Dust control.~~
2911

2912 ~~(moved to Section 12(n)(iii))(A)—Provisions shall be made to allow the~~
2913 ~~transfer of dry fluoride compounds from shipping containers to storage bins or hoppers in such a~~
2914 ~~way as to minimize the quantity of fluoride dust which may enter the room in which the~~
2915 ~~equipment is installed. The enclosure shall be provided with an exhaust fan and dust filter which~~
2916 ~~places the hopper under a negative pressure. Air exhausted from fluoride handling equipment~~
2917 ~~shall discharge through a dust filter to the outside atmosphere of the building. The discharge~~
2918 ~~shall not be located near a building fresh air intake.~~
2919

2920 ~~(moved to Section 12(n)(iii)(C))(B)—A floor drain shall be provided.~~
2921

2922 ~~(v)—Testing equipment. Equipment shall be provided for measuring the~~
2923 ~~quantity of fluoride in the water.~~
2924

2925 ~~(vi)—Defluoridation. Where fluoride removal is required the following methods~~
2926 ~~are acceptable:~~
2927

2928 ~~(moved to Section 12(n)(iv)(A))(A)—Activated alumina may be employed~~
2929 ~~in open gravity filter tanks or pressure filter tanks. The minimum media depth shall be 5 feet.~~
2930 ~~The units shall not be loaded at a rate exceeding 4 gallons per minute per square foot (236~~
2931 ~~m³/m²-d). The activated alumina media shall be in mesh sizes ranging from 28 to 48.~~
2932 ~~Regeneration facilities shall be provided to regenerate the media. These shall include both weak~~
2933 ~~caustic and weak acid systems.~~
2934

2935 ~~(moved to Section 12(n)(iv)(F))(B)—Bone char filtration or lime softening~~
2936 ~~with magnesium addition.~~
2937

2938 ~~(p)—Stabilization. Stabilized water is a water that does not tend to corrode the pipe~~
2939 ~~nor deposit large quantities of scale.~~
2940

2941 ~~(i) Carbon dioxide addition.~~

2942

2943 ~~(A) Recarbonation basin design shall provide a minimum total~~
2944 ~~detention time of 20 minutes. Two compartments consisting of a mixing compartment having a~~
2945 ~~detention time of at least three minutes and a reaction compartment are required. Each~~
2946 ~~compartment shall have a minimum depth of 8 feet (2.4 m).~~

2947

2948 ~~(B) Plants generating carbon dioxide from combustion shall have top~~
2949 ~~recarbonation tanks in order to dissipate carbon monoxide gas. Care shall be taken to prevent the~~
2950 ~~basin off-gases from entering any treatment plant structure.~~

2951

2952 ~~(C) The recarbonation basin shall be sloped to a drain.~~

2953

2954 ~~(ii) Acid addition. Facilities shall be provided for feeding both acid and~~
2955 ~~alkalinity, such as sodium carbonate, lime or sodium bicarbonate.~~

2956

2957 ~~(iii) Polyphosphates. The feeding of polyphosphates is applicable for~~
2958 ~~sequestering calcium in lime softened water, corrosion control, and in conjunction with alkali~~
2959 ~~feed following ion exchange softening. Chlorination equipment and feed points shall be available~~
2960 ~~to chlorinate the phosphate solution tank to maintain a 10 mg/L free chlorine residual and to~~
2961 ~~maintain a 0.5 mg/L residual in the distribution system.~~

2962

2963 ~~(moved to 12 (n)(vii))(iv) Alkali feed. Unstable water created by ion exchange~~
2964 ~~softening shall be stabilized by an alkali feed. An alkali feeder shall be provided for all ion~~
2965 ~~exchange water softening plants.~~

2966

2967 ~~(moved to 12 (n)(viii))(v) Control. Laboratory equipment shall be provided~~
2968 ~~for determining the effectiveness of stabilization treatment. This shall include testing equipment~~
2969 ~~for hardness, calcium, alkalinity, pH and magnesium, as a minimum.~~

2970

2971 ~~(moved to Section 12(o))(q) Taste and odor control. Provision shall be made for the~~
2972 ~~control of taste and odor at all surface water treatment plants.~~

2973

2974 ~~(i) Flexibility. Plants treating water that is known to have taste and odor~~
2975 ~~problems shall be provided with equipment that makes at least two of the control processes~~
2976 ~~available.~~

2977

2978 ~~(ii) Chlorination. When chlorination is used for the removal of some~~
2979 ~~objectionable odors, two hours of contact time must be provided to complete the chemical~~
2980 ~~reactions involved.~~

2981

2982 ~~(iii) Chlorine dioxide. Chlorine dioxide can be used in the treatment of any~~
2983 ~~taste and odor that is treatable by an oxidizing compound. Provisions shall be made for proper~~
2984 ~~storing and handling of the sodium chlorite to eliminate any danger of explosion.~~

2985

2986 ~~(iv) Powdered activated carbon. Provisions shall allow the addition of carbon~~
2987 ~~to the presedimentation basin influent, rapid mix basin, and clarifier effluent. Carbon feed~~
2988 ~~equipment shall be capable of feeding from 0 to 40 mg/L at plant design flows.~~

2989
2990 ~~(iv) A provision shall be made for adequate dust control. Powdered activated~~
2991 ~~carbon shall be handled as a potentially combustible material. It shall be stored and used in a~~
2992 ~~building or compartment as nearly fireproof as possible. Carbon feeder rooms shall be designed~~
2993 ~~for hazardous locations, National Electric Code, Class 1, Groups C and D, Division 1.~~

2994
2995 ~~(moved to Section 12(o)(i))(v) Granular activated carbon adsorption units.~~
2996 ~~Open or closed carbon contacting may be used for taste and odor control by adsorption of~~
2997 ~~organics. The loading rate shall not exceed 10 gpm/ft² (236 m³/m²-d). The minimum empty bed~~
2998 ~~contact time shall be 20 minutes. Provisions shall be made for moving carbon to and from the~~
2999 ~~contactors.~~

3000
3001 ~~(vi) Potassium permanganate. The application point shall be in the raw water~~
3002 ~~or ahead of the clarifier influent. Facilities shall be capable of feeding not less than 10 mg/L of~~
3003 ~~permanganate.~~

3004
3005 ~~(moved to Section 12(o)(iii))(vii) Ozone. Thirty minutes of contact time must~~
3006 ~~be provided to complete the chemical reactions involved. The facilities shall be capable of an~~
3007 ~~applied ozone feed rate of 15 mg/L minimum.~~

3008
3009 ~~(moved to Section 12(p))(r) Microscreening. A microscreen will be allowed as a~~
3010 ~~mechanical supplement to treatment. The microscreening shall be capable of removing~~
3011 ~~suspended matter from the water by straining. It may be used to reduce nuisance organisms and~~
3012 ~~organic loadings. It shall not be~~
3013 ~~used in place of filtration or coagulation.~~

3014
3015 ~~(moved to Section 12(p)(iii))(i) Screens shall be of a corrosion resistant~~
3016 ~~material, plastic or stainless steel.~~

3017
3018 ~~(moved to Section 12(p)(iv))(ii) Bypass piping shall be provided around the~~
3019 ~~unit.~~

3020
3021 ~~(moved to Section 12(p)(v))(iii) Protection against back siphonage shall be~~
3022 ~~provided when potable water is used for washing the screen.~~

3023
3024 ~~(moved to Section 12(p)(vi))(iv) Washwaters shall be wasted and not~~
3025 ~~recycled to the microscreen.~~

3026
3027 ~~(s) Organics removal by granular carbon adsorption.~~

3028
3029 ~~(moved to Section 12(o)(i)(C))(i) Adsorption of organics on granular activated~~
3030 ~~carbon. Water to be treated may be contacted with granular activated carbon. The pH of the~~

3031 ~~water shall be less than 9.0. The turbidity of the applied water shall be less than 2 TU when~~
3032 ~~packed beds are used.~~

3033
3034 ~~(ii) — Contact time. The carbon beds or columns shall provide a minimum of 20~~
3035 ~~minutes of empty bed contact time at design flow. Surface loading rates shall not exceed 10~~
3036 ~~gpm/ft² (590 m³/m²-d).~~

3037
3038 ~~(iii) — Carbon bed or column design.~~

3039
3040 ~~(moved to Section 12(o)(i)(E))(A) — If an upflow countercurrent~~
3041 ~~contactors is used, it may be either packed or expanded. A single unit is acceptable. If a~~
3042 ~~downflow contactor is used, two or more beds in parallel are required.~~

3043
3044 ~~(moved to Section 12(o)(i)(F))(B) — Contactors may be designed as open~~
3045 ~~gravity units, or pressure beds. They may be constructed of concrete, steel, or fiberglass~~
3046 ~~reinforced plastic. Steel vessels shall be protected against corrosion by coaltar epoxy coating,~~
3047 ~~rubber or glass lining, or other means.~~

3048
3049 ~~(moved to Section 12(o)(i)(I))(C) — All carbon beds or columns shall be~~
3050 ~~equipped with provisions for flow reversal and bed expansion. Combination downflow filter~~
3051 ~~contactors shall have backwashing facilities to provide up to 50 percent bed expansion and shall~~
3052 ~~meet the same backwash criteria as rapid filters.~~

3053
3054 ~~(D) — Inlet and outlet screens shall be 304 or 316 stainless steel or other~~
3055 ~~suitable materials.~~

3056
3057 ~~(E) — Carbon beds and columns shall have a means for removing spent~~
3058 ~~carbon and introducing makeup or regenerated carbon.~~

3059
3060 ~~(F) — Pressure contactors shall be equipped with air vacuum release~~
3061 ~~valves fitted with a stainless steel screen, slot size 0.036 mm (0.14 inches), to prevent plugging~~
3062 ~~with carbon.~~

3063
3064 ~~(t) — Radionuclides. Where radionuclide removal is practiced, the waste shall be~~
3065 ~~evaluated for its classification as a hazardous or low level radioactive waste and disposed of as~~
3066 ~~required by the Nuclear Regulatory Commission or other appropriate authority.~~

3067
3068 ~~(u) — Waste handling and disposal. Disposal of any waste sludge or liquid shall meet all~~
3069 ~~the requirements of Chapter 11 of the Water Quality Rules and Regulations where applicable.~~

3070
3071 ~~(moved to Section 12(t)(i)(i)) — Sanitary and laboratory wastes. The sanitary~~
3072 ~~and laboratory wastes from water treatment plants, pumping stations, etc., shall not be recycled~~
3073 ~~to any part of the water plant. Waste from these facilities must be discharged directly to a~~
3074 ~~sanitary sewer system when feasible, or to an on-site waste treatment facility permitted by the~~
3075 ~~Wyoming Department of Environmental Quality.~~

3076

3077 ~~(moved to Section 12(t)(ii))(ii) — Brine waste. The waste from ion-exchange~~
3078 ~~plants, demineralization plants, etc., may not be recycled to the plant. Where discharging to a~~
3079 ~~sanitary sewer, a holding tank shall be provided to prevent the overloading of the sewer and/or~~
3080 ~~interference with the waste treatment processes. The effect of brine discharge to sewage lagoons~~
3081 ~~may depend on the rate of evaporation from the lagoons. Where disposal to an off-site waste~~
3082 ~~treatment system is proposed, it must be demonstrated that the sewer and the facility have the~~
3083 ~~required capacity and dilution capability. The impact on any treatment system discharge shall be~~
3084 ~~evaluated.~~

3085
3086 ~~(moved to Section 12(t)(iii))(iii) — Lime softening sludge. Acceptable methods~~
3087 ~~of treatment and disposal are as follows:~~

3088
3089 ~~(moved to Section 12(t)(iii)(A))(A) — Sludge lagoons. Lagoons shall be~~
3090 ~~designed on the basis of providing a surface area of 0.7 acres (.28 ha) per million gallons per day~~
3091 ~~(3785 m³/day) (average day) per 100 mg/L of hardness removed, based on a usable lagoon depth~~
3092 ~~of 5 feet (1.5 m). At least 2 lagoons shall be provided. An acceptable means of final sludge~~
3093 ~~disposal must be provided. Provisions must be made for convenient cleaning of the lagoons.~~

3094
3095 ~~(moved to Section 12(t)(iii)(A))(A) — The design of lagoons shall provide~~
3096 ~~for location above the 100-year flood or adequately protected from the 100-year flood. There~~
3097 ~~shall be means of diverting surface water runoff so that it does not flow into the lagoons.~~
3098 ~~Minimum free board of 3 feet (0.66 m) shall be present. An adjustable decanting device for~~
3099 ~~recycling the overflow shall be present. There shall be an accessible effluent sampling point.~~

3100
3101 ~~(moved to Section 12(t)(iii)(B))(B) — Land application of liquid lime~~
3102 ~~sludge shall comply with Part E of Chapter 11 of the Water Quality Rules and Regulations.~~

3103
3104 ~~(moved to Section 12(t)(iii)(C))(C) — Disposal at a suitable landfill~~
3105 ~~shall be authorized by the Solid Waste Management Program of the Department of~~
3106 ~~Environmental Quality.~~

3107
3108 ~~(moved to Section 12(t)(iii)(D))(D) — Mechanical dewatering of sludge~~
3109 ~~may be employed.~~

3110
3111 ~~(moved to Section 12(t)(iii)(E))(E) — Recalcination of sludge may be~~
3112 ~~employed.~~

3113
3114 ~~(moved to Section 12(t)(iii)(F))(F) — Lime sludge drying beds shall not be~~
3115 ~~used.~~

3116
3117 ~~(moved to Section 12(t)(iv))(iv) — Alum sludge.~~

3118
3119 ~~(moved to Section 12(t)(iv)(A))(A) — Lagooning may be used as a storage~~
3120 ~~and interim disposal method for alum sludge. The volume of alum sludge storage lagoons shall~~
3121 ~~be at least 100,000 gallons (378.5 m³) per 1,000,000 gpd (3,785 m³/d) of treatment plant~~
3122 ~~capacity.~~

3123
3124 ~~(moved to Section 12(t)(iv)(B))(B)—Discharge of alum sludge to sanitary~~
3125 ~~sewers may be used only when the sewage system has the capability to adequately handle the~~
3126 ~~flow and sludge.~~

3127
3128 ~~(moved to Section 12(t)(iv)(C))(C)—Mechanical dewatering of sludge~~
3129 ~~may be employed.~~

3130
3131 ~~(moved to Section 12(t)(iv)(D))(D)—Alum sludge drying beds may be~~
3132 ~~used.~~

3133
3134 ~~(moved to Section 12(t)(iv)(E))(E)—Alum sludge may be acid treated and~~
3135 ~~recovered.~~

3136
3137 ~~(moved to Section 12(t)(iv)(F))(F)—Disposal at a suitable landfill shall be~~
3138 ~~authorized by the Solid Waste Management Program of the Department of Environmental~~
3139 ~~Quality.~~

3140
3141 ~~(v)—Iron and manganese waste. Waste filter washwater from iron and~~
3142 ~~manganese removal plants may be disposed by filtration, by lagooning, or by discharge to the~~
3143 ~~sewer system.~~

3144
3145 ~~(A)—Sand filters. Sand filters should have a total filter area of not less~~
3146 ~~than 100 square feet (9.29 m²) in a minimum of 2 compartments. The filter shall have sufficient~~
3147 ~~surface area and capacity to contain, in a volume of 2 feet (0.61 m) above the level of the sand,~~
3148 ~~the entire volume of washwater produced by washing the production filters.~~

3149
3150 ~~(I)—The filter shall not be subject to flooding by surface runoff~~
3151 ~~or flood waters. Finished grade elevation shall be such as to facilitate maintenance, cleaning and~~
3152 ~~removal of surface sand as required.~~

3153
3154 ~~(II)—The filter media shall consist of a minimum of 12 inches~~
3155 ~~(30.4 cm) of sand, 3 inches (7.6 cm) of supporting small gravel or torpedo sand, and 9 inches~~
3156 ~~(0.22 m) of gravel in graded layers. All sand and gravel shall be washed to remove fines. Filter~~
3157 ~~sand shall have an effective size of 0.3 to 0.5 mm and a uniformity coefficient not to exceed 3.5.~~

3158
3159 ~~(III)—The filter shall be provided with an underdrain collection~~
3160 ~~system, and provision shall be made for an accessible sample point.~~

3161
3162 ~~(IV)—Overflow devices from these filters shall not be permitted.~~

3163
3164 ~~(V)—Where freezing may occur, provisions shall be made for~~
3165 ~~covering the filters during the winter months.~~

3166

3167 ~~(VI) Iron and manganese waste filters shall provide an~~
3168 ~~atmosphere air break between adjacent compartments that contain finished water and unfiltered~~
3169 ~~water.~~

3171 ~~(B) Washwater recovery lagoons. Filter backwash wastewater may be~~
3172 ~~recovered by washwater recovery lagoons. Decanted filter backwash wastewater from the~~
3173 ~~lagoons shall be recycled to the head of the plant. Lagoons shall provide 250,000 gallons of~~
3174 ~~storage (946 m³) for each 1,000,000 gallons per day (3,785 m³/day) of treatment capacity.~~
3175 ~~Lagoons shall have a minimum usable depth of 3 feet (0.91 m), a length 4 times the width, and a~~
3176 ~~width of at least 3 times the water depth.~~

3177
3178 (a) 2018 TSS, parts 2.9-2.9(c), monitoring equipment; 2.10, sample taps; 2.11,
3179 facility water supply; and 2.14, piping color code; are herein incorporated by reference.

3180
3181 ~~(formerly Section 8(a))(b) Design basis. The proposed design shall demonstrate that~~
3182 ~~the capacity of the water treatment or water production system shall be is designed for the~~
3183 ~~maximum daily demand at the design year based on historical usage records. Where water use~~
3184 ~~records are not available to establish water use, the equivalent per capita water use shall be at~~
3185 ~~least 125 gpd (475 liters per day) and 340 gpd (1,285 liters per day) to size facilities for average~~
3186 ~~and maximum daily water demand, respectively.~~

3187
3188 ~~(formerly Section 8(a))(i) Where water use records are not available to~~
3189 ~~establish water use, the design shall include an equivalent per capita water use shall be of at least~~
3190 ~~125 gallons per day (gpd) (475 liters per day) for average daily water demand and 340 gpd~~
3191 ~~(1,285 liters per day) to size facilities for average and maximum daily water demand,~~
3192 ~~respectively.~~

3193
3194 ~~(formerly Section 8(p))(ii) Design capacities. The plant capacity design shall~~
3195 ~~include maximum daily water demand, filter backwash quantities, and industrial water use. In~~
3196 ~~the absence of data, filter backwash quantity shall be five percent of the maximum daily demand.~~
3197 demonstrate consideration of:

3198
3199 ~~(formerly Section 8(p))(A) M~~maximum daily water demand;

3200
3201 ~~(formerly Section 8(p))(B) A~~gricultural water use;

3202
3203 ~~(formerly Section 8(p))(C) and I~~ndustrial water use; and

3204
3205 ~~(formerly Section 8(p))(D) F~~ilter backwash quantities. In the absence
3206 of data, filter backwash quantity shall be five percent of the maximum daily demand.

3207
3208 ~~(formerly Section 8(g)(iii))(c) Geological conditions. The S~~structural design shall
3209 demonstrate consideration of the seismic zone, groundwater, and soil support. Soils
3210 investigations shall be made, or adequate previous soils investigations shall be available to
3211 develop structural design.;
3212

3213 ~~(formerly Section 8(g)(iii))~~(i) The seismic zone;

3214

3215 ~~(formerly Section 8(g)(iii))~~(ii) Groundwater; and

3216

3217 ~~(formerly Section 8(g)(iii))~~(iii) Soil support: that demonstrates:

3218

3219 ~~(formerly Section 8(g)(iii))~~(A) The applicant has conducted Ssoils

3220 investigations ~~shall be made,~~ or has included documentation of adequate previous soils

3221 investigations ~~shall be available~~used to develop the structural design;

3222

3223 ~~(formerly Section 8(l))~~(B) Basin slabs ~~shall be~~ have been designed to

3224 successfully resist the hydrostatic uplift pressure or include an area dewatering system ~~or an area~~

3225 ~~dewatering system shall be provided;~~ and

3226

3227 ~~(formerly Section 8(l))~~(C) Considerations ~~must be given in structural~~

3228 ~~design to~~ of long-span breakage in basins designed to resist uplift.

3229

3230 ~~(formerly Section 8(b)(i))~~(d) Location. Proposed ~~T~~treatment facilities locations shall ~~be~~

3231 ~~located such~~ demonstrate that:

3232

3233 ~~(formerly Section 8(b)(i))~~(i) No sources of pollution ~~may~~ will affect the quality

3234 of the water supply or treatment system;

3235

3236 ~~(formerly Section 8(b)(i))~~(ii) The ~~facilities~~ facility shall not be located location is

3237 not within 500 feet of landfills, garbage dumps, or wastewater treatment systems; and

3238

3239 ~~(formerly Section 8(b)(i))~~(iii) ~~Flood protection.~~ All treatment process

3240 structures, mechanical equipment, and electrical equipment ~~shall~~ will be protected, accessible,

3241 and remain fully operational during ~~from~~ the maximum flood of record or the 100-year flood,

3242 whichever is greater. ~~The treatment facilities shall remain fully operational and accessible during~~

3243 ~~the 100-year flood.~~

3244

3245 ~~(formerly Section 8(e))~~(e) Level of treatment. ~~Proposed~~ Ttreatment shall ~~be provided~~

3246 ~~to demonstrate that the facility will~~ produce potable water that is bacteriologically, chemically,

3247 radiologically, and physically safe, ~~as determined by the administrator as required by 40 CFR~~

3248 Part 141.

3249

3250 ~~(formerly Section 8(d)(i))~~(f) ~~Multiple units.~~ Designs for proposed Ttreatment facilities

3251 with 100,000 ~~gallons per day (gpd) (378.5 m³/day)~~ capacity and over shall ~~provide~~ include

3252 duplicate units, as a minimum, for chemical feed, flocculation, clarification, sedimentation,

3253 filtration, and disinfection.

3254

3255 ~~(formerly Section 8(d)(i))~~(g) Designs for proposed Ttreatment facilities under 100,000

3256 gpd ~~(378.5 m³/day)~~ capacity shall ~~provide~~ include:

3257

3258 ~~(formerly Section 8(d)(i))~~(i) Duplicate units as described ~~above~~ in paragraph (f)
3259 of this Section; or ~~may provide~~

3260
3261 ~~(formerly Section 8(d)(i))~~(ii) ~~f~~Finished water system storage equal to twice the
3262 maximum daily demand-; and

3263
3264 (iii) Demonstration of consideration of plant design flexibility to account for
3265 future changes in source water quality, unexpected need to modify process piping, service area
3266 expansion, changing treatment technologies, and equipment life cycles and upgrades.

3267
3268 ~~(formerly Section 8(d)(ii))~~(h) ~~Multiple equipment.~~All treatment facility pumping shall
3269 provide the maximum daily demand flow with the largest single-unit not in service. Finished
3270 water pumping in combination with finished water storage that floats on the distribution systems
3271 shall provide the maximum hourly demand with the largest single-unit not in service. ~~When For~~
3272 designs that include fire protection ~~is provided~~, pumping, and finished water storage that floats
3273 on the system shall provide the fire demand plus the maximum daily demand, or the maximum
3274 hourly demand, whichever is greater.

3275
3276 ~~(formerly Section 8(d)(iii))~~(i) ~~Alternative power source.~~Where the finished water storage
3277 volume that floats on the distribution system is not capable of supplying the maximum daily
3278 demand, an the proposed design shall include alternative power ~~shall be provided~~ for the finished
3279 water pumps- ~~The combined finished water storage volume and pumping capacity supplied by~~
3280 ~~alternative power shall be at least adequate to provide the maximum daily demand. Acceptable~~
3281 ~~alternative power sources include an engine generator, engine drive pumps, or a second~~
3282 ~~independent electrical supply.~~ that demonstrates:

3283
3284 ~~(formerly Section 8(d)(iii))~~(i) The combined finished water storage volume and
3285 pumping capacity supplied by alternative power ~~shall~~ will be at least adequate to provide the
3286 maximum daily demand-; and

3287
3288 ~~(formerly Section 8(d)(iii))~~(ii) ~~Acceptable~~ The alternative power sources
3289 will include ~~an~~ engine generators, engine drive pumps, or a second independent electrical supply
3290 that will provide sufficient power to run the system.

3291
3292 ~~(formerly Section 8(e))~~(j) ~~Housing.~~ Process equipment, filters and appurtenances,
3293 disinfection, chemical feed and storage, electrical and controls, and pipe galleries shall be ~~housed~~
3294 located in suitable structures.

3295
3296 ~~(formerly Section 8(m))~~(k) All equipment not required to be in or on open basins,
3297 ~~(such as clarifier drives and flocculators),~~ shall be located in heated, lighted, and ventilated
3298 structures. ~~Structure entrances shall be above grade. Piping shall be buried below frost level,~~
3299 ~~placed in heated structures, or provided with heat and insulated.~~

3300
3301 ~~(formerly Section 8(m))~~(l) Piping shall be buried below frost level, placed in heated
3302 structures, or provided with heat and insulated.

3303

3304 ~~(formerly Section 8(m))~~(m) Structure entrances shall be above grade.

3305

3306 ~~(formerly Section 8(g)(i))~~(n) ~~Construction materials. Selected c~~Construction materials
3307 shall ~~be selected, apportioned, and/or protected to~~ provide water tightness, corrosion protection,
3308 and resistance to weather variations.

3309

3310 ~~(formerly Section 8(g)(ii))~~(o) ~~Coatings. NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN 600-~~
3311 2021 certified Coatings used to protect structures, equipment, and piping shall be suitable for
3312 atmospheres containing moisture and low concentrations of chlorine. ~~Surfaces exposed in~~
3313 ~~chemical areas shall be protected from chemical attack. Paints shall not contain lead, mercury, or~~
3314 ~~other toxic metals or chemicals.~~

3315

3316

3317 ~~(formerly Section 8(g)(ii))~~(p) Surfaces exposed in chemical areas shall be protected from
3318 chemical attack.

3319

3320 ~~(formerly Section 8(g)(ii))~~(q) Paints shall not contain lead, mercury, or other toxic metals
3321 or chemicals.

3322

3323 ~~(formerly Section 8(k))~~(r) ~~Ventilation.~~ All enclosed spaces shall be provided with
3324 forced ventilation, except pumping station wetwells or clearwells. ~~In areas where there are open~~
3325 ~~treatment units exposed to the room, ventilation shall be provided to limit relative humidity to~~
3326 ~~less than 85 percent but not less than 6 air changes per hour. In electrical and equipment rooms,~~
3327 ~~ventilation shall be provided to limit the temperature rise in the room to less than 15° F (8° C)~~
3328 ~~above ambient, but not less than 6 air changes per hour. Rooms housing chlorine storage and/or~~
3329 ~~feeders shall have provisions for exhausting the room contents in 2 minutes and continuous~~
3330 ~~ventilation to provide not less than 12 air changes per hour. that meet the following~~
3331 requirements:

3332

3333 ~~(formerly Section 8(k))~~(i) In areas where there are open treatment units
3334 exposed to the room, ventilation shall be provided to limit relative humidity to less than 85
3335 percent but not less than six air changes per hour.; and

3336

3337 ~~(formerly Section 8(k))~~(ii) ~~In electrical and equipment rooms, V~~entilation in
3338 electrical and equipment rooms shall ~~be provided to~~ limit the temperature rise in the room to less
3339 than 15 °F (8° C) degrees Fahrenheit above ambient, ~~but not less than with at least~~ six air
3340 changes per hour. ~~Rooms housing chlorine storage and/or feeders shall have provisions for~~
3341 ~~exhausting the room contents in 2 minutes and continuous ventilation to provide not less than 12~~
3342 ~~air changes per hour.~~

3343

3344 ~~(formerly Section 8(f)(i))~~(s) ~~Equipment location.~~ Service transformers and other critical
3345 electrical equipment shall be located above the 100-year flood and above grade. Transformers
3346 shall be located so that they are remote or protected by substantial barriers from traffic. Motor
3347 controls shall be located in superstructures and in rooms that do not contain corrosive
3348 atmospheres.

3349

3350 ~~(formerly Section 8(i)(i))(t) Metering.~~ All The treatment ~~facility~~ facilities shall have a
3351 flow measuring device provided for raw water influent and clear well effluent and ~~(formerly~~
3352 ~~Section 8(i)(i)) All flow meters each shall provide totalized flow.~~ The accuracy of the device
3353 shall be at least plus or minus two percent of span. ~~and shall meet the following requirements:~~

3354
3355 ~~(formerly Section 8(i)(iii))(i) Controls.~~ Automatic controls shall be designed to
3356 permit manual override. ~~;~~ and

3357
3358 ~~(formerly Section 8(i)(ii))(ii) Type. All flow meters shall provide totalized flow.~~
3359 ~~For plants with a maximum daily flow of 50,000 gpd (189 m³/d) or more, t~~ The meter shall also
3360 record the instantaneous flow rate.

3361
3362 ~~(formerly Section 8(q))(u) Monitoring equipment.~~ Water treatment plants with a
3363 capacity of ~~0.5 mgd (1892.6 m³/d)~~ 500,000 gpd or more shall be provided with continuous
3364 finished water turbidimeters (including recorders) that demonstrate compliance with the
3365 Guidance Manual for Compliance with the Surface Water Treatment Rules, Turbidity
3366 Provisions.

3367
3368 **Section 11. Chemical Application Source Development.**

3369
3370 ~~(a) — General.~~

3371
3372 ~~(i) — Chemical application. Chemicals shall be applied by such means as to~~
3373 ~~prevent backflow or back siphonage between multiple points of feed through common~~
3374 ~~manifolds.~~

3375
3376 ~~(ii) — General equipment design. General equipment design shall be such that:~~

3377
3378 ~~(A) — Feeders will be able to supply the necessary amounts of chemical~~
3379 ~~throughout the feed range at all times.~~

3380
3381 ~~(B) — Chemical contact materials and surfaces are resistant to the~~
3382 ~~aggressiveness of the chemical solution.~~

3383
3384 ~~(C) — Corrosive chemicals are introduced in such a manner as to~~
3385 ~~minimize potential for corrosion.~~

3386
3387 ~~(D) — Chemicals that are incompatible are not stored or handled together.~~

3388
3389 ~~(E) — All chemicals are conducted from the feeder to the point of~~
3390 ~~application in separate conduits.~~

3391
3392 ~~(F) — Chemical feeders and pumps operate at no lower than 20 percent~~
3393 ~~of the feed range.~~

3395 ~~(G) — Slurry type chemicals, especially lime, are fed by gravity where~~
3396 ~~practical.~~

3397
3398 ~~(moved to Section 13(b))(b) — Facility design.~~

3399
3400 ~~(moved to Section 13(b)(i))(i) — Number of feeders. A separate feeder shall~~
3401 ~~be provided for each chemical applied.~~

3402
3403 ~~(ii) — Control. Feeders may be manually or automatically controlled. Automatic~~
3404 ~~controls shall be designed to allow override by manual controls. Where plant flow rates are not~~
3405 ~~manually controlled, chemical feed rates shall be automatically proportioned to flow.~~

3406
3407 ~~Calibration cylinders shall be provided for each chemical system, enabling exact~~
3408 ~~measurement of chemical feed dose.~~

3409
3410 ~~(iii) — Dry chemical feeders. Dry chemical feeders shall measure chemicals~~
3411 ~~volumetrically or gravimetrically; they shall be provided with a solution water system and mixer~~
3412 ~~in the solution tank and; shall completely enclose chemicals to prevent emission of dust to the~~
3413 ~~operating room.~~

3414
3415 ~~(iv) — Positive displacement pumps. Positive displacement pumps shall be sized~~
3416 ~~for the maximum pressure at the point of injection. A backpressure valve shall be provided in~~
3417 ~~instances where chemicals can flow by gravity through the pump and pump check valves.~~

3418
3419 ~~(v) — Liquid chemical feeders — siphon control. Liquid chemical feeders shall be~~
3420 ~~such that chemical solutions cannot be siphoned into the water supply.~~

3421
3422 ~~(vi) — Cross-connection control. Cross-connection control must be provided to~~
3423 ~~assure that the service water lines discharging to solution tanks shall be protected from backflow~~
3424 ~~and that liquid chemical solutions cannot be siphoned through solution feeders into the water~~
3425 ~~supply. No direct connection shall exist between any sewer and a drain or overflow from the~~
3426 ~~feeder, solution chamber or tank. All drains shall terminate at least 6 inches (0.15 m) or 2 pipe~~
3427 ~~diameters, whichever is greater, above the overflow rim of a receiving sump, conduit or waste~~
3428 ~~receptacle.~~

3429
3430 ~~(vii) — In-plant water supply. The in-plant water supply shall be of sufficient~~
3431 ~~quantity and pressure to meet the chemical system needs. A minimum capability of 15 gpm at 50~~
3432 ~~psi is required.~~

3433
3434 ~~There shall be a new means of controlling and measuring the water when used for~~
3435 ~~preparing specific solution concentrations by dilution, i.e., rotometer and control valve. The~~
3436 ~~water shall be properly treated for hardness when hardness affects the chemical solution.~~

3437
3438 ~~(viii) — Storage of chemicals.~~

3440 (A) — ~~Storage space or tank volume shall be provided for at least 30 days~~
3441 ~~of chemical supply. The storage shall provide protection from intermixing of 2 different~~
3442 ~~chemicals.~~

3443
3444 (B) — ~~Storage tanks and pipelines for liquid chemicals shall be specific to~~
3445 ~~the chemical and not for alternates.~~

3446
3447 (C) — ~~Liquid chemical storage tanks must have a liquid level indicator,~~
3448 ~~an overflow and a receiving basin or drain capable of receiving accidental spills or over-flows,~~
3449 ~~and be located in a contained area sized to store the total contents of a ruptured tank.~~

3450
3451 (moved to Section 13(b)(ii))(D) — ~~All chemical storage tanks shall be~~
3452 ~~constructed of materials which are resistant to the chemical which they store. The tank shall not~~
3453 ~~lose its structural integrity through chemical action or be subject to corrosion.~~

3454
3455 (ix) — ~~Solution and slurry tanks.~~

3456
3457 (A) — ~~Feed and dilution systems shall be designed to maintain uniform~~
3458 ~~strength of solution in solution tanks. A mixer shall be provided to mix the tank contents when~~
3459 ~~batching solutions. Continuous agitation shall be provided to maintain slurries in suspension. A~~
3460 ~~means shall be provided to measure the solution level in the tank. Chemical solution tanks shall~~
3461 ~~have a cover. Large tanks with access openings shall have such openings curbed and fitted with~~
3462 ~~overhanging covers.~~

3463
3464 (B) — ~~Subsurface locations for solution tanks shall be free from sources~~
3465 ~~of possible contamination, and assure positive drainage for groundwaters, accumulated water,~~
3466 ~~chemical spills and overflows.~~

3467
3468 (C) — ~~Overflow pipes, when provided, shall be turned downward, with~~
3469 ~~the end screened. They shall have a free fall discharge and be located where noticeable.~~

3470
3471 (D) — ~~Acid storage tanks must be vented to the outside atmosphere, but~~
3472 ~~not through vents shared with any other material.~~

3473
3474 (E) — ~~Each tank shall be provided with a valved drain, protected against~~
3475 ~~backflow by an air gap of 6 inches (0.15 m) or 2 pipe diameters, whichever is greater.~~

3476
3477 (x) — ~~Day tanks.~~

3478
3479 (A) — ~~Day tanks shall be provided where bulk storage of liquid chemical~~
3480 ~~is provided and a dilute solution is to be fed, or where chemicals are manually batched. Day~~
3481 ~~tanks shall meet the requirements of solution tanks. Tanks shall be properly labeled to designate~~
3482 ~~the chemical contained.~~

3483
3484 (B) — ~~Hand pumps may be used to transfer chemicals from a carboy or~~
3485 ~~drum. A tip rack may be used to permit withdrawal into a bucket from a spigot. Where motor-~~

3486 ~~driven transfer pumps are provided, a liquid level limit switch and an overflow from the day tank~~
3487 ~~shall be provided.~~

3488
3489 ~~(C) — Continuous agitation shall be provided to maintain chemical~~
3490 ~~slurries in suspension. A mixer shall be provided to mix the initial dilution.~~

3491
3492 ~~(xi) — Feed lines:~~

3493
3494 ~~(A) — Shall be of durable material, resistant to the chemical handled.~~

3495
3496 ~~(B) — Shall be readily accessible for maintenance when located within~~

3497 ~~structures.~~

3498
3499 ~~(C) — Shall be protected against freezing.~~

3500
3501 ~~(D) — Shall be readily cleanable by using plugged crosses for 90° bends.~~

3502
3503 ~~(E) — Shall slope upward from the chemical source to the feeder when~~
3504 ~~conveying gases.~~

3505
3506 ~~(F) — Shall be designed consistent with scale forming or solids-~~
3507 ~~depositing properties of the water, chemical, solution, or mixtures conveyed.~~

3508
3509 ~~(G) — Shall be color coded.~~

3510
3511 ~~(H) — Shall have a connection for a flushing line.~~

3512
3513 ~~(xii) — Handling:~~

3514
3515 ~~(A) — Carts, elevators and other appropriate means shall be provided for~~
3516 ~~lifting chemical containers.~~

3517
3518 ~~(B) — Provisions shall be made for the transfer of dry chemicals from~~
3519 ~~shipping containers to storage bins or hoppers to minimize the quantity of dust which may enter~~
3520 ~~the room in which the equipment is installed. Provisions shall also be made for disposing of~~
3521 ~~empty bags, drums or barrels which will minimize exposure to dusts. Control may be provided~~
3522 ~~by using:~~

3523
3524 ~~(I) — Vacuum/pneumatic equipment or closed conveyor systems.~~

3525
3526 ~~(II) — Facilities for emptying shipping containers in special~~
3527 ~~enclosures.~~

3528
3529 ~~(III) — Exhaust fans and dust filters which put the hoppers or bins~~
3530 ~~under negative pressure.~~

3531

3532 ~~(C) Provision shall be made for measuring quantities of chemicals used~~
3533 ~~to prepare feed solutions.~~

3534
3535 ~~(xiii) Housing. Floor surfaces shall be smooth and impervious, slip-resistant and~~
3536 ~~well drained with 2.5 percent minimum slope. Vents from feeders, storage facilities and~~
3537 ~~equipment exhaust shall discharge to the outside atmosphere above grade and remote from air~~
3538 ~~intakes.~~

3539
3540 ~~(e) Specific chemicals.~~

3541
3542 ~~(i) Chlorine gas.~~

3543
3544 ~~(A) Respiratory protection equipment. Respiratory protection~~
3545 ~~equipment, meeting the requirements of the National Institute of Occupational Safety and Health~~
3546 ~~(NIOSH), shall be available where chlorine gas is handled, and shall be stored at a convenient~~
3547 ~~location, but not inside any room where chlorine is used or stored. The units shall use~~
3548 ~~compressed air, have at least a 30-minute capacity, and be compatible with or exactly the same as~~
3549 ~~units used by the fire department responsible for the plant.~~

3550
3551 ~~(B) Chlorine leak detection. Where ton containers are used, or where~~
3552 ~~plants store more than 1000 lbs (454 kg) of chlorine, continuous electronic chlorine leak~~
3553 ~~detection equipment shall be provided.~~

3554
3555 ~~(C) Repair kits. Repair kits approved by the Chlorine Institute shall be~~
3556 ~~provided for plants employing chlorine gas chlorination. The chlorine repair kits shall be~~
3557 ~~available for each size container stored at the facility.~~

3558
3559 ~~(D) Feed and storage areas. Chlorine gas feed and storage shall be~~
3560 ~~enclosed and separated from other operating areas. The chlorine room shall be provided with a~~
3561 ~~shatter-resistant window installed in an interior wall. The room shall be constructed in such a~~
3562 ~~manner that all openings between the chlorine room and the remainder of the plant are sealed.~~
3563 ~~The doors shall be equipped with panic hardware, assuring ready means of exit and opening~~
3564 ~~outward only to the building exterior.~~

3565
3566 ~~(E) Ventilation. Where chlorine gas is used, the room shall~~
3567 ~~have an exhaust ventilating system with a capacity which provides one complete air change~~
3568 ~~every two minutes. The ventilating system shall take suction within 18 inches (0.46 m) of the~~
3569 ~~floor, as far as practical from the door and air inlet, with the point of discharge so located as not~~
3570 ~~to contaminate air intakes to any rooms or structures.~~

3571
3572 ~~Air intakes shall be through louvers near the ceiling. Louvers for chlorine room~~
3573 ~~air intake and exhaust shall facilitate airtight closure.~~

3574
3575 ~~Separate switches for the fan and lights shall be located outside of the chlorine~~
3576 ~~room and at the inspection window. Outside switches shall be protected from vandalism. A~~

3577 ~~signal light indicating fan operation shall be provided at each entrance when the fan can be~~
3578 ~~controlled from more than one point.~~

3579
3580 ~~Vents from feeders and storage shall discharge to the outside atmosphere, above~~
3581 ~~grade. The room location shall be on the prevailing downwind side of the building away from~~
3582 ~~entrances, windows, louvers, walkways, etc.~~

3583
3584 ~~Floor drains shall discharge to the outside of the building and shall not be~~
3585 ~~connected to other internal or external drainage systems.~~

3586
3587 ~~(F) — Cylinders. Full and empty cylinders of chlorine gas shall be~~
3588 ~~isolated from operating areas, restrained in position to prevent upset, stored in rooms separate~~
3589 ~~from ammonia storage, and stored in areas not in direct sunlight or exposed to excessive heat.~~

3590
3591 ~~(G) — Heating. Chlorinator rooms shall be heated to 60° F (15.6° C) and~~
3592 ~~be protected from excessive heat. Cylinders and gas lines shall be protected from temperatures~~
3593 ~~above that of the feed equipment.~~

3594
3595 ~~(H) — Feed lines. Pressurized chlorine feed lines shall not carry chlorine~~
3596 ~~gas beyond the chlorinator room.~~

3597
3598 ~~(ii) — Acids and caustics.~~

3599
3600 ~~(A) — Acids and caustics shall be kept in closed corrosion-resistant~~
3601 ~~shipping containers or in covered bulk storage units.~~

3602
3603 ~~(B) — Acids and caustics shall be pumped in undiluted form from~~
3604 ~~original containers or bulk storage units through suitable pipe or hose to the point of treatment or~~
3605 ~~to a covered day tank.~~

3606
3607 ~~(C) — An emergency deluge shower and eye wash shall be provided~~
3608 ~~where corrosive chemicals are stored or used.~~

3609
3610 ~~(iii) — Sodium chlorite. Provisions shall be made for proper storage and handling~~
3611 ~~of sodium chlorite to eliminate any danger of explosion. No hydrocarbons or organics shall be~~
3612 ~~stored with sodium chlorite.~~

3613
3614 (a) 2018 TSS, parts 3.1.4.1-3.1.4.1(i), surface water, structures, design of intake
3615 structures; 3.1.4.3-3.1.4.3(f) surface water, structures, offstream raw water storage reservoir;
3616 3.1.6-3.1.6.3, surface water, impoundments and reservoirs; 3.2.3.2, groundwater, location,
3617 continued sanitary protection; 3.2.4-3.2.4.14(b)(4), groundwater, general well construction;
3618 3.2.5-3.2.5.4, groundwater, testing and records; 3.2.6.1-3.2.6.1(c), groundwater, aquifer types
3619 and construction methods--special conditions, sand or gravel wells; 3.2.6.2-3.2.6.2(b)(7),
3620 groundwater, aquifer types and construction methods--special conditions, gravel pack material;
3621 3.2.6.4-3.2.6.4(d), groundwater, aquifer types and construction methods--special conditions,
3622 infiltration lines; 3.2.6.5-3.2.6.5(b), groundwater, aquifer types and construction methods--

3623 special conditions, limestone or sandstone wells; 3.2.7.3-3.2.7.3(c)(3), groundwater, well pumps,
3624 discharge piping and appurtenances, discharge piping; 3.2.7.4-3.2.7.4(d), groundwater, well
3625 pumps, discharge piping and appurtenances, pitless well units; 3.2.7.6, groundwater, well pumps,
3626 discharge piping and appurtenances, casing vent; 3.2.7.7-3.2.7.7(b), groundwater, well pumps,
3627 discharge piping and appurtenances, water level measurement; 3.2.7.8-3.2.7.8(b), groundwater,
3628 well pumps, discharge piping and appurtenances, observation wells; are herein incorporated by
3629 reference.

3630

3631 (b) Surface water intake structures that operate in the winter shall be capable of
3632 minimizing the formation of ice on the intake.

3633

3634 (c) Transmission lines and interconnecting process piping shall be capable of
3635 withstanding the forces and conditions they will be subject to and comply with the following
3636 specifications for water service, as applicable:

3637

3638 (i) AWWA C200;

3639

3640 (ii) AWWA C207;

3641

3642 (iii) AWWA C208;

3643

3644 (iv) AWWA C220;

3645

3646 (v) AWWA C228;

3647

3648 (vi) AWWA C300;

3649

3650 (vii) AWWA C301;

3651

3652 (viii) AWWA C302;

3653

3654 (ix) AWWA C303;

3655

3656 (x) AWWA C304;

3657

3658 (xi) AWWA C900;

3659

3660 (xii) AWWA C901;

3661

3662 (xiii) AWWA C903;

3663

3664 (xiv) AWWA C904;

3665

3666 (xv) AWWA C906;

3667

3668 (xvi) AWWA C907;

- 3669
3670 (xvii) AWWA C909;
3671
3672 (xviii) AWWA C950;
3673
3674 (xix) ASTM A53;
3675
3676 (xx) ASTM A134;
3677
3678 (xxi) ASTM A135;
3679
3680 (xxii) ASTM A139;
3681
3682 (xxiii) ASTM D2846;
3683
3684 (xxiv) ASTM F480;
3685
3686 (xxv) ASTM F645;
3687
3688 (xxvi) ASTM F877;
3689
3690 (xxvii) ASTM F23891;
3691
3692 (xxviii) ASTM F2806;
3693
3694 (xxix) ASTM F2855;
3695
3696 (xxx) ASTM F2969;
3697
3698 (xxxi) API 5L;
3699
3700 (A) Grade B;
3701
3702 (B) Grade X42;
3703
3704 (C) Grade X46;
3705
3706 (D) Grade X52;
3707
3708 (E) Grade X56;
3709
3710 (F) Grade X60;
3711
3712 (G) Grade X65;
3713
3714 (H) Grade X70; or

3715
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3759

(I) Grade X80.

~~(formerly Section 9(a)(iii))(d) Raw water supply piping. No Designs shall not include any~~ customer service connection ~~shall be provided~~ from the raw water transmission line to the treatment plant, unless there are provisions to treat the water to meet ~~these standards~~ the requirements of this Chapter, or the sole purpose of the service is for irrigation or agricultural water use. For irrigation agricultural services, applicants shall conduct a hazard classification and implement appropriate backflow prevention.

~~(formerly Section 9(b))(e) Designs that include G~~groundwater source development shall comply with the following requirements:

~~(formerly Section 9(b)(i))(i) Number and capacity. The total developed groundwater source, along with other water sources, shall provide a combined capacity that shall equal or exceed the design maximum daily demand. Proposed designs shall include Aa~~ minimum of: ~~2 wells, or 1 well and finished water storage equal to twice the maximum daily demand shall be provided. Where 2 wells are provided, the sources shall be capable of equaling or exceeding the design average daily demand with the largest producing well out of service.~~

~~(formerly Section 9(b)(i))(A) 2 wells, or 1 well and finished water storage equal to twice the maximum daily demand shall be provided. Where 2 Two wells are provided, the sources shall be that are each~~ capable of ~~equaling or exceeding the design~~ supplying the average daily demand with the largest producing well out of service:;

~~(formerly Section 9(b)(i))(B) 2 wells, or 1 One well and finished water storage that together equal to twice the maximum daily demand shall be provided. Where 2 wells are provided, the sources shall be capable of equaling or exceeding the design average daily demand with the largest producing well out of service.; or~~

(C) For public water supplies that are not community water systems or nontransient noncommunity water systems, as determined by the Administrator, one well that is capable of supplying the maximum daily demand.

~~(formerly Section 9(b)(i)(B))(ii) Relation to sources of pollution. Every well shall be located further from any of the sources of pollution listed below. The Wells shall maintain the following minimum~~ isolation distances ~~listed below apply when domestic wastewater is the only wastewater present.;~~

~~(formerly Section 9(b)(i)(B)(I))(A) If domestic wastewater is the only wastewater present and the design~~ domestic sewage flow is less than 2,000 ~~gallons per day gpd (7,560 L/day)~~, the following minimum isolation distance shall be maintained:

~~(formerly Section 9(b)(i)(A)(II)(A) Table 1. Isolation Distances for Domestic Sewage Flows Less than 2,000 gpd~~

<i>Source of Domestic Wastewater</i>	<i>Minimum Distance to Well</i>
--------------------------------------	---------------------------------

Sewer	50 feet
Septic tank	50 feet
Disposal field	100 feet (30.5 m)
Seepage pit	100 feet (30.5 m)
Cesspool	100 feet (30.5 m)
<u>Storm and Sanitary Sewer Collection Systems</u>	<u>50 feet</u>
<u>Septic tank</u>	<u>100 feet</u>
<u>Absorption system</u>	<u>200 feet</u>

3760
3761 ~~(formerly Section 9(b)(i)(B)(H))(B)~~ If domestic wastewater is the only
3762 wastewater present and the design domestic sewage flow is greater than 2,000 gpd ~~(7,560 L/day)~~
3763 but less than 10,000 gpd ~~(37,800 L/day)~~, the following minimum isolation distances shall be
3764 maintained:

3765
3766 Table 2. Isolation Distances for Domestic Sewage Flows Greater than 2,000 gpd

<u>Source of Domestic Wastewater</u>	<u>Minimum Distance to Well</u>
Sewer	50 feet
Septic tank	50 feet
Disposal field	200 feet
Seepage pit	200 feet
Cesspool	200 feet
<u>Storm and Sanitary Sewer Collection Systems</u>	<u>50 feet</u>
<u>Septic tank</u>	<u>100 feet</u>
<u>Absorption system</u>	<u>500 feet</u>

3767
3768 ~~(formerly Section 9(b)(i)(B)(H))(C)~~ For systems larger If domestic
3769 wastewater is the only wastewater present and the design domestic sewage flow is greater than
3770 10,000 gallons per day ~~(37,800 L/day)~~; or non-domestic wastewater is present the required
3771 isolation distance shall be determined by a ~~hydrogeological~~ subsurface study, in accordance with
3772 the requirements of ~~Section 15 of Chapter 3 Water Quality Rules and Regulations~~ Water Quality
3773 Rules Chapter 3, Section 17(b), but shall not be less than those ~~listed above~~ required in Tables 1
3774 and 2 of this Section.

3775
3776 ~~(formerly Section 9(b)(i)(C))(iii)~~ Relation to Wells shall maintain the
3777 following minimum isolation distances from buildings and property lines:-
3778

3779 ~~(formerly Section 9(b)(i)(C)(I))(A)~~ When a well is adjacent to the
3780 outside of a building, the well shall be located so that the ~~centerline~~ the surface casing has a
3781 clearance radius of a minimum of 10 feet horizontally and extended vertically, will clear any
3782 projection from the building ~~by not less than 3 feet (0.91 m), and will clear any power line by not~~
3783 less than 10 feet (3.05 m);

3784
3785 ~~(formerly Section 9(b)(i)(C)(II))(B)~~ When a well is ~~to be~~ located
3786 inside a building; ~~the top of the casing and any other well opening shall not terminate in the~~
3787 ~~basement of the building, or in any pit or space that is below natural ground surface unless the~~
3788 ~~well is completed with a properly protected submersible pump. Wells located in a structure~~
3789 ~~must be accessible to pull the casing or the pump. The structure shall have overhead access.~~

3790
3791 ~~(formerly Section 9(b)(i)(C)(II))(I)~~ ~~†~~The top of the casing
3792 and any other well opening shall not terminate in the basement of the building, or in any pit or
3793 space that is below natural ground surface unless the well is completed with a properly protected
3794 submersible pump or provided with provisions for drainage to the ground surface that is not
3795 subject to flooding by surface water;

3796
3797 ~~(formerly Section 9(b)(i)(C)(II))(II)~~ Wells located in a
3798 structure shall be accessible to pull the casing, pipe, or pump; and

3799
3800 ~~(formerly Section 9(b)(i)(C)(II))(III)~~ The structure shall
3801 have overhead access.

3802
3803 ~~(formerly Section 9(b)(i)(D))(C)~~ ~~Relation to property lines. Every~~
3804 ~~w~~Wells shall be located at least ~~10~~ 50 feet ~~(3.05 m)~~ from any property line.

3805
3806 ~~(formerly Section 9(b)(ii)(iv))~~ Applicants for wells shall complete ~~†~~testing and
3807 maintain records as follows:

3808
3809 ~~(formerly Section 9(b)(ii)(A))(A)~~ ~~Yield and drawdown tests.~~ Yield
3810 and drawdown tests shall be performed on every production well after construction or
3811 subsequent treatment and prior to placement of the permanent pump. The test methods shall be
3812 clearly indicated in the specifications. The test pump capacity, at maximum anticipated
3813 drawdown, shall be at least 1.5 times the design rate anticipated. The ~~test well~~ shall ~~provide for~~
3814 ~~continuous pumping~~ be test pumped at the desired yield (design capacity) of the well for at least
3815 24 consecutive hours ~~or until after~~ stabilized drawdown. ~~has continued~~ Alternatively, the well
3816 may be pumped at a rate of 150 percent of the desired yield for at least ~~6~~ six continuous hours
3817 after stabilized drawdown. ~~when test pumped at 1.5 times the design pumping rate.~~

3818
3819 ~~(formerly Section 9(b)(ii)(B))(B)~~ ~~Plumbness and alignment~~
3820 ~~requirements.~~ Every well shall be tested for plumbness and alignment in accordance with
3821 AWWA A-100 A100. ~~The test method and allowable tolerance shall be stated in the~~
3822 ~~specifications.~~

3823

3824 (v) In addition to meeting the requirements of Section 8 of this Chapter, plans for
3825 wells developed through acidizing activities shall also include the following elements:

3826
3827 (A) Information on the geology of the area that contains descriptions
3828 of:

3829
3830 (I) Known or potential faults, fractures, springs, karst features
3831 (such as sinkholes and other similar features) within a one-mile radius of the proposed well; and

3832
3833 (II) Faults and fractures that may extend from the acidized zone
3834 into overlying and underlying geologic formations and a description of any measures that will be
3835 taken to ensure that the acidized solution does not migrate into any of those geologic formations.

3836
3837 (B) For wells developed within a radius of one mile of existing wells,
3838 applicants shall submit plans that analyze the risk and mitigation measures to be taken to prevent
3839 impacts to those wells and the risk and mitigation measures for any potential effects to each
3840 existing well;

3841
3842 (C) Existing information on the location of other wells (such as water
3843 supply, oil and gas, mineral development wells) within a one-mile radius of the proposed well,
3844 including any wells that intercept the acidized zone, and for wells that intercept the acidized
3845 zone;

3846
3847 (I) An analysis of whether or not those wells that intercept the
3848 acidized zone have been properly plugged and abandoned;

3849
3850 (II) An analysis of whether or not those wells have been
3851 properly cased and cemented; and

3852
3853 (III) A description of what measures will be or have been taken
3854 to prevent the acidized solution from migrating vertically in the annular space or casing of the
3855 existing wells into overlying or underlying geologic formations.

3856
3857 (D) A description of the borehole drilling phase and what measures
3858 will be taken to minimize the introduction of lost circulation materials into aquifers when
3859 encountering under-pressured geologic formations or other factors that may lead to a loss of
3860 circulation;

3861
3862 (E) A description of the acid injection process and the measures that
3863 will be taken to ensure that injection pressures do not create fractures in the overlying and
3864 underlying geologic formations and through which the acidized solution may migrate;

3865
3866 (F) A description of the volume and content of the acid and any other
3867 chemical compounds to be used during acidizing activities, including the management of the acid
3868 and chemical compounds prior to acidizing and final disposition of any acid, water, or chemical
3869 mixtures recovered from the well after acidizing activities are completed;

3870
3871 (G) A description of the measures that will be or have been taken to
3872 ensure that the recovery of the acidized solution is of sufficient duration and volume to eliminate
3873 the potential for acidic impacts to other wells completed within the injection zone; and
3874

3875 (H) A description of the methods to be performed to establish the
3876 placement and integrity of the annular seal and casing prior to acidization of the well.
3877

3878 ~~(formerly Section 9(b)(iii)(A))(vi) Protection during construction.~~ During any
3879 well construction or modification, the well and surrounding area ~~must~~ shall be adequately
3880 protected to prevent any groundwater contamination. Surface water ~~must~~ shall be diverted away
3881 from the construction area.

3882
3883 ~~(formerly Section 9(b)(iii)(B))(vii) All Wells types and shall comply with the~~
3884 following construction methods standards:
3885

3886 ~~(formerly Section 9(b)(iii)(I))(A) Dug wells.~~ Dug wells shall be ~~used~~
3887 ~~only where geological conditions preclude the possibility of developing an acceptable drilled~~
3888 ~~well constructed according to the State Engineer's standards;~~
3889

3890 ~~(formerly Section 9(b)(iii)(II)(2.))(B) Every d~~Drilled, driven, jetted, or bored wells
3891 shall have an unperforated casing that extends from a minimum of 12 inches ~~(30 cm)~~
3892 ~~ground~~ the concrete surface and 18 inches above natural ground surface ~~to at least 10 feet (3.05~~
3893 ~~m) below ground surface. In unconsolidated formations, this casing shall extend to the water~~
3894 ~~table or below. In consolidated formations, the casing may be terminated in rock or watertight~~
3895 ~~clay above the water table. and the design shall demonstrate compliance with Water Quality~~
3896 Rules, Chapter 26, Section 8;
3897

3898 ~~(formerly Section 9(b)(iii)(B)(X)(2.))(C)~~ In gravel-packed wells or
3899 artificial filter-packed wells, aquifers containing inferior quality water shall be sealed by pressure
3900 grouting, or with special packers or seals, to prevent such water from moving vertically in
3901 gravel-packed portions of the well. Gravel-packed wells shall meet the following sealing
3902 requirements:
3903

3904 ~~(formerly Section 9(b)(iii)(IV)(2.))(I)~~ If a permanent surface
3905 casing is not installed, the annular opening between the casing and the drill hole shall be sealed
3906 in the top 10 feet ~~(3.05 m)~~ with concrete or cement grout; or
3907

3908 ~~(formerly Section 9(b)(iii)(IV)(2.))(II)~~ If a permanent surface
3909 casing is installed, it shall extend to a depth of at least 10 feet ~~(3.05 m)~~. The annular opening
3910 between this outer casing and the inner casing shall be covered with a metal or cement seal.

3911
3912 ~~(formerly Section 9(b)(iii)(IV)(1.))(D)~~ When artesian
3913 naturally flowing water is encountered in a well, unperforated casing shall extend into the
3914 confining layer overlying the artesian water-bearing zone. This casing shall be adequately sealed
3915 with cement grout into the confining zone and shall extend at least 10 feet into the target aquifer

3916 to prevent both surface and subsurface leakage from the ~~artesian~~ water-bearing zone. The
3917 method of construction shall be such that during the placing of the grout and the time required
3918 for it to set, no water shall flow through or around the annular space outside the casing, and no
3919 water pressure sufficient to disturb the grout prior to final set shall occur. ~~After the grout has set~~
3920 ~~completely,~~ dDrilling operations ~~may~~ shall not be continued into the ~~artesian~~ water-bearing zone
3921 until the grout has set completely. If leakage occurs around the well casing or adjacent to the
3922 well, the well shall be recompleted with any seals, packers or casing necessary to eliminate the
3923 leakage completely.

3924
3925 (I) Flowing wells shall be constructed to control the flow of
3926 water from the well. The well grouting shall be engineered to prevent the movement of water
3927 along the well casing and to prevent the migration of pressurized water into upper aquifers. A
3928 flow control device shall be installed into the wellhead to control the flow of water from the well.
3929 The well discharge or overflow line installations must connect to the well casing at least 12
3930 inches above ground and be valved. The size of the air gap between the overflow line from the
3931 well to drainage structure shall be twice the diameter of the well overflow pipe. Overflow water
3932 must be drained and diverted to prevent ponding around the well casing.

3933
3934 (II) There shall be no direct connection between any discharge
3935 pipe and a sewer or other source of pollution.

3936
3937 ~~(formerly Section 9(b)(iii)(B)(X)(1.))(E)~~ Any time during the
3938 ~~construction of a well that~~ If mineralized water or water known to be polluted is encountered
3939 during the construction of a well, the aquifer or aquifers containing such inferior quality water
3940 shall be adequately cased or sealed off ~~so that to prevent~~ water shall not from entering the well,
3941 ~~nor will it move~~ and to prevent water from moving up or down the annular space; ~~outside the~~
3942 ~~well casing. If necessary, special seals or packers shall be installed to prevent movement of~~
3943 ~~inferior quality water. Mineralized water may be used if it can be properly treated to meet all~~
3944 ~~drinking water quality standards as determined by the administrator. When mineralized water is~~
3945 ~~encountered, it shall not be mixed with any other waters from different aquifers within the well.~~

3946
3947 ~~(formerly Section 9(b)(iii)(B)(X)(1.))(I)~~ If a well is penetrating
3948 ~~multiple aquifers, mineralized water shall be excluded from the well if water is taken from other~~
3949 ~~non-mineralized aquifers.~~ For wells is that penetrating penetrate multiple aquifers,
3950 mineralized water shall be excluded from the well if water is taken from other, non-mineralized
3951 aquifers.

3952
3953 (II) Applicants that propose to use mMineralized water ~~may be~~
3954 ~~used as a public water supply shall demonstrate if it can be properly~~ that any necessary
3955 ~~treatment to meet all will comply with the~~ drinking water quality standards ~~as determined by~~
3956 ~~the administrator~~ required by 40 CFR Part 141.

3957
3958 ~~(formerly Section 9(b)(iii)(B)(XI)(1.))(F)~~ Existing oil ~~and or~~ gas wells,
3959 ~~seismic test holes, private water wells, or mineral~~ exploration test holes that can be completed to
3960 conform to all minimum construction standards required by this Chapter may be converted for
3961 use as a public water supply wells, ~~provided that the wells can be completed to conform to the~~

3962 ~~minimum construction standards cited in this chapter. This does not relieve the applicant from~~
3963 ~~obtaining appropriate permits.~~ The permit application shall identify all actions to be completed to
3964 achieve compliance with this Chapter.

3965
3966 (viii) The minimum grout thickness for public water supply wells shall be
3967 determined in accordance with AWWA Standard A100, part 4.7.8.3.

3968
3969 (ix) Well seals shall meet the following requirements:

3970
3971 (A) The annular space shall be sealed to protect against contamination
3972 or pollution by the entrance of surface or shallow subsurface waters; and

3973
3974 (B) Annular seals shall be installed to provide protection for the casing
3975 against corrosion, to ensure the structural integrity of the casing, and to stabilize the upper
3976 formation.

3977
3978 (x) Upper terminal well designs that include a concrete floor shall
3979 demonstrate a slope of one inch per foot away from the casing at .

3980
3981 (xi) Well pumps shall be located at a point above the top of the well screen.

3982
3983 ~~(formerly Section 9(b)(iii)(D)(II))~~ (xii) Submersible pumps. Where a
3984 submersible pump is used, the top of the casing shall be effectively sealed against the entrance of
3985 water under all conditions of vibration or movement of conductors or cables. The electrical
3986 cable shall be firmly attached to the rise pipe at 20 foot (6.1 m) intervals or less, and the pump
3987 shall be located at a point above the top of the well screen. An accessible check valve that is not
3988 located in the pump column shall be installed in the discharge line of each well between the
3989 pump and the shut-off valve. Additional check valves shall be located in the pump column as
3990 necessary to prevent negative pressures on the discharge piping.

3991
3992 ~~(formerly Section 9(b)(iii)(C)(IV))~~ (xiii) Pitless well units. A pitless adaptor
3993 or well house shall be used where needed to protect the water system from freezing.

3994
3995 ~~(formerly Section 9(b)(iii)(C)(IV))~~ (xiv) A frost pit may be used only in
3996 conjunction with a properly protected pitless adaptor.

3997
3998 ~~(formerly Section 9(b)(iii)(C)(vi))~~ (xv) Water level management. Every
3999 wWells with diameters that are greater than 4 four inches (10 cm) in diameter shall be equipped
4000 with an access port that will allow for the measurement of the depth to the water surface; or in
4001 the case of a flowing artesian well, with a pressure gauge that will indicate pressure. A an air line
4002 used for water level measurements or, shall be provided on all wells greater than 4 inches (10
4003 cm) in diameter. Installation of water level measuring equipment shall be made using corrosion-
4004 resistant materials attached firmly to the drop pipe or pump column and in such a manner as to
4005 prevent entrance of foreign materials. in the case of a flowing artesian well, with a pressure gauge
4006 that will indicate pressure.

4008 ~~(formerly Section 9(b)(iii)(C)(VII))(xvi)~~ Discharge measuring device. Every
4009 well shall be piped so that a device capable of measuring the total well discharge can be placed
4010 in operation at the well for well testing. Every well field (or when only one well is present,
4011 every well) shall have a device capable of measuring the total discharge. An instantaneous and
4012 totalizing flow meter equipped with nonvolatile memory shall be installed on the discharge line
4013 of each well in accordance with the manufacturer's specifications. Meters installed on systems
4014 with variable frequency drives shall be capable of accurately reading the full range of flow rates.
4015

4016 ~~(formerly Section 9(b)(iii)(D)(IX))(xvii)~~ Well abandonment. Test wells and
4017 groundwater sources ~~which that are not in use shall be~~ sealed for plugging and abandonment in
4018 accordance with requirements of Water Quality Rules Chapter 26, ~~Water Quality Rules and~~
4019 ~~Regulations. Section 11 (formerly 9(b)(iii)(D)(IX))Wells~~ shall be sealed by filling with neat
4020 cement grout. The filling materials shall be applied to the well hole through a pipe, or tremie, ~~or~~
4021 ~~bailer.~~
4022

4023 (xviii) Designs for groundwater sources that are subject to 40 CFR
4024 141.402(a)(1)(i) and either 40 CFR 141.402(a)(1)(ii) or 40 CFR 141.402(a)(1)(iii) shall
4025 demonstrate compliance with 40 CFR 141.402(e).
4026

4027 (f) Facilities that include spring development shall meet the following requirements:
4028

4029 (i) Spring collection systems shall be constructed to collect spring water
4030 while preventing contamination of the source from the ground surface or other contaminant
4031 sources.
4032

4033 (ii) Seepage springs shall have a trench for the collection site that extends at
4034 least six inches into the impervious layer, but not entirely through the impervious layer.
4035 Concentrated springs shall be developed down to bedrock.
4036

4037 (iii) A bed of clean and disinfected rock that extends the width of the spring
4038 from which water is being collected shall be installed at the collection site.
4039

4040 (iv) The collection site shall:

4041 (A) Be covered with 60 mil plastic sheeting or an equivalent puncture-
4042 proof and water-proof barrier; and
4043

4044 (B) Be protected from damage during back-fill and re-grading of the
4045 site to the original surface elevation with protective fabric or sand.
4046

4047 (v) Collecting walls shall be:

4048 (A) Constructed immediately downstream of the collection site; and
4049

4050 (B) Made of concrete, or other material that meets the requirements of
4051 Section 15(b)(ii) of this Chapter;
4052
4053

- 4054
4055 (vi) The spring water collection pipe shall be installed in accordance with the
4056 USDA NRCS Part 631 National Engineering Handbook, Chapter 32, part 631.3201(b)(iii) for
4057 delivery pipes and shall meet the following requirements:
4058
4059 (A) The size of the collection pipe shall be sufficient to convey the
4060 flow of the spring; and
4061
4062 (B) Pipe material and appurtenances shall comply with allowable well
4063 construction material for water distribution in accordance with the standards listed in paragraph
4064 (c) of this Section.
4065
4066 (vii) Appropriate bedding and cover material shall protect the spring collection
4067 system from damage and freezing.
4068
4069 (viii) The Administrator shall determine the spring protection area, based on the
4070 information submitted in the engineering design report required by Section 8 of this Chapter,
4071 which shall be no less than the isolation distances in (e)(ii) of this Section. The Administrator
4072 may require additional setback distances if the engineering design report demonstrates the
4073 additional distance is required to prevent contamination of the source from the ground surface or
4074 other contaminant sources.
4075
4076 (ix) All potential sources of contamination shall be removed from the spring
4077 protection area.
4078
4079 (x) The spring collection site shall include fencing or other protective features
4080 that are constructed and secured to exclude large animals and unauthorized persons from
4081 entering the protection area.
4082
4083 (A) Fencing shall be designed to withstand animals and snow loading.
4084 Other protective systems may be proposed.
4085
4086 (B) Fencing shall include an entry point to allow access by authorized
4087 persons for inspection and maintenance activities.
4088
4089 (xi) The spring collection site shall include a diversion ditch that is constructed
4090 on the upstream side of the spring collection site to route surface water flows away from the
4091 collection area. The diversion ditch shall be located a minimum of 10 feet away from the
4092 collection wall.
4093
4094 (xii) The spring collection site shall be equipped to disinfect water prior to
4095 distribution and shall include sampling ports before and after the disinfection application point.
4096 The equipment shall be maintained and available to operate for its intended use.
4097

4098 (xiii) Spring box designs shall comply Section 15(a), (b), (f-j), and (l) of this
4099 Chapter. Combined spring box and finished water storage designs shall comply with Section 15
4100 of this Chapter.

4101
4102 (xiv) All designs for the spring collector box and collecting walls shall be
4103 performed by a Wyoming registered professional engineer. The plans or contractor furnished
4104 information shall be signed and sealed by a Wyoming registered professional engineer.

4105
4106 **Section 12. Pumping Facilities Treatment.**

4107
4108 ~~(moved to Section 14(g)(iv))(a) — Total dynamic head. The total dynamic head rating~~
4109 ~~of pumping units shall be based on pipe friction, pressure losses from piping entrances, exits,~~
4110 ~~appurtenances (bends, valves, etc.), and static head at the design flow.~~

4111
4112 ~~(b) — Location.~~

4113
4114 ~~(i) — The pumping station shall be elevated or protected to a minimum of 3 feet~~
4115 ~~above the 100-year flood elevation, or 3 feet above the highest recorded flood elevation,~~
4116 ~~whichever is higher.~~

4117
4118 ~~(ii) — The station shall be accessible to operating personnel at all times, and~~
4119 ~~during all weather.~~

4120
4121 ~~(iii) — The site around the station shall be graded to lead surface drainage away~~
4122 ~~from the station.~~

4123
4124 ~~(iv) — The station shall have security installed to prevent vandalism and entrance~~
4125 ~~by unauthorized persons or animals.~~

4126
4127 ~~(e) — Pumping stations — raw and finished water.~~

4128
4129 ~~(i) — They shall have outward-opening doors.~~

4130
4131 ~~(ii) — They shall have a floor elevation or a main level entry of at least 6 inches~~
4132 ~~above finished grade. All floors shall slope at least 2-1/2 inches in every 10 feet to a suitable~~
4133 ~~drain. Pumps shall have an outlet for drainage from pump glands without discharging onto the~~
4134 ~~floor.~~

4135
4136 ~~(iii) — They shall have any underground structures waterproofed.~~

4137
4138 ~~(d) — Wetwells. Finished water wetwells shall be covered. All vents shall be turned~~
4139 ~~down and screened. Finished water wetwells shall be located above the groundwater table and~~
4140 ~~the top of the walls from the wetwell shall be at least 18 inches above finished grade.~~

4141
4142 ~~(e) — Equipment servicing. Pump stations shall be provided with craneways, hoist~~
4143 ~~beams, eyebolts, or other facilities for servicing or removing pumps, motors or other heavy~~

4144 equipment. They shall be rated for not less than 50 percent more than the weight of the heaviest
4145 single item to be lifted. Openings in floors and roofs shall be provided as needed for removal of
4146 heavy or bulky equipment.

4147
4148 ~~(moved to Section 14(b))(f) — Stairways and ladders. Stairways or ladders shall be~~
4149 ~~provided between all floors, and in pits or compartments which must be entered. They shall have~~
4150 ~~handrails on both sides, and treads of non-slip material. The Wyoming Occupational Health and~~
4151 ~~Safety Rules and Regulations shall be complied with.~~

4152
4153 ~~(moved to Section 14(e))(g) — Heating. Provisions shall be made for heating to maintain a~~
4154 ~~minimum temperature of 40° F (4° C) if not typically occupied and 50° F (10° C) if occupied.~~

4155
4156 ~~(moved to Section 14(d))(h) — Ventilation. All accessible pumping station areas shall be~~
4157 ~~ventilated. Ventilation may be continuous or intermittent. If intermittent, ventilation in areas~~
4158 ~~normally visited by operating personnel shall be started automatically at not greater than 30~~
4159 ~~minute intervals. Permanently installed drywell ventilation shall provide at least 6 air changes~~
4160 ~~per hour if continuous, and 12 air changes per hour if intermittent. Intermittent ventilating~~
4161 ~~equipment shall ensure starting upon entry of operating personnel. Wetwells shall be designed to~~
4162 ~~permit the use of portable blowers that will exhaust the space and continue to supply fresh air~~
4163 ~~during access periods.~~

4164
4165 ~~(moved to Section 14(e))(i) — Dehumidification. In below ground pumping stations, a~~
4166 ~~means for dehumidification shall be provided. The facilities shall be sized to maintain the~~
4167 ~~dewpoint at least 2 below the coldest anticipated temperature of water to be conveyed in the~~
4168 ~~pipes.~~

4169
4170 ~~(j) — Lighting. Lighting levels shall be sufficient to permit safe operation and~~
4171 ~~maintenance of all equipment within the pumping stations, but not less than 30 foot candles. All~~
4172 ~~areas shall be lit in such a manner that the failure of 1 lighting fixture or lamp will not cause the~~
4173 ~~area to be completely dark.~~

4174
4175 ~~(moved to Section 14(f))(k) — Sanitary and other conveniences. All pumping stations that~~
4176 ~~are manned for four or more hours per day shall be provided with potable water, lavatory and~~
4177 ~~toilet facilities. Wastes shall be discharged to the sanitary sewer or to an on-site waste treatment~~
4178 ~~system.~~

4179
4180 ~~(moved to Section 14(g))(l) — Pumps. At least two pumping units shall be provided. With~~
4181 ~~the largest pump out of service, the remaining pump or pumps shall be capable of providing the~~
4182 ~~maximum pumping rate of the system.~~

4183
4184 ~~(moved to Section 14(g)(ii))(m) — Suction lift. Pumps shall be selected so that the net~~
4185 ~~positive suction head required at maximum flow (NPSHR) is less than the net positive suction~~
4186 ~~head available (NPSHA) minus 4 feet (1.2 m) based on the hydraulic conditions and altitude of~~
4187 ~~the pumping station. If this condition is not met, then priming shall be provided.~~

4188

4189 ~~Priming water must not be of lesser sanitary quality than that of the water being pumped.~~
4190 ~~Vacuum priming may be used.~~

4191
4192 ~~When an air operated ejector is used, the screened intake shall draw clean air from a point~~
4193 ~~at least 10 feet above the ground or other source of possible contamination.~~

4194
4195 ~~(moved to Section 14(g)(iii))(n) — Surge control. Piping systems shall be designed to~~
4196 ~~withstand the maximum possible surge (water hammer) from the pumping station, or adequate~~
4197 ~~surge control provided to protect the piping. Pressure relief valves are not acceptable surge~~
4198 ~~control.~~

4199
4200 ~~(moved to Section 14(h))(o) — Booster pumps.~~

4201
4202 ~~(moved to Section 14(h)(i))(i) Booster pumps shall not produce a pressure less~~
4203 ~~than 5 psi in suction lines. Where the suction line has service connections, booster pump intake~~
4204 ~~pressure shall be at least 35 psi (138 kPa) when the pump is in normal operation and shall be~~
4205 ~~provided with a low pressure cutoff switch if the suction line pressure is a minimum of 20 psi (69~~
4206 ~~kPa).~~

4207
4208 ~~(moved to Section 14(h)(iii))(ii) — Automatic or remote control devices shall~~
4209 ~~have a range between the start and cutoff pressure which will prevent cycling of more than 1~~
4210 ~~start every 15 minutes.~~

4211
4212 ~~(moved to Section 14(h)(iv))(iii) — In line booster pumps shall be accessible for~~
4213 ~~servicing and repairs. The access opening and vault shall be large enough to remove the pump.~~

4214
4215 ~~(moved to Section 14(h)(v))(iv) — Individual home booster pumps shall not be~~
4216 ~~allowed for any individual service from the public water supply main.~~

4217
4218 ~~(moved to Section 14(h)(vi))(p) — Automatic and remote controlled stations.~~
4219 ~~Conditions that may affect continuous delivery of water shall be alarmed at an attended location.~~

4220
4221 ~~(q) — Appurtenances.~~

4222
4223 ~~(i) — Valves.~~

4224
4225 ~~(A) — All pumps except submersibles shall have a suction and discharge~~
4226 ~~valve to permit satisfactory operation, maintenance and repair of the equipment. Submersible~~
4227 ~~pumps shall have a check valve and discharge valve to permit satisfactory operation,~~
4228 ~~maintenance and repair of the equipment.~~

4229
4230 ~~(B) — If foot valves are necessary, they shall have a net valve area of at~~
4231 ~~least 2 1/2 times the area of the suction pipe and they shall be screened.~~

4233 ~~(moved the Section 14(i)(i))(C) — Each pump shall have an individual~~
4234 ~~suction line or the lines shall be so manifolded that they will ensure similar hydraulic and~~
4235 ~~operating conditions.~~

4236
4237 ~~(D) — Check. All pumps shall be provided with a check valve located~~
4238 ~~between the pump and the discharge shutoff valve, except where arranged so that backflow is not~~
4239 ~~possible under normal operating conditions.~~

4240
4241 ~~(moved to Section 14(i)(i))(E) — Air release. Air release valves shall~~
4242 ~~be provided where the pipe crown is dropped in elevation.~~

4243
4244 ~~(ii) — Gauges. Each pump shall have a standard pressure gauge on its discharge~~
4245 ~~line. Each pump shall have a compound gauge on its suction line, except wet pit type pumps.~~

4246
4247 ~~(iii) — Water seals. Water seals shall not be supplied with water of a lesser~~
4248 ~~sanitary quality than that of the water being pumped. Where pumps are sealed with potable water~~
4249 ~~and are pumping water of lesser sanitary quality, the seal shall be supplied from a break tank~~
4250 ~~open to atmospheric pressure. The tank shall have an air gap of at least 6 inches (0.15 m) or 2~~
4251 ~~pipe diameters, whichever is greater, between the feeder line and the spill line of the tank.~~

4252
4253 ~~(iv) — Controls. Pumps, their prime movers and accessories, shall be controlled~~
4254 ~~in such a manner that they will operate at rated capacity without overload. Provision shall be~~
4255 ~~made to prevent energizing the motor in the event of a backspin cycle. Electrical controls shall~~
4256 ~~be located above grade.~~

4257
4258 (a) 2018 TSS, parts 4.2.1(b), presedimentation, inlets; 4.2.1(c), presedimentation,
4259 bypass; 4.2.2, coagulation; 4.2.2(a), coagulation, mixing; 4.2.2(b), coagulation, equipment;
4260 4.2.2(c), coagulation, location; 4.2.4(b), sedimentation, inlet devices; 4.2.4(c), sedimentation,
4261 velocity; 4.2.4(d)-4.2.4(d)(4), sedimentation, outlet devices; 4.3.1.1, rapid rate gravity filters,
4262 pretreatment; 4.3.1.4-4.3.1.4(o), rapid rate gravity filters, structural details and hydraulics;
4263 4.3.1.6(a), filter material, total depth; 4.3.1.6(b), filter material, uniformity coefficient; 4.3.1.6(c),
4264 filter material, minimum; 4.3.1.6(d)(1)-4.3.1.6(d)(1)(f), filter material, types of filter media,
4265 anthracite; 4.3.1.6(d)(2)-4.3.1.6(d)(2)(d), filter material, types of filter media, sand filter;
4266 4.3.1.6(d)(4)-4.3.1.6(d)(4)(d), filter material, types of filter media, granular activated carbon
4267 (GAC); 4.3.1.6(e)(1)-4.3.1.6(e)(1)(b), filter material, support media, topedo sand; 4.3.3.6-
4268 4.3.3.6(b), diatomaceous earth filtration, pre-coat; 4.3.3.7-4.3.3.7(c), diatomaceous earth
4269 filtration, body feed; 4.3.3.8-4.3.3.8(e), diatomaceous earth filtration, filtration; 4.3.3.10(a)(1),
4270 diatomaceous earth filtration, appurtenances, sampling taps; 4.3.3.10(a)(2), diatomaceous earth
4271 filtration, appurtenances, loss of head; 4.3.3.10(a)(3), diatomaceous earth filtration,
4272 appurtenances, rate of flow indicator; 4.3.3.10(a)(4), diatomaceous earth filtration,
4273 appurtenances, throttling valve; 4.3.4.2, slow sand filters, number; 4.3.4.4, slow sand filters, rates
4274 of filtration; 4.3.4.5, slow sand filters, underdrains; 4.3.4.6-4.3.4.6(e), slow sand filters, filter
4275 material; 4.3.4.7, slow sand filters, filter gravel; 4.3.4.8, slow sand filters, depth of water on filter
4276 beds; 4.3.4.9(b) and (e), slow sand filters, control appurtenances; 4.3.4.9(f), slow sand filters,
4277 control appurtenances; 4.4.1(a), disinfection, contact time, CT, and point(s) of application;
4278 4.4.1(b), disinfection, contact time, CT, and point(s) of application; 4.4.3(a)-(d), disinfection,

4279 testing equipment; 4.4.4.3, chlorine, automatic switch-over; 4.4.4.7, chlorine, cross-connection
4280 protection; 4.4.4.8, chlorine, pipe material; 4.4.5, chloramines; 4.4.6.1, ozone, design
4281 considerations; 4.4.6.2, ozone, feed gas preparation; 4.4.6.3, ozone, ozone generator; 4.4.6.4,
4282 ozone, ozone contactors; 4.4.6.5, ozone, ozone destruction unit; 4.4.6.6, ozone, piping materials;
4283 4.4.6.7, ozone, joints and connections; 4.4.6.8, ozone, instrumentation; 4.4.6.9, ozone, alarms;
4284 4.4.6.11, ozone, construction considerations; 4.5.1, softening, lime or lime-soda process; 4.5.1.1,
4285 softening, lime or lime-soda process, hydraulics; 4.5.1.3, softening, lime or lime-soda process,
4286 chemical feed point; 4.5.1.4, softening, lime or lime-soda process, rapid mix; 4.5.1.5, softening,
4287 lime or lime-soda process, stabilization; 4.5.1.6-4.5.1.6(b), softening, lime or lime-soda process,
4288 sludge collection; 4.5.1.7, softening, lime or lime-soda process, sludge disposal; 4.5.1.8,
4289 softening, lime or lime-soda process, disinfection; 4.5.1.9, softening, lime or lime-soda process,
4290 plant start-up; 4.5.2.1, cation exchange process, pre-treatment requirements; 4.5.2.2, cation
4291 exchange process, design; 4.5.2.3, cation exchange process, design; 4.5.2.4, cation exchange
4292 process, depth of resin; 4.5.2.5, cation exchange process, flow rates; 4.5.2.7, cation exchange
4293 process, underdrains and supporting gravel; 4.5.2.8, cation exchange process, brine distribution;
4294 4.5.2.9, cation exchange process, cross-connection control; 4.5.2.10, cation exchange process,
4295 bypass piping and equipment; 4.5.2.11, cation exchange process, additional limitations;
4296 4.5.2.13(a)-4.5.2.13(f), cation exchange process, brine and salt storage tanks; 4.5.2.14, cation
4297 exchange process, salt and brine storage capacity; 4.5.2.15, cation exchange process, brine pump
4298 or eductor; 4.5.2.18, cation exchange process, construction materials; 4.5.2.19, cation exchange
4299 process, housing; 4.5.3, water quality test equipment; 4.6, anion exchange treatment; 4.6.1, anion
4300 exchange treatment, pre-treatment requirements; 4.6.2-4.6.2(b), anion exchange treatment,
4301 design; 4.6.3, anion exchange treatment, exchange capacity; 4.6.4, anion exchange treatment,
4302 number of units; 4.6.5, anion exchange treatment, type of resin; 4.6.6, anion exchange treatment,
4303 flow rates; 4.6.7, anion exchange treatment, free board; 4.6.8-4.6.8(b), anion exchange treatment,
4304 miscellaneous appurtenances; 4.6.9, anion exchange treatment, cross-connection control; 4.6.10,
4305 anion exchange treatment, construction materials; 4.6.11, anion exchange treatment, housing;
4306 4.6.12, anion exchange treatment, pre-conditioning of the resin; 4.6.13, anion exchange
4307 treatment, waste disposal; 4.6.14, anion exchange treatment, water quality test equipment; 4.7,
4308 aeration; 4.7.1-4.7.1(i), aeration, natural draft aeration; 4.7.2-4.7.2(l), aeration, forced or induced
4309 draft aeration; 4.7.3-4.7.3(e), aeration, spray aeration; 4.7.4-4.7.4(b), aeration, pressure
4310 aeration; 4.7.5, aeration, packed tower aeration; 4.7.5.1-4.7.5.1(f), aeration, packed tower
4311 aeration, process design; 4.7.5.2-4.7.5.2(b), aeration, packed tower aeration, materials of
4312 construction; 4.7.5.3-4.7.5.3(l), aeration, packed tower aeration, water flow system; 4.7.5.4-
4313 4.7.5.4(f), aeration, packed tower aeration, air flow system; 4.7.5.5-4.7.5.5(m), aeration, packed
4314 tower aeration, other features that shall be provided; 4.7.5.6-4.7.5.6(b), aeration, packed tower
4315 aeration, environmental factors; 4.7.6, aeration, other methods of aeration; 4.7.7, aeration,
4316 protection of aerators; 4.7.8, aeration, disinfection; 4.7.9, aeration, bypass; 4.7.10, aeration,
4317 corrosion control; 4.7.11, aeration, quality control; 4.8, iron and manganese control; 4.8.1, iron
4318 and manganese control, removal by oxidation, detention and filtration, oxidation; 4.8.1.2, iron
4319 and manganese control, removal by oxidation, detention and filtration, detention; 4.8.1.3, iron
4320 and manganese control, removal by oxidation, detention and filtration, filtration; 4.8.2, iron and
4321 manganese control, removal by the lime-soda softening process; 4.8.3-4.8.3(f), iron and
4322 manganese control, removal by manganese coated media filtration; 4.8.4, iron and manganese
4323 control, removal by ion exchange; 4.8.6-4.8.6(d), iron and manganese control, sequestration by
4324 polyphosphates; 4.8.7-4.8.7(e), iron and manganese control, sequestration by sodium silicates;

4325 4.8.8, iron and manganese control, sampling taps; 4.9.3-4.9.3(e), stabilization and corrosion
4326 control, carbon dioxide addition; 4.9.5(c)-4.9.5(c)(9), stabilization and corrosion control,
4327 phosphates, design; 4.9.6, stabilization and corrosion control, pH/alkalinity adjustment; 4.9.6.1,
4328 stabilization and corrosion control, pH/alkalinity adjustment; 4.9.6.1(a), stabilization and
4329 corrosion control, pH/alkalinity adjustment, chemicals; 4.9.6.1(a)(1.), stabilization and corrosion
4330 control, pH/alkalinity adjustment, chemicals, caustic soda; 4.9.6.1(a)(2.), stabilization and
4331 corrosion control, pH/alkalinity adjustment, chemicals, soda ash; 4.9.6.1(a)(3.), stabilization and
4332 corrosion control, pH/alkalinity adjustment, chemicals, lime; 4.9.6.1(a)(4.), stabilization and
4333 corrosion control, pH/alkalinity adjustment, chemicals, sodium bicarbonate; 4.9.6.1(b)-
4334 4.9.6.1(b)(4.), stabilization and corrosion control, pH/alkalinity adjustment, simultaneous
4335 compliance; 4.9.6.1(c)-4.9.6.1(c)(4.), stabilization and corrosion control, pH/alkalinity
4336 adjustment, alkalinity/pH adjustment systems; 4.10, taste and odor control; 4.10.1, taste and odor
4337 control, flexibility; 4.10.2, taste and odor control, chlorination; 4.10.3, taste and odor control,
4338 chlorine dioxide; 4.10.4-4.10.4(f), taste and odor control, powdered activated carbon; 4.10.8,
4339 taste and odor control, potassium permanganate; 4.11, membrane technologies for public water
4340 supplies; 4.11.1-4.11.1(c), membrane technologies for public water supplies, pilot
4341 study/preliminary investigations; 4.11.2, membrane technologies for public water supplies,
4342 general design considerations; 4.11.2(a), membrane technologies for public water supplies,
4343 general design considerations, pretreatment; 4.11.2(b), membrane technologies for public water
4344 supplies, general design considerations, materials; 4.11.2(c), membrane technologies for public
4345 water supplies, general design considerations, useful life of membranes; 4.11.2(d), membrane
4346 technologies for public water supplies, general design considerations, membrane integrity and
4347 finished water monitoring; 4.11.2(e), membrane technologies for public water supplies, general
4348 design considerations, bypass water; 4.11.2(f)-4.11.2(f)(6.), membrane technologies for public
4349 water supplies, general design considerations, membrane cleaning; 4.11.2(g), membrane
4350 technologies for public water supplies, general design considerations, controls; 4.11.2(h)-
4351 4.11.2(h)(13.), membrane technologies for public water supplies, general design considerations,
4352 alarms; 4.11.2(i), membrane technologies for public water supplies, general design
4353 considerations, compressed air; 4.11.2(j), membrane technologies for public water supplies,
4354 general design considerations, operation frequency; 4.11.2(k), membrane technologies for public
4355 water supplies, general design considerations, cross connection control; 4.11.2(l)-4.11.2(l)(4.),
4356 membrane technologies for public water supplies, general design considerations, redundancy of
4357 critical components; 4.11.3-4.11.3(h), membrane technologies for public water supplies, systems
4358 treating surface water or GWUDI; 5.4.7-5.4.7(f), specific chemicals, fluoride; 5.4.8, specific
4359 chemicals, activated carbon; 9.3, precipitative softening sludge; 9.3(a)-9.3(a)(2.), precipitative
4360 softening sludge, lagoons; 9.4.1-9.4.1(h), alum sludge, lagoons; 9.5, red water waste; 9.5.1-
4361 9.5.1(k), red water waste, sand filters; 9.5.2-9.5.2(g), red water waste, lagoons; 9.5.3, red water
4362 waste, discharge to community sanitary sewer; are herein incorporated by reference.

4363
4364 ~~(formerly Section 10(a))(b)~~ **Design capacity.** The capacity of the water treatment or
4365 water production system shall be designed for the maximum daily demand at the design year.

4366
4367 ~~(formerly Section 10(b))(c)~~ Presedimentation: shall be required for Rraw waters
4368 which that have episodes of turbidity in excess of 1,000 ~~TU~~ Nephelometric turbidity units (NTU)
4369 for a period of one week or longer ~~shall be presettled~~.

4370

- 4371 (d) Basins shall meet the following requirements:
4372
4373 ~~(formerly Section 10(b)(i))(i)~~ (i) ~~Detention time.~~ Basins without mechanical
4374 sludge collection equipment shall have a minimum detention time of three days; ~~Basins with~~
4375 ~~mechanical sludge collection equipment shall have a minimum detention time of three hours.~~
4376
4377 ~~(formerly Section 10(b)(i))(ii)~~ (ii) Basins with mechanical sludge collection
4378 equipment shall have a minimum detention time of three hours; ~~;~~
4379
4380 ~~(formerly Section 10(b)(iv))(iii)~~ (iii) ~~Bottom slope.~~ Basins shall have a bottom
4381 slope to drain of ¼ inch per foot ~~(20 mm/m)~~ without mechanical sludge collection equipment and
4382 2 two inches per foot ~~(16 cm/m)~~ with mechanical sludge collection equipment; ~~;~~ and
4383
4384 ~~(formerly Section 10(b)(iii))(iv)~~ (iv) ~~Drains.~~ Basins shall have a minimum of one, ~~;~~
4385 ~~8-inch (20 cm)~~ eight-inch drain line to completely dewater the facility.
4386
4387 ~~(formerly Section 10(e))(e)~~ (e) ~~Rapid mix.~~ Rapid dispersal of chemicals throughout the
4388 water shall be accomplished by mechanical mixers, jet mixers, static mixers, or hydraulic jump;
4389 and shall meet the following requirements:
4390
4391 ~~(formerly Section 10(e)(i))(i)~~ (i) ~~Mixing intensity.~~ For mechanical mixers, the
4392 minimum Gt (velocity gradient (sec-1) x t (sec)) provided at maximum daily flow shall be
4393 27,000; ~~;~~
4394
4395 ~~(formerly Section 10(e)(ii))(ii)~~ (ii) ~~Mixing time.~~ The detention time in a flash
4396 mixing chamber shall not exceed 30 seconds at maximum daily flow conditions; ~~;~~ and
4397
4398 ~~(formerly Section 10(e)(iii))(iii)~~ (iii) ~~Drain.~~ The basin shall have a drain.
4399
4400 ~~(formerly Section 10(d))(f)~~ (f) Flocculation shall comply with the following
4401 requirements; ~~The low velocity agitation of chemically treated water shall be accomplished by~~
4402 ~~mechanical flocculators.~~
4403
4404 ~~(formerly Section 10(d))(i)~~ (i) Mechanical flocculators shall be used for ~~The low~~-velocity
4405 agitation of chemically treated water ~~shall be accomplished by mechanical flocculators.~~
4406
4407 ~~(formerly Section 10(d)(i))(ii)~~ (ii) ~~Detention time.~~ ~~A~~ The minimum detention
4408 time of 10 minutes ~~detention time~~ shall be provided.
4409
4410 ~~(formerly Section 10(d)(iii))(iii)~~ (iii) ~~Drains.~~ ~~Flocculation b~~Basins shall have a
4411 minimum of one drain line to dewater the facility.
4412
4413 ~~(formerly Section 10(d)(ii))(iv)~~ (iv) ~~Mixing intensity.~~ The velocity gradient (G
4414 value) ~~imposed~~ shall be adjustable ~~by providing~~ through the use of variable speed drives, ~~or shall~~
4415 ~~be designed to~~ The velocity gradient for single basin systems shall be 30 sec-1, ~~if a single basin~~
4416 ~~is provided;~~ 20 sec-1 in the final basin of a two stage system, and 10 sec-1 in the final basin of a

4417 three stage system. ~~For a single speed drive system, the tip speed of the mixer shall not exceed 3~~
4418 ~~feet per second (0.91 m/sec). Variable speed drives shall provide tip speeds of 0.5 to 3.0 feet per~~
4419 ~~second (0.15-0.91 m/sec).~~

4420
4421 ~~(formerly Section 10(d)(ii))(v)~~ For a single speed drive system, ~~t~~The tip
4422 speed for a single speed drive system of the mixer shall not exceed 3 feet per second ~~(0.91~~
4423 ~~m/sec) (ft/sec)~~. Variable speed drives shall provide tip speeds ~~of~~ between 0.5 ~~to~~ and 3.0 ~~feet per~~
4424 ~~second (0.15-0.91 m/sec) ft/sec~~.

4425
4426 ~~(formerly Section 10(d)(iv))(vi)~~ Piping. The velocity of flocculated water
4427 through pipes or conduits to settling basins shall not be less than 0.5 ft/sec or greater than 1.5 ~~feet~~
4428 ~~per second (0.15-0.46 m/sec) ft/sec~~.

4429
4430 ~~(formerly Section 10(e))(g)~~ Sedimentation basins shall comply with the following
4431 requirements:

4432
4433 ~~(formerly Section 10(e)(i))(i)~~ Diameter. The maximum diameter in circular basins
4434 shall be 80 feet.

4435
4436 ~~(formerly Section 10(e)(iv))(ii)~~ Side water depth. The minimum basin side
4437 water depth shall be 8 eight feet ~~(2.43 m)~~ if mechanical sludge collection equipment is provided
4438 or ~~basins or~~ basin sludge hopper segments are less than 100 square feet ~~(9.3 m)~~ in surface area
4439 and 15 feet ~~(4.6 m)~~ if basins are manually cleaned. ~~Mechanical sludge collection equipment~~
4440 ~~includes mechanically driven drives that use scrapers or differential water level to collect the~~
4441 ~~sludge.~~

4442
4443 ~~(formerly Section 10(e)(v))(iii)~~ Freeboard. The outer walls of the settling
4444 basins shall extend at least 12 inches ~~(30.5 cm)~~ above the surrounding ground and provide at
4445 least 12 inches ~~(30.5 cm)~~ of freeboard to the water surface. Where the basin walls are less than 4
4446 four feet ~~(1.22 m)~~ above the surrounding ground, a fence or other debris barrier shall be provided
4447 on the wall.

4448
4449 ~~(formerly Section 10(e)(xi))(iv)~~ Drainage. Basin bottoms shall slope toward
4450 the drain at not less than 1 one inch per foot ~~(8 cm/m)~~ where mechanical sludge collection
4451 equipment is provided and ¼ inch per foot ~~(2 cm/m)~~ where no mechanical sludge collection
4452 equipment is provided.

4453
4454 ~~(formerly Section 10(e)(ii))(v)~~ Overflow rate. The basin overflow rate shall
4455 not exceed 1,000 gpd/ft² ~~(41 m³/m²d)~~ at design conditions.

4456
4457 ~~(formerly Section 10(e)(viii))(vi)~~ Sludge collection. Mechanical sludge
4458 collection shall be provided ~~if~~ settleable organics are present in the water or if ~~there is a history~~
4459 ~~of organically related taste and odor problems, mechanical sludge collection shall be provided~~
4460 the source water exceeds secondary maximum contaminant levels identified at 40 CFR 143.3.
4461

4462 ~~(formerly Section 10(e)(ix))(vii)~~ Sludge removal. ~~Sludge removal design~~
4463 ~~shall provide that sludge pipes~~ for removing sludge shall be not be less than 6 six inches ~~(15.2~~
4464 ~~cm)~~ in diameter and arranged to facilitate cleaning. Valves on ~~the~~ sludge lines shall be located
4465 outside the tank.

4466
4467 ~~(formerly Section 10(f))(h)~~ Facilities with ~~S~~softening sedimentation – or clarification.
4468 ~~Conventional sedimentation—clarification as described above shall be provided in softening~~
4469 ~~operations, except for softening~~ softened a groundwater supply sources of constant quality.
4470 ~~Where a groundwater supply is softened, the requirements may be modified as follows shall~~
4471 meet the following requirements:

4472
4473 ~~(formerly Section 10(f)(i))(i)~~ Overflow rate. The basin overflow rate ~~at the design~~
4474 ~~flow~~ shall not exceed ~~2,100~~ 21,000 gpd/ft² ~~(86 m³/m²-d)~~ at the design flow; and

4475
4476 ~~(formerly Section 10(f)(ii))(ii)~~ Sludge. Mechanical sludge removal shall be
4477 provided and shall be designed to handle a load of 40 lbs/foot ft ~~(60 kg/m)~~ of collector ~~scraper~~
4478 scraper arm length.

4479
4480 ~~(formerly Section 10(g))(i)~~ Solids contact units. ~~These treatment~~ Solids contact units
4481 are acceptable for combined softening and clarification of well water where water quality
4482 characteristics are not variable and the flow rates are uniform and consistent. ~~The~~ Solids contact
4483 units shall ~~be designed to meet the criteria detailed previously~~ meet the requirements of
4484 paragraphs (c) and (e) of this Section, and may be considered under the following circumstances:

4485
4486 ~~(formerly Section 10(g)(i))(i)~~ Such Solids contact units may be considered for use
4487 as clarifiers without softening when they are designed ~~to meet the criteria detailed in the~~ as
4488 ~~conventional sedimentation—clarification—units; and~~

4489
4490 ~~(formerly Section 10(g)(ii))(ii)~~ These Solids contact units may ~~also~~ be used
4491 for other treatment ~~purposes; processes~~ such as rapid mixing; or flocculation; ~~etc.~~, when the
4492 individual components of the ~~solids contact~~ units are designed ~~in accordance with the design~~
4493 ~~criteria~~ for that individual specific treatment process ~~as described above~~.

4494
4495 ~~(formerly Section 10(h))(j)~~ Settling tube clarifiers. ~~Shallow depth sedimentation~~
4496 ~~devices or tube clarifier systems of the essentially horizontal or steeply inclined types~~ Tube
4497 clarifiers that are horizontal or steeply inclined may be used when designed as follows:

4498
4499 ~~(formerly Section 10(h)(iv))(i)~~ Loading rates. The maximum ~~overflow~~ rate
4500 shall be less than 2.0 ~~gpm/sq ft (62.7 m³/m²-d)~~ gpm/ft² based on the surface area of the basin
4501 covered by the tubes;:

4502
4503 ~~(formerly Section 10(h)(iii))(ii)~~ Tube placement. ~~The~~ Tops of the tubes
4504 shall be more than 12 inches ~~(0.3 m)~~ from the underside of the launder and more than 18 inches
4505 ~~(0.46 m)~~ from the water surface; and ~~(formerly Section 10(h)(v))~~ The spacing ~~between of the~~
4506 effluent launders shall not ~~exceed~~ be more than three times the distance from the water surface to
4507 the top of the tube modules;:

4508
4509 ~~(formerly Section 10(h)(i))(iii)~~ Sludge removal. Sludge shall be removed
4510 using 45-~~degree~~ or steeper hoppers bottoms, ~~or~~ mechanical devices that move the sludge to
4511 hoppers, or devices that remove settled sludge from the basin floor using differential hydraulic
4512 level-; and

4513
4514 ~~(formerly Section 10(h)(i))(iv)~~ Tube cleaning. A method of tube cleaning
4515 shall be provided. ~~This that~~ may include a provisions for ~~obtaining~~ a rapid reduction in clarifier
4516 water surface elevation, a water jet spray system, or an air scour system. ~~Where~~ If cleaning is
4517 automatic, controls shall ~~be provided to~~ cease clarifier operation during tube cleaning and a 20-
4518 minute rest period.

4519
4520 ~~(formerly Section 10(i))(k)~~ Filtration-systems shall comply with the following
4521 requirements:

4522
4523 ~~(formerly Section 10(i)(i))(i)~~ Pressure granular media filters. Vertical or
4524 horizontal pressure filters shall not be used for on filtration of surface waters. Pressure filters
4525 may be used for groundwater filtration, including iron and manganese removal.

4526
4527 ~~(formerly Section 10(i)(ii)(A))(A)~~ Slow rate sand filters. ~~These types of~~
4528 ~~filters~~ may be used when maximum ~~raw water~~ turbidity is less than 50 NTUs and the turbidity
4529 present is not ~~attributable to~~ caused by colloidal clay-; and ~~Maximum color shall not exceed 30~~
4530 ~~units.~~

4531
4532 ~~(formerly Section 10(i)(ii)(A))(B)~~ Maximum color shall not exceed 30
4533 units.

4534
4535 ~~(formerly Section 10(i)(ii)(B)(III))(ii)~~ Washwater troughs shall comply
4536 with the following requirements. ~~Washwater troughs shall be constructed to provide for not more~~
4537 ~~than 6 feet (1.8 m) clear distance between troughs. The troughs shall not cover more than 25~~
4538 ~~percent of filter area.;~~

4539
4540 ~~(formerly Section 10(i)(ii)(B)(III))(A)~~ The Washwater troughs shall
4541 not cover more than 25 percent of the filter area-;

4542
4543 ~~(formerly Section 10(i)(ii)(B)(III)(1.))~~ (B) The Mminimum clearance
4544 distance between the bottom of the trough and the top of the unexpanded media shall be 12
4545 inches ~~(30.5 cm);~~

4546
4547 ~~(formerly Section 10(i)(ii)(B)(III)(2.))~~ (C) The Mminimum distance
4548 between the weir of the trough and the unexpanded media shall be 30 inches ~~(0.76 m);~~

4549
4550 ~~(formerly Section 10(i)(ii)(B)(III))(D)~~ Washwater troughs shall be
4551 ~~constructed to provide for not~~ There shall be no more than 6 six feet ~~(1.8 m)~~ clear distance
4552 between troughs-;

4553

4554 ~~(formerly Section 10(i)(ii)(B)(III)(3)(E)~~ The trough and ~~washwater~~
4555 ~~waste wastewater~~ line shall be sized ~~to carry for~~ a filter backwash rate of 20 gpm/ft² ~~(1181~~
4556 ~~m³/m²-d)~~ plus a surface wash rate of 2.0 gpm/ft² ~~(118 m³/m²-d);~~
4557

4558 ~~(formerly Section 10(i)(ii)(B)(IV)(1.))(F)~~ The backwash system
4559 shall be sized to provide a minimum backwash ~~flow rate~~ flowrate of 20 gpm/ft² ~~(1181 m³/m²-d)~~.
4560 ~~Washwater storage shall be designed to provide two 20 minute washes in rapid succession.~~
4561 ~~Where multiple units are not required and only one filter compartment is present, backwash~~
4562 ~~storage capabilities may be reduced to provide one 20 minute backwash. Where pumps are used~~
4563 ~~to provide backwash to the filter or to supply water to a washwater tank, the washwater pumps~~
4564 ~~shall be in duplicate, or a rate necessary to provide a 50 percent expansion of the filter bed;~~
4565

4566 ~~(formerly Section 10(i)(ii)(B)(IV)(1.))(G)~~ The system and Washwater
4567 wash water storage shall be designed to provide two, 20-minute washes in rapid succession ~~and~~
4568 shall meet the following requirements:
4569

4570 ~~(formerly Section 10(i)(ii)(B)(IV)(1.))(I)~~ Where multiple units
4571 are not required and only one filter compartment is present, backwash storage capabilities may
4572 be reduced to provide one 20 minute backwash. If only one filter is provided, the backwash
4573 system needs to provide only one 20-minute backwash; and
4574

4575 ~~(formerly Section 10(i)(ii)(B)(IV)(1.))(II)~~ Where If pumps are
4576 used to provide convey backwash water to the filter(s) or to supply water to a the washwater
4577 wash water tank, ~~the washwater~~ two equivalent pumps shall be ~~in duplicate~~ provided.
4578

4579 ~~(formerly Section 10(i)(ii)(B)(IV)(2.))(H)~~ The backwash and surface
4580 ~~wash-washwater supply~~ Washwater shall be filtered and disinfected;:
4581

4582 ~~(formerly Section 10(i)(ii)(B)(IV)(3.))(I)~~ The Washwater wastewater
4583 rate shall be controlled ~~by a separate valve, manual or automatic,~~ on the main ~~washwater~~ wash
4584 water line. ~~Washwater~~ and the flow rate flowrate shall be metered and indicated;:
4585

4586 ~~(formerly Section 10(i)(ii)(B)(IV)(4.))(J)~~ Air-assisted backwash
4587 systems may be used when the design precludes disturbing the gravel support ~~and the the~~
4588 minimum flowrate for air-assisted backwash shall be 12 gpm/ft²;
4589

4590 ~~(formerly Section 10(i)(ii)(B)(IV)(5.))(K)~~ A surface wash system shall
4591 be provided ~~and shall meet the following requirements: The system shall be capable of~~
4592 ~~supplying 0.5 gpm/ft² (29.5 m³/m²-d) for system with rotating arms and 2.0 gpm/ft² (118~~
4593 ~~m³/m²-d) with fixed nozzles, at a minimum pressure of fifty (50) psi (344 kPa). The surface~~
4594 ~~wash shall use filtered and disinfected water or air and filtered disinfected water The supply~~
4595 ~~system shall be provided with adequate backflow prevention.~~
4596

4597 ~~(formerly Section 10(i)(ii)(B)(IV)(5.))(I)~~ The system shall be
4598 capable of supplying 0.5 gpm/ft² ~~(29.5 m³/m²-d)~~ for a system with rotating arms and 2.0 gpm/ft²
4599 ~~(118 m³/m²-d)~~ with for fixed nozzles, at a minimum pressure of fifty (50) psi ~~(344 kPa); and~~

4600
4601 ~~(formerly Section 10(i)(ii)(B)(IV)(5.))~~(II) The surface wash
4602 ~~shall use filtered and disinfected water or air and filtered disinfected water~~ can be air-assisted.
4603 ~~The supply system shall be provided with adequate backflow prevention.~~

4604
4605
4606 ~~(formerly Section 10(i)(ii)(B)(IV)(5.))~~(L) The Both backwash and
4607 surface wash supply systems shall be provided with adequate backflow prevention.;

4608
4609 ~~(formerly Section 10(i)(ii)(B)(V)(3.))~~(iii) ~~Anthracite for s~~Single media beds:
4610 shall use either ~~C~~clean crushed anthracite or a ~~combination of sand and anthracite~~ may be used
4611 mixture, Such the media shall have an effective size ~~from of~~ 0.45 mm to ~~0.55 mm,~~ and a
4612 uniformity coefficient not greater than 1.65, and shall meet the following requirements:

4613
4614 ~~(formerly Section 10(i)(ii)(B)(V)(4.))~~(A) Gravel. When gravel is used
4615 as a supporting media, ~~gravel it~~ shall consist of coarse aggregate in which ~~a high proportion of~~
4616 ~~the particles are~~ most of it is rounded round and ~~tend toward a generally spherical or~~
4617 ~~equidimensional~~ of similar size and shape. ~~It shall possess sufficient strength and hardness to~~
4618 ~~resist degradation during handling and use, be substantially free of harmful materials, and exceed~~
4619 ~~the minimum density requirement. The gravel shall meet the requirements of AWWA B100.~~

4620
4621 ~~(formerly Section 10(i)(ii)(B)(V)(4.))~~(B) ~~It~~Gravel as supporting media
4622 shall ~~possess~~have sufficient strength and hardness to resist degradation during handling and use,
4623 ~~be substantially free of harmful materials, and exceed the minimum density requirements.;~~ and

4624
4625 ~~(formerly Section 10(i)(ii)(B)(V)(4.))~~(C) The gravel shall ~~meet also~~
4626 comply with the requirements of AWWA B100 specifications.

4627
4628 ~~(formerly Section 10(i)(ii)(B)(V)(6.))~~(iv) Dual media: ~~C~~coal sand
4629 filters shall consist of a coarse layer of coal layer not less than 15 inches deep above a layer of
4630 fine sand not less than eight inches deep on a torpedo sand or garnet layer of support not less
4631 than three inches on gravel support. ~~The media shall consist of not less than 8 inches (20 cm) of~~
4632 ~~sand and 15 inches (0.38 m) of coal on a torpedo sand or garnet layer support of not less than 3~~
4633 ~~inches (7.8 cm) on the gravel support.~~

4634
4635 ~~(formerly Section 10(i)(ii)(B)(VI))~~(v) Filter bottoms: ~~Acceptable filter~~
4636 ~~bottoms~~ and strainer systems shall be limited to pipe, perforated pipe laterals, tile block, and
4637 perforated tile block. Perforated plate bottoms or plastic nozzles shall not be used.

4638
4639 ~~(formerly Section 10(i)(ii)(B)(VII))~~(vi) Appurtenances: Every filter shall
4640 have: ~~influent and effluent sampling taps; indicating loss of head gauge; indicating effluent~~
4641 ~~turbidimeter; a waste drain for draining the filter compartment to waste; and a filter rate flow~~
4642 ~~meter. Every filter shall provide polymer feed facilities including polymer mixing and storage~~
4643 ~~tank and at least one feed pump for each filter compartment. On plants having a capacity in~~
4644 ~~excess of 0.5 MGD, recorders shall be provided on the turbidimeters.~~

4645

4646 ~~(formerly Section 10(i)(ii)(B)(VII))(A)~~ iInfluent and effluent
4647 ~~sampling~~ taps;
4648
4649 ~~(formerly Section 10(i)(ii)(B)(VII))(B)~~ A ~~indicating loss of~~ head loss
4650 gauge;
4651
4652 ~~(formerly Section 10(i)(ii)(B)(VII))(C)~~ An indicating effluent
4653 turbidimeter;
4654
4655 ~~(formerly Section 10(i)(ii)(B)(VII))(D)~~ a ~~A~~ waste drain for draining
4656 the filter ~~compartment~~ component to waste; ~~and~~
4657
4658 ~~(formerly Section 10(i)(ii)(B)(VII))(E)~~ a ~~A~~ filter rate ~~flow meter~~
4659 flow meter;
4660
4661 ~~(formerly Section 10(i)(ii)(B)(VII))(F)~~ Every filter shall provide
4662 ~~p~~Polymer feed facilities including polymer mixing, ~~and~~ storage tank and at least one feed pump
4663 for each filter compartment; and
4664
4665 ~~(formerly Section 10(i)(ii)(B)(VII))(G)~~ On plants having a capacity
4666 ~~in excess of 0.5 MGD, r~~Recorders shall be provided on the turbidimeters if the facility has a
4667 capacity in excess of 0.5 MGD.
4668
4669 ~~(formerly Section 10(i)(ii)(B)(VIII))(vii)~~ Filter rate control. Filter rate control
4670 shall be such that the filter is not surged. The fFilter rate of flow shall not change ~~at a rate greater~~
4671 more than 0.3 gpm/ft² ~~(17.7 m³/m²-d)~~ per minute. A Filters that stops and restarts during a
4672 cycle shall have a filter-to-waste system installed. Declining flow rate filters shall not be used
4673 unless the flow rate for each filter is controlled to a rates less than allowed in ~~10(i)(ii)(B)~~
4674 paragraph (j)(iii) of this Section and there are four ~~or~~ more individual filters.
4675
4676 ~~(formerly Section 10(i)(ii)(B)(IX))(viii)~~ A filter to waste cycle shall be
4677 provided after the filter backwash operation. The filter to waste cycle shall be at least 10 minutes.
4678
4679 ~~(formerly Section 10(i)(ii)(B)(V)(5.))(ix)~~ Multi-media: Filter beds ~~of this type~~
4680 shall contain a depth of fine media made up of anthracite ~~coal (specific gravity 1.5), specific~~
4681 ~~gravity 1.5;~~ silica sand (specific gravity 2.6), ~~specific gravity 2.6;~~ and garnet sand or ilemite
4682 (specific gravity 4.2-4.5), ~~specific gravity 4.2—4.5. (formerly Section 10(i)(ii)(B)(V)(5.)(a.))~~ The
4683 bBed depths and distribution ~~of the media~~ shall be determined by the water quality; and shall
4684 meet the following requirements:
4685
4686 ~~(formerly Section 10(i)(ii)(B)(V)(5.)(a.))(A)~~ Bed depths and
4687 ~~distribution shall be determined by the water quality but~~ There shall not be less than 10 inches
4688 ~~(0.25 m) of fine sand and 24 inches (0.61 m) of coal anthracite;~~ The relative size of the particles
4689 shall be such that hydraulic grading of the material during backwash will result in a filter bed
4690 with pore space graded progressively from coarse to fine in the direction of filtration (down).
4691

4692 ~~(formerly Section 10(i)(ii)(B)(V)(5.)(a.))~~(B) The relative size of
4693 the ~~particles media~~ shall be such that the hydraulic grading of the material during backwash will
4694 result in a ~~filter bed with~~ pore space ~~graded that~~ progressively goes from coarse to fine in the
4695 direction of ~~filtration (down) flow~~;

4696
4697 ~~(formerly Section 10(i)(ii)(B)(V)(5.)(b.))~~ (C) The multi-media shall
4698 be supported on two layers of special high-density gravel placed above the conventional silica
4699 gravel supporting bed; ~~The special gravel shall have a specific gravity not less than 4.2. The~~
4700 ~~bottom layer shall consist of particles passing No. 5 and retained on No. 12 U.S. mesh sieves~~
4701 ~~and shall be 1 ½ inches (3.8 cm) thick. The top layer shall consist of particles passing No. 12 and~~
4702 ~~retained on No. 20 U.S. mesh sieves, and shall be 1 ½ inches (3.8 cm) thick.~~

4703
4704 ~~(formerly Section 10(i)(ii)(B)(V)(5.)(b.))~~ (D) The special gravel
4705 shall have a specific gravity not less than 4.2;

4706
4707 ~~(formerly Section 10(i)(ii)(B)(V)(5.)(b.))~~ (E) The bottom layer
4708 shall consist of particles passing ~~No. U.S. Standard 5 mesh sieves~~ and retained ~~on in No. U.S.~~
4709 ~~Standard 12 U.S. mesh sieves~~ and shall be 1 ½ inches ~~(3.8 cm)~~ thick; and

4710
4711 ~~(formerly Section 10(i)(ii)(B)(V)(5.)(b.))~~ (F) The top layer shall
4712 consist of particles passing ~~No. U.S. Standard 12 mesh sieves~~ and retained on U.S. Standard No.
4713 ~~20 U.S. mesh sieves~~; and shall be 1 ½ inches ~~(3.8 cm)~~ thick.

4714
4715 ~~(formerly Section 10(j))~~(x) Diatomaceous earth filtration shall comply with the
4716 following requirements; ~~These types of filters may be used as the filtration process to remove~~
4717 ~~turbidity from surface waters where turbidities entering the filters do not exceed 25 TU and~~
4718 ~~where total raw water coliforms do not exceed 100 organisms/100 ml. These filters may be used~~
4719 ~~where the raw water quality exceeds the above limits when flocculation and sedimentation are~~
4720 ~~used preceding the filters. Diatomaceous earth filters may also be used for removal of iron from~~
4721 ~~groundwaters.~~

4722
4723 ~~(formerly Section 10(j))~~(A) ~~These types of Diatomaceous earth filters~~
4724 may be used under the following circumstances:

4725
4726 ~~(formerly Section 10(j))~~(I) ~~filters may be used as the filtration~~
4727 ~~process t~~To remove turbidity from surface waters where turbidities entering the filters do not
4728 exceed 25 NTU and where total raw water coliforms do not exceed 100 organisms/100 mL;

4729
4730 ~~(formerly Section 10(j))~~(II) ~~These filters may be used w~~Where
4731 the raw water quality exceeds the ~~above~~ previously mentioned limits when flocculation and
4732 sedimentation are used preceding the filters; and

4733
4734 ~~(formerly Section 10(j))~~(III) ~~Diatomaceous earth filters may also~~
4735 ~~be used for removal of~~ To remove iron from groundwaters.

4736

4737 ~~(formerly Section 10(j)(i))(B) Types of filters. The proposed diatomaceous~~
4738 ~~earth filtration units shall include Ppressure or vacuum diatomaceous earth filtration units will be~~
4739 ~~considered for approval.~~ type units; and

4740
4741 ~~(formerly Section 10(j)(ii))(C) Precoat.~~ A precoating system shall
4742 be provided.

4743
4744 (D) The proposed diatomaceous earth filtration shall include a
4745 continuous monitoring turbidimeter with recorder on each filter effluent for plants treating
4746 surface water.

4747
4748 (l) All designs that propose supplies of surface water, groundwater under the direct
4749 influence of surface water, and groundwater that does not meet 40 CFR Part 141 or where other
4750 treatment is provided, shall include disinfection via one of the following methods:

4751
4752 (i) Chlorine;

4753
4754 (ii) Chloramines, recommended only for secondary disinfection;

4755
4756 (iii) Chlorine dioxide;

4757
4758 (iv) Ozone;

4759
4760 (v) Ultraviolet light; or

4761
4762 (vi) Other disinfecting agents that demonstrate reliable application equipment
4763 is available and that include testing procedures for a residual that is recognized in Standard
4764 Methods for the Examination of Water and Wastewater 2018.

4765
4766 (m) All designs that require disinfection shall demonstrate that:

4767
4768 (i) The system will maintain a detectable residual throughout the distribution
4769 system; and

4770
4771 (ii) The applicant has considered the formation of disinfection byproducts
4772 when selecting the disinfection.

4773
4774 ~~(formerly Section 10(k))(n) Disinfection equipment shall comply with the following~~
4775 ~~requirements: Chlorine, chlorine dioxide, ozone or other disinfectant as approved by the~~
4776 ~~administrator may be used for disinfection. Where the primary disinfectant is ozone, chlorination~~
4777 ~~equipment shall be provided to enable maintaining a residual disinfectant throughout the~~
4778 ~~distribution system. Automatic proportioning of disinfectant feed to flow rate is required where~~
4779 ~~the plant flow control is automatic.~~

4780
4781 ~~(formerly Section 10(k)(i))(i) Chlorination equipment shall comply with~~
4782 ~~NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN 600-2021 and the following requirements:-~~

4783
4784 ~~(formerly Section 10(k)(i)(A))(A)~~ Type. Solution feed gas chlorinators
4785 ~~or hypochlorite feeders of the positive displacement type~~ Positive displacement pumps shall be
4786 provided for solution feed gas chlorinators or hypochlorite feeders;

4787
4788 ~~(formerly Section 10(k)(i)(E))(B)~~ Diffuser. The chlorine solution
4789 ~~injection injector/diffuser shall provide a rapid and thorough mix with all the water being treated.~~
4790 ~~If the application point is to a pipeline discharging to a clearwell, the chlorine shall be added to~~
4791 ~~the center of the pipe at least 10 pipe diameters upstream of the discharge into the clearwell.;~~

4792
4793 ~~(formerly Section 10(k)(i)(E))(C)~~ _____ If the application point is to a
4794 pipeline discharging to a clearwell, the chlorine shall be added to the center of the pipe at least
4795 10 pipe diameters upstream of the discharge into the clearwell.;

4796
4797 (D) _____ Gas chlorinators shall comply with the following requirements:

4798
4799 ~~(formerly Section 10(k)(i)(F))(I)~~ Injector/Eductor. For gas feed
4800 ~~chlorinators, t~~The injector/eductor eductor shall be selected based on solution ~~water~~ pressure,
4801 injector ~~waterflow rate~~ water flowrate, feed point backpressure, and chlorine solution line length
4802 and size. ~~The maximum feed point backpressure shall not exceed 110 psi (759 kPa). Where~~
4803 ~~backpressure exceeds 110 psi (750 kPa), a chlorine solution pump shall be used. Gauges shall be~~
4804 ~~provided for chlorine solution pressure, feed water pressure and chlorine gas pressure, or~~
4805 ~~vacuum.~~

4806
4807 ~~(formerly Section 10(k)(i)(F))(II)~~ _____ The maximum feed point
4808 backpressure shall not exceed 110 psi ~~(759 kPa).~~ unless ~~Where backpressure exceeds 110 psi~~
4809 ~~(750 kPa), a chlorine solution pump shall be is used.;~~ and

4810
4811 ~~(formerly Section 10(k)(i)(F))(III)~~ _____ Gauges shall be provided for
4812 chlorine solution pressure, feed water pressure and chlorine gas pressure, or vacuum.

4813
4814 ~~(formerly Section 10(k)(i)(C))(E)~~ Standby equipment. Standby
4815 equipment of sufficient capacity shall be available to replace the largest chlorinator unit. ~~;~~ except
4816 ~~for a w~~Well water systems providing no treatment other than disinfection are exempt from the
4817 requirements of this paragraph (E) and are not required to provide standby chlorination
4818 equipment.

4819
4820 ~~(formerly Section 10(k)(ii))(ii)~~ _____ Points of application and contact time shall
4821 comply with the following requirements.;

4822

4823 (A) Filtration types shall comply with the contact time and minimum chlorine
4824 residuals required in Table 3 of this Section after the appropriate baffling factor has been applied
4825 to the reactor. Contact times assume a baffling factor of 0.1 unless documentation justifying the
4826 use of a higher baffling factor is provided. Contact time requirements are based on worst-case
4827 operating conditions of water temperature of 32.9 degrees Fahrenheit and pH of 9.
4828
4829

Table 3. Required Contact Time and Residual by Filtration Type

<u>Filtration Type</u>	<u>Required Contact Time (minutes), 0.4 mg/L minimum chlorine residual</u>	<u>Required Contact Time (minutes), 1.0 mg/L minimum chlorine residual</u>
<u>Conventional Filtration</u>	<u>162.5</u>	<u>73</u>
<u>Direct Filtration, Bag or Cartridge Filtration, Slow Sand Filtration, Diatomaceous Earth Filtration</u>	<u>325</u>	<u>146</u>
<u>Membrane Filtration (MF or UF)</u>	<u>30</u>	<u>12</u>

4830
4831
4832 (B) When chlorine is applied to a groundwater source to maintain a
4833 residual, no contact time is required.
4834

4835 (o) Systems that propose disinfection via ultraviolet light shall comply with the
4836 following requirements:
4837

4838 (i) Proposed designs for ultraviolet light shall include the following
4839 information in the ultraviolet reactor influent water quality analysis:
4840

4841 (A) Influent temperature (degrees Fahrenheit);
4842

4843 (B) UV transmittance (UVT) at a reported wavelength of 254 nm and a
4844 pathlength of 1 cm;
4845

4846 (C) A description of the UVT range over a 12-month period;
4847

4848 (D) Total hardness (mg/L as CaCO₃);
4849

4850 (E) pH;
4851

4852 (F) Alkalinity (mg/L as CaCO₃);
4853

4854 (G) Total iron (mg/L) influent < 0.3mg/L;
4855

4856 (H) Calcium (mg/L); and
4857

- 4858 (I) Total manganese (mg/L) influent <0.03 mg/L
- 4859
- 4860 (ii) Proposed designs for ultraviolet disinfection systems shall include the
- 4861 following information:
- 4862
- 4863 (A) The maximum, average, and minimum flowrates;
- 4864
- 4865 (B) A matrix that identifies paired flow and ultraviolet treatment values;
- 4866
- 4867 (C) A description of the organisms targeted for inactivation;
- 4868
- 4869 (D) Log inactivation requirements;
- 4870
- 4871 (E) Operating approach (UV intensity vs. calculated dose);
- 4872
- 4873 (F) Maximum and minimum operating pressures;
- 4874
- 4875 (G) Maximum pressure at the UV reactor;
- 4876
- 4877 (H) UV system redundancy;
- 4878
- 4879 (I) Lamp cleaning strategy;
- 4880
- 4881 (J) Mercury trap for broken UV lamps;
- 4882
- 4883 (K) Maximum headloss through the UV reactor;
- 4884
- 4885 (L) A demonstration that the UV reactor(s) shall be hydrostatically
- 4886 tested to 1.5 times the rated operating pressure;
- 4887
- 4888 (M) A demonstration that the UV reactor(s) shall be designed to ensure
- 4889 that plant personnel can change lamps and the UV intensity meter without draining the reactor;
- 4890 and
- 4891
- 4892 (N) A demonstration that the units shall meet NSF/ANSI/CAN
- 4893 Standard 61.
- 4894
- 4895 (iii) Ultraviolet treatment systems shall be designed to comply with the
- 4896 Ultraviolet Disinfection Guidance Manual for the Final LT2ESWTR and the following dose
- 4897 requirements:
- 4898
- 4899 (A) The UV disinfection system shall deliver a validated dose that
- 4900 meets or exceeds the required dose at the end of lamp life, with fouled sleeves.
- 4901
- 4902 (B) The minimum required validated dose used for system design shall
- 4903 incorporate a Combined Age and Fouling Factor (CAF), calculated as:

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CAF = EOLL x FF.

EOLL is the ratio of the lamp output at the end of life relative to the new lamp output

FF is the fouling factor.

(C) The EOLL shall be 75 percent of the new lamp output.

(D) The FF shall be:

(I) 0.5 for UV systems with no sleeve wiping system;

(II) 0.75 for UV systems with mechanical wiping only; or

(III) 0.95 for UV systems with a combined online chemical and mechanical cleaning.

(E) The validated dose that meets or exceeds the required dose shall be delivered under maximum flow and design (UVT) condition, when the larger UV unit is out of service.

(iv) Ultraviolet disinfection shall comply with the following validation requirements:

(A) The applicant shall submit the manufacturer's bioassay validation report for the proposed UV reactor with the permit application;

(B) The bioassay testing and results shall demonstrate validation by an independent third party in full compliance with the Ultraviolet Disinfection Guidance Manual for the Final LT2ESWTR;

(C) The owner and engineer shall submit a certification to the Administrator if validation requirements are adjusted and identify each of the equipment and system modifications required to ensure that the appropriate dosage is provided for the inactivation requirements;

(D) Bioassay testing shall evaluate reactor performance over the range of:

(I) Flowrates (maximum, average, and minimum);

(II) UVT from 70 percent to 98 percent (measured at 254 nm, 1 cm path length); and

4950 (III) RED at maximum flowrate and design UVT conditions.

4951
4952 (E) The bioassay testing shall incorporate the range of design and
4953 operating conditions described in paragraph (o)(i) of this Section for UV Light;

4954
4955 (F) Extrapolations to flowrates, UV transmittance values, or UV doses
4956 outside the range actually tested, are not permitted; and

4957
4958 (G) Bioassay testing shall also verify that the head loss generated by
4959 the proposed reactor is less than or equal to the specified limits.

4960
4961 (v) Ultraviolet disinfection hydraulics shall comply with the following
4962 requirements:

4963
4964 (A) The inlet and outlet piping configuration to the UV reactor shall
4965 result in a UV dose delivery that is equal to or greater than the dose delivered when the UV
4966 reactor was validated;

4967
4968 (B) If the UV reactor validation is performed off-site, the applicant
4969 shall refer to the validation report to determine the validated inlet and outlet conditions that apply
4970 to the site-specific requirements; and

4971
4972 (C) Ultraviolet hydraulic piping shall comply with at least one of the
4973 following requirements:

4974
4975 (I) The piping configuration shall consist of a minimum of 10
4976 pipe diameters of straight pipe upstream and five pipe diameters of straight pipe downstream of
4977 the UV reactors, with additional pipe diameters above the minimum if required by the
4978 manufacturer's guidelines for electromagnetic or other flowmeter installation;

4979
4980 (II) The inlet and outlet piping configurations shall be identical
4981 to those constructed for the UV reactor validation; or

4982
4983 (III) If on-site validation or custom off-site validation is
4984 planned, the inlet and outlet piping hydraulics must be designed according to the manufacturer's
4985 recommendations and to accommodate any site-specific constraints.

4986
4987 (vi) Ultraviolet control and measurement instrumentation for each reactor shall
4988 comply with the following requirements:

4989
4990 (A) Each reactor shall be capable of measuring UV intensity and lamp
4991 status (on/off);

4992
4993 (B) For systems that use the calculated dose monitoring strategy, each
4994 reactor shall be capable of measuring or calculating the UV transmittance;

4995

4996 (C) Piping for each UV reactor shall be sized and configured in
4997 accordance with the validated operating conditions and maintain equal head loss through each
4998 reactor over the range of validated flowrates. Each UV reactor shall not be by-passed;
4999

5000 (D) Each UV reactor train shall have a dedicated flow meter to confirm
5001 the validated operating conditions;
5002

5003 (E) UV lamps in the UV reactor shall be submerged at all times during
5004 operation;
5005

5006 (F) The specific configuration of the UV reactor(s) within a facility
5007 will dictate the use of air release, air/vacuum, or combination air valves to prevent air pockets
5008 and negative pressure conditions and the design shall verify that the UV manufacturer was
5009 consulted to determine any equipment-specific air release and pressure control valve
5010 requirements;
5011

5012 (G) Each UV reactor shall have the piping configured so that it can be
5013 isolated and removed from service while the other UV reactor(s) remain in service; and
5014

5015 (H) A booster pump shall be used if the head loss constraints indicate
5016 that a pump is necessary. The UV reactor shall be sized accordingly.
5017

5018 (vii) The applicant shall describe the dose monitoring strategy and the
5019 operational approach for the UV reactor that complies with the approaches described in
5020 Ultraviolet Disinfection Guidance Manual for the Final LT2ESWTR, part 3.5.2.
5021

5022 (viii) The cleaning system for each UV reactor shall comply with the following
5023 requirements:
5024

5025 (A) Each UV reactor shall be equipped with an automatic online
5026 mechanical lamp sleeve cleaning system and may include optional chemical cleaning;
5027

5028 (B) The UV sensor shall include mechanical cleaning capabilities with
5029 an automatically initiated and controlled cleaning cycle; and
5030

5031 (C) The UV reactor(s) shall be fully operational and shall provide
5032 validated dose requirements during system cleaning.
5033

5034 (ix) The minimum spare parts kept at a facility shall include the following:
5035

5036 (A) 20 percent of the UV Lamps;
5037

5038 (B) Five percent of the lamp sleeves; and
5039

5040 (C) One UV intensity sensor.
5041

5042 ~~(formerly Section 10(o))(p)~~ Facilities that propose disinfection via Fluoridation and
5043 defluoridation shall comply with the following requirements:

5044
5045 ~~(formerly Section 10(o)(i))(i)~~ Fluoride compound storage designs shall
5046 demonstrate that: ~~Storage tanks shall be covered; all storage shall be inside a building. Storage~~
5047 ~~tanks for hydrofluosilie acid shall be vented to the atmosphere at a point outside the building.~~

5048
5049 ~~(formerly Section 10(o)(i))(A)~~ Fluoride Sstorage tanks shall be
5050 covered;

5051
5052 ~~(formerly Section 10(o)(i))(B)~~ Aall other storage shall be inside a
5053 building; and

5054
5055 ~~(formerly Section 10(o)(i))(C)~~ Storage tanks for of hydrofluosilie
5056 hydrofluorosilicic acid shall be vented to the atmosphere at a point outside the building.

5057
5058 ~~(formerly Section 10(o)(i))(ii)~~ Chemical feed equipment. Fluoride feed
5059 equipment shall meet the following requirements:

5060
5061 ~~(formerly Section 10(o)(ii)(A))(A)~~ There shall be Sscales or ~~loss of~~
5062 weight loss recorders ~~shall be provided~~ for dry chemical feeds and the Ffeeders shall be accurate
5063 to within five percent of any desired feed rate;

5064
5065 ~~(formerly Section 10(o)(ii)(B))(B)~~ The point of application of
5066 hydrofluosilie hydrofluorosilicic acid, if into a horizontal pipe, shall be in the lower half of the
5067 pipe;

5068
5069 ~~(formerly Section 10(o)(ii)(B))(C)~~ Fluoride compounds shall not be added
5070 before lime soda ~~softening~~ or ion exchange softening;

5071
5072 ~~(formerly Section 10(o)(ii)(C))(D)~~ A fluoride solution shall be applied
5073 by a positive displacement pump having a stroke rate not less than 20 nor more than 95 strokes
5074 per minute. Fluoride solutions shall not be injected to a point of negative pressure;

5075
5076 ~~(formerly Section 10(o)(ii)(C))(E)~~ Fluoride The solutions shall not be
5077 injected ~~to~~ into a point of negative pressure;

5078
5079 ~~(formerly Section 10(o)(ii)(D))(F)~~ All fluoride feed lines and dilution
5080 water lines shall be isolated from the potable water supplies by either an air gap above the
5081 solution tank or a reduced pressure principal backflow ~~preventor~~ preventer;

5082
5083 ~~(formerly Section 10(o)(ii)(E))(G)~~ Water used for sodium fluoride
5084 fluoride dissolution solution shall have a hardness not exceeding ~~50 mg/L~~ 45 mg/L; and
5085 ~~Softening shall be provided for the solution water where hardness exceeds 45 mg/L.~~

5086

5087 ~~(formerly Section 10(o)(ii)(F))~~(H) Flow meters for treated water flow
5088 rate and fluoride solution water shall be provided.

5089
5090 ~~(formerly Section 10(o)(iv)(A))~~(iii) Provisions shall be made to allow the
5091 transfer of dry fluoride compounds from shipping containers to storage bins or hoppers ~~in such a~~
5092 ~~way as to~~ that minimize the quantity of fluoride dust ~~which that~~ may enter the room ~~in which~~
5093 where the equipment is installed. and shall meet the following requirements: The enclosure shall
5094 be provided with an exhaust fan and dust filter which places the hopper under a negative
5095 pressure. Air exhausted from fluoride handling equipment shall discharge through a dust filter to
5096 the outside atmosphere of the building. The discharge shall not be fresh air intake.

5097
5098 ~~(formerly Section 10(o)(iv)(A))~~(A) ~~The enclosure~~The transfer system
5099 shall be ~~provided~~ equipped with an exhaust fan and dust filter ~~which that~~ places the hopper or
5100 storage bin under negative pressure.;

5101
5102 ~~(formerly Section 10(o)(iv)(A))~~(B) Air exhausted from fluoride handling
5103 equipment shall discharge through a dust filter to the atmosphere outside the building. ~~The~~
5104 discharge and shall not ~~be located near a building~~ discharge within 50 feet of a fresh air intake
5105 for the building.; and

5106
5107 ~~(formerly Section 10(o)(iv)(B))~~(C) A floor drain shall be provided for
5108 cleaning equipment and maintenance.

5109
5110 (iv) The following methods are acceptable for fluoride removal:

5111
5112 ~~(formerly Section 10(o)(vi)(A))~~(A) Activated alumina may be ~~employed~~
5113 used in open gravity filters tanks or pressure filter tanks. ~~The minimum media depth shall be 5~~
5114 feet. The units shall not be loaded at a rate exceeding 4 gallons per minute per square foot (236
5115 m³/m²-d). The activated alumina media shall be in mesh sizes ranging from 28 to 48.
5116 ~~Regeneration facilities shall be provided to regenerate the media. These shall include both weak~~
5117 ~~caustic and weak acid systems.~~

5118
5119 ~~(formerly Section 10(o)(vi)(A))~~(B) The minimum media depth shall be 5
5120 five feet.;

5121
5122 ~~(formerly Section 10(o)(vi)(A))~~(C) The ~~units shall not be loaded~~ loading
5123 at a rate exceeding shall not exceed 4 gallons per minute per square foot gpm/ft² (236 m³/m²-d).;

5124
5125 ~~(formerly Section 10(o)(vi)(A))~~(D) The mesh size for the activated
5126 alumina media shall be in mesh sizes ranging from between #28 to and #48.;

5127
5128 ~~(formerly Section 10(o)(vi)(A))~~(E) Media Regeneration facilities shall
5129 be provided ~~to regenerate the media. These~~ and shall include both weak caustic and weak acid
5130 systems.; and

5131

5132 ~~(formerly Section 10(o)(vi)(B))(F)~~ Bone char filtration or lime softening
5133 with magnesium addition may be used.

5134
5135 (v) Water that is unstable due either to natural causes or to subsequent
5136 treatment shall be stabilized.

5137
5138 (vi) Facilities shall have the capability of feeding both acid and alkalinity.

5139
5140 ~~(formerly Section 10(q)(iv))(vii)——Alkali feed.~~ Unstable water created by ion
5141 exchange softening shall be stabilized by an alkali feed. ~~An alkali feeder shall be provided for all~~
5142 ~~ion-exchange water softening plants.~~

5143
5144 ~~(formerly Section 10(q)(v))(viii) Control.~~ Laboratory equipment shall be
5145 provided ~~for to determining~~ determine the effectiveness of stabilization treatment. This shall
5146 include testing equipment for hardness, calcium, alkalinity, pH₂ and magnesium; at as-a
5147 minimum.

5148
5149 ~~(formerly Section 10(q))(q) Taste and odor control equipment. Provision shall be made~~
5150 ~~for the control of taste and odor at all surface water treatment plants.~~ shall comply with the
5151 following requirements:

5152
5153 ~~(formerly Section 10(q)(v))(i) Granular activated carbon adsorption units.~~
5154 Open or closed, granular activated carbon ~~contacting~~ adsorption units may be used to absorb
5155 organics for taste and odor control. ~~by adsorption of organics subject to the following~~
5156 requirements. The loading rate shall not exceed 10 gpm/ft² (236 m³/m²-d). The minimum
5157 empty bed contact time shall be 20 minutes. Provisions shall be made for moving carbon to and
5158 from the contactors.

5159
5160 ~~(formerly Section 10(q)(v))(A)~~ The loading rate shall not exceed 10
5161 gpm/ft² ~~(236 m³/m²-d).~~;

5162
5163 ~~(formerly Section 10(q)(v))(B)~~ The minimum empty bed contact
5164 time shall be 20 minutes.;

5165
5166 ~~(formerly Section 10(s)(i))(C) Adsorption of organics on granular~~
5167 ~~activated carbon. Water to be treated may be contacted with granular activated carbon.~~ The pH
5168 of the water shall be less than 9.0 with a turbidity of less than 2 NTU when using packed beds.;
5169 ~~The turbidity of the applied water shall be less than 2 TU when packed beds are used.~~

5170
5171 ~~(formerly Section 10(q)(v))(D)~~ There shall be Provisions ~~shall be~~
5172 ~~made~~ for moving the carbon to and from the contactors.;

5173
5174 ~~(formerly Section 10(s)(iii)(A))(E) If an upflow countercurrent~~
5175 ~~contactors is used, it may be either packed or expanded. A single unit is acceptable. If a~~
5176 ~~downflow contactor is used, two or more beds in parallel are required.~~ Contactors may be

5177 upflow or downflow design. A single unit is acceptable for countercurrent upflow designs.
5178 Downflow designs shall have two or more parallel units;

5179
5180 ~~(formerly Section 10(s)(iii)(B))(F)~~ Contactors ~~may~~ shall be designed as
5181 open gravity ~~units~~, or pressure beds.; ~~They may be constructed of concrete, steel, or fiberglass~~
5182 ~~reinforced plastic. Steel vessels shall be protected against corrosion by coaltar epoxy coating,~~
5183 ~~rubber or glass lining, or other means.~~

5184
5185 (G) Pressure contactors shall have an air-vacuum relief valve fitted
5186 with a stainless-steel screen to prevent plugging;

5187
5188 ~~(formerly Section 10(s)(iii)(B))(H)~~ They may be constructed ~~The~~
5189 contactor materials of construction shall be concrete, steel, or fiberglass reinforced plastic, and
5190 shall meet the following requirements:

5191
5192 ~~(formerly Section 10(s)(iii)(B))(I)~~ Steel vessels shall be
5193 protected against corrosion ~~by coaltar epoxy coating, rubber or glass lining, or other means;~~ and
5194

5195 ~~(formerly Section 10(s)(iii)(B))(II)~~ Inlet and outlet screens shall
5196 be made of stainless steel or other suitable materials.

5197
5198 ~~(formerly Section 10(s)(iii)(C))(I)~~ All carbon beds or columns ~~There~~
5199 shall be ~~equipped with~~ provisions for flow reversal and bed expansion. ~~that meet the following~~
5200 requirements: ~~Combination downflow filter contactors shall have backwashing facilities to~~
5201 ~~provide up to 50 percent bed expansion and shall meet the same backwash criteria as rapid~~
5202 ~~filters.~~

5203 ~~(formerly Section 10(s)(iii)(C))(I)~~ Combination downflow filter
5204 contactors shall have ~~b~~Backwashing facilities to shall provide up to 50 percent bed expansion;
5205 and

5206
5207 ~~(formerly Section 10(s)(iii)(C))(II)~~ Backwashing facilities shall
5208 meet the ~~same~~ backwash criteria as rapid filters.

5209
5210 ~~(formerly Section 10(q)(vii))(ii)~~ Ozone. If ozone is used for taste and odor
5211 control, there shall be at least ~~Thirty~~ 10 minutes of contact time ~~must be provided~~ to complete ~~the~~
5212 all ~~chemical~~ reactions ~~involved~~, and ~~the facilities shall be capable of an~~ minimum applied feed
5213 rate of ozone ~~feed rate of~~ shall be ~~15~~ 1 mg/L ~~minimum~~, or the design shall identify a contact
5214 time and feed rate that demonstrate the application of ozone will not cause an exceedance of the
5215 maximum contaminant levels identified at 40 CFR 143.3.

5216
5217 (r) Designs that include the addition of phosphates for stabilization and corrosion
5218 control shall demonstrate the evaluation of reactions with aluminum and impacts on wastewater
5219 treatment plants to overcome the secondary impacts of phosphates that may potentially limit
5220 their use.

5221

5222 (s) Designs that propose anion-exchange treatment shall include a pH/alkalinity feed
5223 system unless otherwise approved by the Administrator.

5224
5225 ~~(formerly Section 10(r))(t) Microscreening-~~ Microscreens shall comply with the
5226 following requirements: A microscreen will be allowed as a mechanical supplement to treatment.
5227 ~~The microscreening shall be capable of removing suspended matter from the water by straining.~~
5228 ~~It may be used to reduce nuisance organisms and organic loadings. It shall not be used in place~~
5229 ~~of filtration or coagulation.~~

5230
5231 ~~(formerly Section 10(r))(i)~~ A microscreen will shall be allowed as a mechanical
5232 supplement to treatment but it shall not be used in place of filtration or coagulation-;

5233
5234 ~~(formerly Section 10(r))(ii)~~ The microscreening screen shall be capable of
5235 removing suspended matter from the water by straining-;

5236
5237 ~~(formerly Section 10(r)(i))(iii)~~ Screens shall be made of a corrosion-
5238 resistant material, plastic or stainless steel-;

5239
5240 ~~(formerly Section 10(r)(ii))(iv)~~ Bypass piping around the unit shall be
5241 provided around the unit-;

5242
5243 ~~(formerly Section 10(r)(iii))(v)~~ There shall be pProtection against back
5244 siphonage shall be provided when potable water is used for washing the screen-; and

5245
5246 ~~(formerly Section 10(r)(iv))(vi)~~ ~~Washwaters~~ Wash water shall be wasted and
5247 not recycled to the microscreen.

5248
5249 (u) Membrane technologies shall comply with the following requirements:

5250
5251 (i) Proposed membrane treatment processes shall comply with the
5252 requirements of Section 6 of this Chapter. Protocols for pilot plant testing shall incorporate
5253 guidance or procedures from the US EPA Membrane Filtration Guidance Manual, Chapter 6.

5254
5255 (ii) All proposed membrane filters shall demonstrate third-party validation for
5256 the removal of Giardia or Cryptosporidium. Removal efficiency shall be determined through
5257 challenge testing as outlined in the US EPA Membrane Filtration Guidance Manual and one of
5258 the following:

5259
5260 (A) Membranes that are used as final compliance filters of a multiple
5261 treatment barrier approach shall meet the requirements of 40 CFR Part 141; or

5262
5263 (B) All surface water or groundwater under direct influence (GWUDI)
5264 systems using membrane technology shall demonstrate minimum disinfection that meets 4.0-Log
5265 virus inactivation.

5267 (v) Facilities that propose bag and cartridge filters shall comply with the procedures
5268 identified in Section 6 of this Chapter and the following requirements:

5269
5270 (i) Filter performance will be based on Cryptosporidium oocyst removal;

5271
5272 (ii) The filter shall demonstrate at least a 3-log removal of particle size 1
5273 micron and above with an associated log reduction credit of 2-logs for Giardia and
5274 Cryptosporidium;

5275
5276 (iii) Removal efficiency shall be determined through challenge testing as
5277 outlined in Toolbox Guidance Manual, Chapter 8 and NSF/ANSI 419-2018;

5278
5279 (iv) The performance demonstration shall be specific to the corresponding
5280 housing and type or model of filter. Any other combination of housing and filter that could be
5281 used for treatment shall also demonstrate filter efficiency;

5282
5283 (v) Applicants shall include documentation that the proposed bag or cartridge
5284 filter has received third-party validation for the removal of Giardia and Cryptosporidium;

5285
5286 (vi) Filter and housing specifications shall include a description of the
5287 materials of construction, surface area per filter, and the minimum and maximum operating
5288 pressure, and the specifications shall meet the requirements of NSF/ANSI 419-2018 and the
5289 Toolbox Guidance Manual, Chapter 8;

5290
5291 (vii) System components such as housing, bags, cartridges, gaskets, and O-
5292 rings shall comply with NSF/ANSI/CAN 61 for leaching of contaminants;

5293
5294 (viii) A means for monitoring the performance of the filter shall be provided and
5295 shall include at a minimum flow meters and valves, pressure gauges, and sample taps;

5296
5297 (ix) The proposed design shall specify chemical compatibility limitations;

5298
5299 (x) A minimum of two filter housings shall be provided;

5300
5301 (xi) Bag or cartridge filters that are used as final compliance filters of a
5302 multiple treatment barrier approach shall meet the requirements of 40 CFR Part 141; and

5303
5304 (xii) All surface water or GWUDI systems using bag or cartridge filter
5305 technology shall provide at minimum disinfection that meets 4.0-log virus inactivation and 1.0-
5306 log Giardia inactivation or shall demonstrate that combined filtration and disinfection will
5307 provide 3-log removal.

5308
5309 (w) Pre-engineered water treatment plants shall comply with the following
5310 requirements:

5312 (i) Pre-engineered water treatment plants shall be permitted on a case-by-case
5313 basis for specific process applications and flow rates. Multiple units may be installed in parallel
5314 to accommodate flow rates.

5315 (ii) Pre-engineered water treatment plant equipment shall be designed in
5316 accordance with NSF/ANSI/CAN 61 and NSF/ANSI/CAN 372;

5317 (iv) Pre-engineered water treatment plants shall comply with the procedures in
5320 Section 6 of this Chapter to obtain data that demonstrates the treatment effectiveness of the
5321 treatment for the source water and the proposed application; and

5322 (v) Each component and process of the pre-engineered water treatment plant
5323 shall demonstrate compliance with the applicable design criteria of the respective treatment
5324 processes of this Chapter.

5325 (x) Wastes shall be handled and disposed of as follows:

5326 ~~(formerly Section 10(u)(i))~~(i) Sanitary and laboratory wastes. The sanitary
5327 and laboratory wastes from water treatment plants, pumping stations, ~~ete.~~or well systems, shall
5328 not be recycled to any part of the water plant. ~~Waste from these facilities must and shall be~~
5329 discharged directly to into a sanitary sewer system when feasible, ~~or to an on-site waste~~
5330 ~~treatment facility permitted by the Wyoming Department of Environmental Quality.~~ or a
5331 permitted on-site disposal system;

5332 ~~(formerly Section 10(u)(ii))~~(ii) Brine waste. ~~The waste~~ from ion exchange
5333 plants, demineralization plants, ~~ete., and other similar facilities~~ may not be recycled to the water
5334 plant. and shall meet the following requirements: ~~Where discharging to a sanitary sewer, a~~
5335 ~~holding tank shall be provided to prevent the overloading of the sewer and interference with the~~
5336 ~~waste treatment process. Where disposal to an off-site waste treatment system is proposed, the~~
5337 ~~sewer and treatment facility shall have the required capacity and dilution capability.~~

5338 ~~(formerly Section 10(u)(ii))~~(A) Where discharging to a sanitary sewer, a
5339 holding tank shall be provided to prevent the overloading of the sewer and/or interference with
5340 the waste treatment processes; and ~~The effect of brine discharge to sewage lagoons may depend~~
5341 ~~on the rate of evaporation from the lagoons.~~

5342 ~~(formerly Section 10(u)(ii))~~(B) Where disposal to an off-site waste
5343 treatment system is proposed, it must be demonstrated that the sewer and the treatment facility
5344 shall have the required capacity and dilution capability. ~~The impact on any treatment system~~
5345 ~~discharge shall be evaluated.~~

5346 ~~(formerly Section 10(u)(iii))~~(iii) ~~Lime softening sludge.~~ Acceptable methods
5347 of-treatment and disposal of lime softening sludge are ~~as follows:~~

5348 (A) Sludge lagoons, provided that the design of sludge lagoons
5349 includes:

5358
5359 ~~(formerly Section 10(u)(iii)(A))(I)~~ for The location of the lagoon
5360 shall be protected from above the 100-year flood ~~or adequately protected from the 100-year~~
5361 ~~flood.~~

5362
5363 ~~(formerly Section 10(u)(iii)(A))(II)~~ There shall be A means of
5364 diverting surface water runoff so that it does not flow into the lagoons;

5365
5366 ~~(formerly Section 10(u)(iii)(A))(III)~~ Minimum free board The
5367 freeboard shall be a minimum of 3 three feet ~~(0.66 m) shall be present.;~~

5368
5369 ~~(formerly Section 10(u)(iii)(A))(IV)~~ An adjustable decanting
5370 device for recycling the overflow ~~shall be present.;~~ and

5371
5372 ~~(formerly Section 10(u)(iii)(A))(V)~~ There shall be aAn accessible
5373 effluent sampling point.

5374
5375 ~~(formerly Section 10(u)(iii)(B))(B)~~ Land application of liquid lime
5376 softening sludge; shall comply with Part E of that demonstrates compliance with Water Quality
5377 Rules Chapter 11, Part E of the Water Quality Rules and Regulations.

5378
5379 ~~(formerly Section 10(u)(iii)(C))(C)~~ Disposal at a suitable landfill; shall
5380 be authorized by the Solid Waste Management Program of the Department of Environmental
5381 Quality.

5382
5383 ~~(formerly Section 10(u)(iii)(D))(D)~~ Mechanical dewatering of sludge
5384 may be employed-used.;

5385
5386 ~~(formerly Section 10(u)(iii)(E))(E)~~ Recalcination of sludge may be
5387 employed-used.; and

5388
5389 ~~(formerly Section 10(u)(iii)(F))(F)~~ Lime sludge drying beds shall not be
5390 used allowed.

5391
5392 ~~(formerly Section 10(u)(iv))(iv)~~ Acceptable methods of treatment and
5393 disposal of Alum sludge-are as follows:

5394
5395 ~~(formerly Section 10(u)(iv)(A))(A)~~ Lagooning Lagoons may be used as
5396 a storage and interim disposal method for alum sludge. Lagoons used for storage shall have a
5397 The volume of alum sludge storage lagoons shall be at least 100,000 gallons (378.5 m³) per for
5398 every 1,000,000 gpd (3,785 m³/d) of facility water treatment plant treating capacity.

5399
5400 ~~(formerly Section 10(u)(iv)(B))(B)~~ Discharge of alum sludge to sanitary
5401 sewers may be used only when the sewage system has the capability to adequately handle the
5402 flow and sludge. Alum sludge may be discharged to the sanitary sewer only when the system is
5403 capable of handling the waste and with the approval of the owner of the sewer system.

5404
5405 ~~(formerly Section 10(u)(iv)(C))(C)~~ Mechanical dewatering ~~of sludge~~
5406 may be ~~employed~~ used.

5407
5408 ~~(formerly Section 10(u)(iv)(D))(D)~~ Alum sludge drying beds may be used.

5409
5410 ~~(formerly Section 10(u)(iv)(E))(E)~~ Alum sludge may be acid treated and
5411 recovered.

5412
5413 ~~(formerly Section 10(u)(iv)(F))(F)~~ Disposal at a suitable landfill ~~shall be~~
5414 ~~authorized by the Solid Waste Management Program of the Department of Environmental~~
5415 ~~Quality.~~

5416
5417 (v) Designs that propose disposal of waste filter wash water from iron and manganese
5418 removal plants that include sand filters shall demonstrate the inclusion of a separate structure,
5419 unless otherwise approved by the Administrator.

5420
5421 **Section 13. ~~Finished Water Storage~~ Chemical Application.**

5422
5423 ~~(moved to Section 15(b))(a) — General. Steel finished water storage structures shall be~~
5424 ~~provided using the requirements of the AWWA D100 or AWWA D103. All tank design and~~
5425 ~~foundation design shall be performed by a registered professional engineer and the plans or~~
5426 ~~contractor furnished information shall so designate the registered engineer providing the design.~~
5427 ~~Materials other than steel may be used for water storage tanks.~~

5428
5429 ~~(i) — Sizing. Storage facilities shall have the capacity to meet domestic~~
5430 ~~demands, and where required, fire protection storage.~~

5431
5432 ~~(A) — Water systems serving less than 50,000 gallons (189 m³) on the~~
5433 ~~design average daily demand shall provide clearwell and system storage capacity equal to the~~
5434 ~~average daily demand.~~

5435
5436 ~~(B) — Water systems serving from 50,000 to 500,000 gallons (189-1,892~~
5437 ~~m³) on the design average daily demand shall provide clearwell and system storage capacity~~
5438 ~~equal to the average daily demand plus fire storage, based on recommendations established by~~
5439 ~~the State Fire Marshall or local fire agency.~~

5440
5441 ~~(C) — Water systems serving in excess of 500,000 gallons (1,892 m³) on~~
5442 ~~the design average daily demand shall provide clearwell and system storage capacity equal to 25~~
5443 ~~percent of the design maximum daily demand, plus added fire storage based on~~
5444 ~~recommendations established by the State Fire Marshall or local fire agency.~~

5445
5446 ~~(moved to Section 15(c)(iv))(D) — Storage need not be provided in a~~
5447 ~~well supply system where a minimum of two wells are provided and the maximum hour demand~~
5448 ~~or fire demand, whichever is greater, can be supplied with the largest well out of service.~~

5449

5450 (ii) ~~Location of ground level reservoirs.~~

5451

5452 (A) ~~The bottom of reservoirs and standpipes shall be above or~~
5453 ~~protected from the 100-year flood or highest flood of record, whichever is greater.~~

5454

5455 (B) ~~When the bottom is below normal ground surface, it shall be~~
5456 ~~placed above the groundwater table. Sewers, drains, standing water, and similar sources of~~
5457 ~~possible contamination must be kept at least 50 feet (15.2 m) from the reservoir. Watermain pipe,~~
5458 ~~pressure tested in place to 50 psi (345 kPa) without leakage, may be used for gravity sewers at~~
5459 ~~distances greater than 20 feet (6.1 m) and less than 50 feet (15.2 m).~~

5460

5461 (C) ~~The top of the reservoir walls shall not be less than 18 inches (0.46~~
5462 ~~m) above normal ground surface. Clearwells constructed under filters are exempted from this~~
5463 ~~requirement when the total design gives the same protection.~~

5464

5465 (iii) ~~Protection. All finished water storage structures shall have suitable~~
5466 ~~watertight roofs which exclude birds, animals, insects, and excessive dust.~~

5467

5468 (iv) ~~Protection from trespassers. Security type fencing, locks on access~~
5469 ~~manholes, and other precautions shall be provided to prevent trespassing, vandalism, and~~
5470 ~~sabotage at above ground storage facilities. Below ground level storage facilities may be exempt~~
5471 ~~from the fencing requirements.~~

5472

5473 (v) ~~Drains. No drain on a water storage structure may have a direct connection~~
5474 ~~to a sewer or storm drain. Water storage structures drained to sewer or storm drains shall be~~
5475 ~~drained through piping which allows an air gap such that the drain pipe is at least three pipe~~
5476 ~~diameters above the ground level at the drain point to the sanitary or storm drain.~~

5477

5478 (vi) ~~Overflow. All water storage structures shall be provided with an overflow~~
5479 ~~which is brought down to an elevation between 12 and 24 inches (0.3-0.61 m) above the ground~~
5480 ~~surface, and discharges over a drainage inlet structure or a splash plate. No overflow may be~~
5481 ~~connected directly to a sewer or a storm drain. All overflow pipes shall be located so that any~~
5482 ~~discharge is visible.~~

5483

5484 (A) ~~When an internal overflow pipe is used on elevated tanks, it shall~~
5485 ~~be located in the access tube. For vertical drops on other types of storage facilities, the overflow~~
5486 ~~pipe shall be located on the outside of the structure.~~

5487

5488 (moved to Section 15(f)(iv))(B) ~~The overflow of a ground level~~
5489 ~~structure shall open downward and be screened with noncorrodible screen installed within the~~
5490 ~~pipe at a location least susceptible to damage by vandalism.~~

5491

5492 (C) ~~The overflow pipe shall be of sufficient diameter to permit wasting~~
5493 ~~of water in excess of the filling rate.~~

5494

5495 ~~(vii) — Access. Finished water storage structures shall be designed with access to~~
5496 ~~the interior for cleaning and maintenance. Manholes above the waterline shall be framed at least~~
5497 ~~4 inches (0.1 m) above the surface of the roof at the opening; on ground level structures,~~
5498 ~~manholes should be elevated a minimum of 24 inches (0.61 m) above the top. The manholes~~
5499 ~~shall be fitted with a solid watertight cover which overlaps the framed opening and extends down~~
5500 ~~around the frame at least 2 inches (5 cm). The cover shall be hinged at 1 side and shall have a~~
5501 ~~locking device. The man hold shall have a minimum inside opening diameter of 24 inches.~~

5502
5503 ~~(moved to Section 15(i))(viii) Vents. Finished water storage structures shall be~~
5504 ~~vented. Overflows shall not be considered as vents. Open construction between the sidewall and~~
5505 ~~roof is not permissible. Vents shall prevent the entrance of surface water and rainwater, and shall~~
5506 ~~exclude birds and animals.~~

5507
5508 ~~(moved to Section 15(i)(i))(A) — For elevated tanks and standpipes, 24~~
5509 ~~mesh noncorrodible screen may be used.~~

5510
5511 ~~(B) — For ground level structures, the vents shall terminate in an inverted~~
5512 ~~U construction with the opening a minimum of 24 inches (0.61 m) above the roof and covered~~
5513 ~~with 24 mesh noncorrodible screen installed within the pipe at a location least susceptible to~~
5514 ~~vandalism.~~

5515
5516 ~~(ix) — Roof and sidewall. The roof and sidewalls of all structures shall be~~
5517 ~~watertight with no openings except properly constructed vents, manholes, overflows, risers,~~
5518 ~~drains, pump mountings, control ports, or piping for inflow and outflow.~~

5519
5520 ~~(x) — Painting and/or cathodic protection. Protection shall be given to metal~~
5521 ~~surfaces by paints or other protective coatings, by cathodic protective devices, or by both.~~
5522 ~~Materials and procedures shall conform to AWWA Standard D102. Paint systems, after proper~~
5523 ~~curing, shall not transfer any substance to the water which will be toxic or cause tastes or odors.~~
5524 ~~Paints containing lead or mercury shall not be used. All paints and other protective coatings shall~~
5525 ~~be compatible.~~

5526
5527 ~~(xi) — Disinfection. Finished water storage structures shall be specified to be~~
5528 ~~disinfected in accordance with AWWA Standard D105. Sampling shall be specified.~~

5529
5530 ~~(b) — Plant storage.~~

5531
5532 ~~(i) — Washwater tanks. Washwater tanks shall be sized, in conjunction with~~
5533 ~~available pump units and finished water storage, to provide the backwash water required by~~
5534 ~~Section 10 (i). The storage and pumping shall be sized so that a minimum of two filters may be~~
5535 ~~backwashed in rapid succession.~~

5536
5537 ~~(moved to Section 15(m)(i))(ii) — Clearwell. Clearwell storage shall be sized,~~
5538 ~~in conjunction with distribution system storage, to relieve the filters from having to follow~~
5539 ~~fluctuations in water use. Where water is pumped from clearwater storage to the system, an~~
5540 ~~overflow shall be provided.~~

5541
5542 (iii) ~~Adjacent compartments. Finished water must be separated from~~
5543 ~~unfinished water in adjacent compartments by double walls.~~

5544
5545 (moved to Section 15(m)(iii)(iv) ~~Basins and wetwells. Receiving basins and~~
5546 ~~and pump wetwells for finished water shall be designed as finished water storage structures.~~

5547
5548 (e) ~~Hydropneumatic tanks. Hydropneumatic (pressure) tanks may be used as the only~~
5549 ~~storage facility when the system serves less than 50 homes. When servicing more than 50 homes,~~
5550 ~~ground or elevated storage designed in accordance with Section 13(a) should be provided.~~
5551 ~~Pressure tank storage is not to be considered for fire protection purposes. Pressure tanks shall~~
5552 ~~meet ASME code requirements or local laws and regulations for the construction and installation~~
5553 ~~of unfired pressure vessels.~~

5554
5555 (i) ~~Location. The tank shall be located above normal ground surface and be~~
5556 ~~completely housed.~~

5557
5558 (ii) ~~Sizing. The capacity of the wells and pumps in a hydropneumatic system~~
5559 ~~shall be at least 10 times the average daily consumption rate. The gross volume of the~~
5560 ~~hydropneumatic tank, in gallons, shall be at least 10 times the capacity of the largest pump, rated~~
5561 ~~in gallons per minute. For example, a 250 gpm (1,364 m³/d) pump should have a 2,500 gallon~~
5562 ~~(9.46 m³) pressure tank.~~

5563
5564 (iii) ~~Piping. The tank shall be plumbed with bypass piping.~~

5565
5566 (iv) ~~Appurtenances. Each tank shall have an access manhole, a drain, and~~
5567 ~~control equipment consisting of pressure gauge, water tight glass, automatic or manual air~~
5568 ~~blowoff, means for adding air, and pressure operated startstop controls for the pumps.~~

5569
5570 (a) 2018 TSS, parts 5.0.2(f), chemical application, general, chemical application;
5571 5.0.3-5.0.3(h), chemical application, general, general equipment design; 5.1.2-5.1.2(e)(4.),
5572 chemical application, feed equipment, control; 5.1.3-5.1.3(c), chemical application, feed
5573 equipment, dry chemical feeders; 5.1.4-5.1.4(d), chemical application, feed equipment, positive
5574 displacement solution feed pumps; 5.1.5-5.1.5(d), chemical application, feed equipment, liquid
5575 chemical feeders-siphon control; 5.1.6-5.1.6(d), chemical application, feed equipment, cross-
5576 connection control; 5.1.8-5.1.8(e), chemical application, feed equipment, in-plant water supply;
5577 5.1.9(a)(1-3), (b), and (d), chemical application, feed equipment, storage of chemicals; 5.1.10-
5578 5.1.10(j), chemical application, feed equipment, bulk liquid storage tanks; 5.1.11-5.1.11(h),
5579 chemical application, feed equipment, day tanks; 5.1.12-5.1.12(e), chemical application, feed
5580 equipment, feed lines; 5.1.13-5.1.3(d); chemical application, feed equipment, handling; 5.1.14-
5581 5.1.14(b), chemical application, feed equipment, housing; 5.3.2, operator safety, respiratory
5582 protection equipment; 5.3.3, operator safety, chlorine gas leak detection; 5.4.1(d)(1-5) and (7-
5583 10), (f), and (h), specific chemicals, chlorine gas; 5.4.1(f) and (h), 5.4.2-5.4.2(b), specific
5584 chemicals, acids and caustics; 5.4.3-5.4.3(c)(5.), specific chemicals, sodium chlorite; 5.4.4-
5585 5.4.4(b)(5.), specific chemicals, sodium hypochlorite; are herein incorporated by reference.
5586

5587 ~~(formerly Section 11(b))~~(b) Chemical application facilities designs shall comply with
5588 the following requirements:

5589
5590 ~~(formerly Section 11(b)(i))~~(i) Number of feeders: A separate feeder shall be
5591 provided used for each chemical applied; and

5592
5593 ~~(formerly Section 11(b)(viii)(D))~~(ii) All ~~e~~Chemical storage tanks shall be
5594 constructed of materials ~~which that~~ are resistant to the chemicals ~~which they store~~ stored. ~~The~~
5595 ~~t~~Tanks shall ~~not lose its~~ maintain structural integrity ~~through chemical action or be subject to~~
5596 ~~corrosion~~ while in use.

5597
5598 ~~(formerly Section 8(i)(iv))~~(c) Alarms: Chemical application facilities shall include an alarm for
5599 Hhigh effluent turbidity, low chlorine residual, and chlorine leaks ~~(when chlorine gas is used)~~
5600 ~~shall be alarmed at an attended location~~. The alarm shall be located at an attended location.

5601
5602 **Section 14. ~~Distribution Systems~~ Pumping Facilities.**

5603
5604 (a) ~~Materials:~~

5605
5606 ~~(moved to Section 16(b))(i)~~ ~~Types of commercial pipe approved for water~~
5607 ~~systems include:~~

5608
5609 ~~(moved to Section 16(b)(i))(A)~~ ~~—PVC water pipe: ASTM D2241, less~~
5610 ~~than 4" diameter (10 cm); AWWA C900: 4" (10 cm) and larger diameter.~~

5611
5612 ~~(B)~~ ~~—Asbestos cement pressure pipe: AWWA C400.~~

5613
5614 ~~(moved to Section 16(b)(ii))(C)~~ ~~Ductile iron pipe: AWWA C151.~~

5615
5616 ~~(moved to Section 16(b)(iii))(D)~~ ~~—Glass fiber reinforced~~
5617 ~~thermosetting resin pressure pipe: AWWA C950.~~

5618
5619 ~~(moved to Section 16(b)(iv))(E)~~ ~~—Polyethylene: AWWA C901.~~

5620
5621 ~~(F)~~ ~~—Polybutylene: AWWA C902.~~

5622
5623 ~~(ii)~~ ~~—Used materials. Watermains and valves which have been used previously~~
5624 ~~for conveying potable water may be reused provided they are in good working order and can~~
5625 ~~meet these standards. No other used materials may be employed.~~

5626
5627 ~~(moved to Section 16(c)(iii))~~ ~~—Joints. Packing and jointing materials used in the~~
5628 ~~joints of pipe shall be flexible and durable. Flanged piping shall not be used for buried service~~
5629 ~~except for connections to valves; push-on or mechanical joints shall be used.~~

5630
5631 ~~(iv)~~ ~~—Service connections. Service connections shall mean and include any~~
5632 ~~water line or pipe connected to a distribution supply main or pipe for the purpose of conveying~~

5633 ~~water to a building or dwelling. All service connections shall be constructed in conformance with~~
5634 ~~the Uniform Plumbing Code.~~

5635
5636 ~~(moved to Section 16(d))(b) — Watermain design.~~

5637
5638 ~~(i) — Pressure. All watermains, including those not designed to provide fire~~
5639 ~~protection, shall be sized after a hydraulic analysis based on flow demands and pressure~~
5640 ~~requirements. The system shall be designed to maintain a minimum pressure of 20 psi (138 kPa)~~
5641 ~~at ground level at all points in the distribution system under all conditions of flow. The normal~~
5642 ~~working pressure in the distribution system shall be not less than 35 psi (276 kPa).~~

5643
5644 ~~(ii) — Diameter. The minimum size of a watermain for providing fire protection~~
5645 ~~and serving fire hydrants shall be 6 inches (0.15 m) diameter when service is provided from 2~~
5646 ~~directions, or where the maximum length of 6 inches pipe serving the hydrant from 1 direction~~
5647 ~~does not exceed 250 feet, or 8 inches (0.2 m) where service is provided from 1 direction only.~~
5648 ~~Larger size mains shall be provided as necessary to allow the withdrawal of the required fire~~
5649 ~~flow while maintaining the minimum residual pressure of 20 psi (138 kPa).~~

5650
5651 ~~(moved to Section 16(d)(i))(iii) — Fire protection. When fire protection is to be~~
5652 ~~provided, system design shall be such that fire flows can be served.~~

5653
5654 ~~(iv) — Small mains. Any main smaller than 6 inches (0.15 m) shall be justified by~~
5655 ~~hydraulic analysis and future water use.~~

5656
5657 ~~(v) — Hydrants. Only watermains designed to carry fire flows shall have fire~~
5658 ~~hydrants connected to them.~~

5659
5660 ~~(vi) — Deadends. Deadends shall be minimized by looping.~~

5661
5662 ~~(vii) — Flushing. Where deadend mains occur they shall be provided with a~~
5663 ~~flushing hydrant or blowoff for flushing purposes. Flushing devices shall be sized to provide~~
5664 ~~flows which will give a velocity of 2.5 feet per second minimum in the watermain being flushed.~~
5665 ~~No flushing device shall be directly connected to any sewer.~~

5666
5667 ~~(e) — Valves. Valves shall be provided on watermains so that inconvenience and~~
5668 ~~sanitary hazards will be minimized during repairs. Valves shall be located at not more than 500~~
5669 ~~foot (152 m) intervals in commercial districts and at not more than 1 block or 800 foot (244 m)~~
5670 ~~intervals in other districts.~~

5671
5672 ~~(d) — Hydrants.~~

5673
5674 ~~(moved to Section 16(f)(i))(i) Hydrant leads. The hydrant lead shall be a~~
5675 ~~minimum of 6 inches (0.15 m) in diameter. Valves shall be installed in all hydrant leads.~~

5676
5677 ~~(moved to Section 16(e)(iii))(ii) — Protection from freezing. Provisions shall be~~
5678 ~~made to protect fire hydrant leads and barrels from freezing. The use of hydrant weep holes is~~

5679 ~~not allowed when groundwater levels are above the gravel drain area. In these cases it will be~~
5680 ~~necessary to pump the hydrant dry or use other means of dewatering.~~

5681
5682 ~~(moved to Section 16(f)(v))(iii)——Drainage. Hydrant drains shall not be~~
5683 ~~connected to or located within 10 feet (3.05 m) of sanitary sewers or storm drains.~~

5684
5685 ~~(e)——Air relief valves; Valve, meter and blowoff chambers.~~

5686
5687 ~~(i)——Air relief valves. In all transmission lines and in distribution lines 16~~
5688 ~~inches and larger at high points (where the water pipe crown elevation falls below the pipe invert~~
5689 ~~elevation), provisions shall be made for air relief. Fire hydrants or active service taps may be~~
5690 ~~substituted for air relief valves on 6 and 8 inch lines. Manholes or chambers for automatic air~~
5691 ~~relief valves shall be designed to prevent submerging the valve with groundwater or surface~~
5692 ~~water.~~

5693
5694 ~~(ii)——Chamber drainage. Chambers, pits or man holes containing valves,~~
5695 ~~blowoffs, meters, or other such appurtenances to a distribution system, shall not be connected~~
5696 ~~directly to any storm drain or sanitary sewer, nor shall blowoffs or air relief valves be connected~~
5697 ~~directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where~~
5698 ~~they are not subject to flooding by surface water or to absorption pits underground. Where~~
5699 ~~drainage cannot be provided, a sump for a permanent or portable pump shall be provided.~~

5700
5701 ~~(moved to Section 16(h))(f)——Excavation, bedding, installation, backfill.~~

5702
5703 ~~(moved to Section 16(h)(i))(i)Excavation. The trench bottom shall be excavated~~
5704 ~~for the pipe bell. All rock shall be removed within 6 inches (15.2 cm) of the pipe. The trench~~
5705 ~~shall be dewatered for all work.~~

5706
5707 ~~(moved to Section 16(h))(ii)——Bedding. Bedding shall be designed in accordance~~
5708 ~~with ASTM C12 types A, B, C for rigid pipe and ASTM D2321 types I, II, III for flexible~~
5709 ~~pipe.~~

5710
5711 ~~(iii)——Installation. The pipe shall be joined to assure a watertight fitting. Ductile~~
5712 ~~iron pipe shall be installed in accordance with AWWA 600 and PVC piping shall be installed in~~
5713 ~~accordance with AWWA manual M23.~~

5714
5715 ~~(moved to Section 16(k))(iv)——Backfill. Backfill shall be performed without~~
5716 ~~disturbing pipe alignment. Backfill shall not contain debris, frozen material, unstable material, or~~
5717 ~~large clods. Stones greater than 3 inches (7.6 cm) in diameter shall not be placed within 2 feet~~
5718 ~~(0.6 m) of pipe. Compaction shall be to a density equal to or greater than the surrounding soil.~~

5719
5720 ~~(v)——Cover. All watermains shall be located to protect them from freezing and~~
5721 ~~frost heave.~~

5722
5723 ~~(vi)——Blocking. All tees, bends, plugs, and hydrants shall be provided with~~
5724 ~~reaction blocking, tie rods, or joints designed to prevent movement.~~

5725
5726 (vii) ~~—Pressure and leakage testing. All types of installed pipe shall be specified~~
5727 ~~to be pressure tested and leakage tested in accordance with AWWA Standard C600.~~
5728

5729 (viii) ~~—Disinfection. All new, cleaned, repaired, or reused watermains shall be~~
5730 ~~specified to be disinfected in accordance with AWWA Standard C601. Specifications shall~~
5731 ~~include detailed procedures for the adequate flushing, disinfection, and microbiological testing of~~
5732 ~~all watermains.~~
5733

5734 ~~(moved to Section 16(l))(g) —Separation of watermains, sanitary sewers and storm~~
5735 ~~sewers.~~
5736

5737 (i) ~~—Horizontal and vertical separation from sewer lines. Minimum horizontal~~
5738 ~~separation shall be 10 feet (3 m) where the invert of the watermain is less than 1.5 feet (0.46 m)~~
5739 ~~above the crown of the sewer line. Minimum vertical separation shall be 1.5 feet (0.46 m) at~~
5740 ~~crossings. Joints in sewers at crossings shall be located at least 10 feet (3 m) from water mains.~~
5741 ~~The upper line of a crossing shall be specially supported. Where vertical and/or horizontal~~
5742 ~~clearances cannot be maintained, the sewer or water line shall be placed in a separate conduit~~
5743 ~~pipe.~~
5744

5745 ~~(formerly Section 14)(g)(ii) —Sewer manholes. No water pipe shall pass through~~
5746 ~~or come in contact with any part of a sewer manhole.~~
5747

5748 (h) ~~—Surface water crossings.~~
5749

5750 (i) ~~—Above water crossings. The pipe shall be adequately supported and~~
5751 ~~anchored, protected from damage and freezing, and accessible for repair or replacement.~~
5752

5753 (ii) ~~—Underwater crossings. A minimum cover of 2 feet (0.61 m) shall be~~
5754 ~~provided over the pipe. When crossing water courses which are greater than 15 feet (4.6 m) in~~
5755 ~~width, the following shall be provided:~~
5756

5757 (A) ~~—The pipe shall be of special construction, having flexible watertight~~
5758 ~~joints.~~
5759

5760 (B) ~~—Valves shall be provided at both ends of water crossings so that the~~
5761 ~~section can be isolated for testing or repair; the valves shall be easily accessible and not subject~~
5762 ~~to flooding; and the valve closest to the supply source shall be located in a manhole.~~
5763

5764 ~~(moved to Section 16(l))(i) —Cross connections.~~
5765

5766 ~~(moved to Section 16(l))(i)(i) Cross connections. There shall be no water service~~
5767 ~~connection installed or maintained between a public water supply and any water user whereby~~
5768 ~~unsafe water or contamination may backflow into the public water supply.~~
5769

5770 ~~(moved to Section 16(1)(i)(A))(A) — Applicability. In order to protect all~~
5771 ~~public water supplies from the possibility of the introduction of contamination due to cross~~
5772 ~~connections, the water supplier shall require backflow prevention devices for each water service~~
5773 ~~connection in accordance with Table 1 which appears at the end of this section, with the~~
5774 ~~exception of (B)(I) residential water service connections and (B)(II) domestic non-residential~~
5775 ~~water service connections. The water supplier shall take appropriate actions which may include~~
5776 ~~immediate disconnection for any water user that fails to maintain a properly installed backflow~~
5777 ~~prevention device or comply with other measures as identified in Section 14 (i) of these~~
5778 ~~regulations.~~

5779
5780 ~~(moved to Section 16(1)(i)(A)(III))(I) Any high hazard non-~~
5781 ~~residential connection to any public water supply shall be protected by the appropriate backflow~~
5782 ~~prevention device.~~

5783
5784 ~~(II) — Any service connection made to facilities constructed under~~
5785 ~~a permit to construct issued after adoption of this regulation, Section 14 (i), shall be in full~~
5786 ~~compliance with this section. This requirement applies to all service connections made or~~
5787 ~~initially activated after the adoption of this regulation.~~

5788
5789 ~~(moved to Section 16(1)(i)(A)(IV))(III) — Water suppliers shall~~
5790 ~~establish record keeping and management procedures to ensure that requirements of this~~
5791 ~~regulation for installation and maintenance of backflow prevention devices are being met.~~

5792
5793 ~~(moved to Section 16(1)(i)(B))(B) — The method of backflow control,~~
5794 ~~selected from Table 1, shall be determined based upon the degree of hazard of the cross~~
5795 ~~connection and the cause of the potential backflow. Hazards shall be classified as high hazard or~~
5796 ~~low hazard. The potential cause of the backflow shall be identified as being back siphonage or~~
5797 ~~back pressure.~~

5798
5799 ~~(moved to Section 16(1)(i)(B)(I))(I) — Residential water service~~
5800 ~~connections shall be considered to be low hazard back siphonage connections, unless determined~~
5801 ~~otherwise by a hazard classification.~~

5802
5803 ~~(moved to Section 16(1)(i)(B)(II))(II) Domestic non-residential~~
5804 ~~water service connections shall be considered to be low hazard back pressure connections, unless~~
5805 ~~determined otherwise by a hazard classification conducted by the water supplier. Examples~~
5806 ~~include schools without laboratories, churches, office buildings, warehouses, motels, etc.~~

5807
5808 ~~(moved to Section 16(1)(i)(B)(III))(III) — Any water user's~~
5809 ~~system with an auxiliary source of supply shall be considered to be a high hazard, back pressure~~
5810 ~~cross connection. A reduced pressure principle backflow device shall be installed at the water~~
5811 ~~service connection to any water user's system with an auxiliary source of supply.~~

5812
5813 ~~(moved to Section 16(1)(i)(B)(V))(IV) — All water loading~~
5814 ~~stations shall be considered high hazard connections. A device, assembly, or method consistent~~
5815 ~~with Table 1 shall be provided.~~

5816
5817 ~~(moved to Section 16(1)(i)(B)(VI))(V) — Non-domestic~~
5818 ~~commercial or industrial water service connections shall be considered to be high-hazard back~~
5819 ~~pressure connections, unless determined otherwise by a hazard classification. Examples include~~
5820 ~~restaurants, refineries, chemical mixing facilities, sewage treatment plants, mortuaries,~~
5821 ~~laboratories, laundries, dry cleaners, irrigation systems, facilities producing or utilizing~~
5822 ~~hazardous substances, etc. For some of these service connections, a hazard classification may~~
5823 ~~result in a determination of a back-siphonage or low-hazard classification. The backflow~~
5824 ~~prevention device required shall be appropriate to the hazard classification. Where potential high~~
5825 ~~hazards exist within the non-residential water user's system, even though such high hazards may~~
5826 ~~be isolated at the point of use, an approved backflow prevention device shall be installed and~~
5827 ~~maintained at the water service connection.~~

5828
5829 ~~(moved to Section 16(1)(i)(C))(C) — Determination of the hazard~~
5830 ~~classification of a water service connection is the responsibility of the water supplier. The water~~
5831 ~~supplier may require the water user to furnish a hazard classification survey to be used to~~
5832 ~~determine the hazard classification.~~

5833
5834 ~~(moved to 5(o))(D) — Hazard classifications shall be conducted by hazard~~
5835 ~~classification surveyors that are certified by the USC Foundation for Cross-Connection Control~~
5836 ~~and Hydraulic Research, the American Association of Sanitary Engineers (ASSE), or by another~~
5837 ~~state certification program approved by the administrator, or by a water distribution system~~
5838 ~~operator also certified as a backflow device tester employed by the public water supplier for the~~
5839 ~~service where the survey is being conducted.~~

5840
5841 ~~(moved to Section 16(1)(i)(E))(E) — All backflow prevention devices~~
5842 ~~must be in-line serviceable (repairable), in-line testable except for devices meeting ASSE~~
5843 ~~Standard #1024, and installed in accordance with manufacturer instructions and applicable~~
5844 ~~plumbing codes.~~

5845
5846 ~~(moved to Section 16(1)(i)(F))(F) — All backflow prevention devices~~
5847 ~~must have a certification by an approved third-party certification agency. Approved certification~~
5848 ~~agencies are:~~

5849
5850 ~~(moved to Section 16(1)(i)(F)(I))(I) — American Society of Sanitary~~
5851 ~~Engineers (ASSE),~~

5852
5853 ~~(moved to Section 16(1)(i)(F)(II))(II) — International Association of~~
5854 ~~Plumbing/Mechanical officials (IAPMO), and~~

5855
5856 ~~(moved to Section 16(1)(i)(F)(III))(III) — Foundation for Cross-~~
5857 ~~Connection Control and Hydraulic Research, University Of Southern California~~
5858 ~~(USC_FCCCHR).~~

5859

5860 ~~(moved to Section 16(1)(i)(G))(G) — Backflow prevention devices at~~
 5861 ~~water service connections shall be inspected and certified by a certified backflow assembly tester~~
 5862 ~~at the time of installation. Certification of the assembly tester shall be by one of the following:~~

5863
 5864 ~~(moved to Section 16(1)(i)(G)(I))(I) — The American Society~~
 5865 ~~Sanitary Engineers (ASSE);~~

5866
 5867 ~~(moved to Section 16(1)(i)(G)(II))(II) American Backflow~~
 5868 ~~Prevention Association (ABPA);~~

5869
 5870 ~~(III) — A state certification program approved by the~~
 5871 ~~administrator.~~

5872
 5873 ~~(moved to Section 16(1)(i)(H))(H) — Backflow prevention devices~~
 5874 ~~installed at high hazard non-residential cross connections shall be inspected and tested on an~~
 5875 ~~annual basis by a certified backflow assembly tester.~~

5876
 5877 ~~(moved to Section 16(1)(i)(I))(I) — The administrator may conduct~~
 5878 ~~inspections of backflow prevention devices. If any device is found to be defective or functioning~~
 5879 ~~improperly, it must be immediately repaired or replaced. Failure to make necessary repairs to a~~
 5880 ~~backflow prevention device will be cause for the water service connection to be terminated.~~

5881
 5882 ~~(moved to Section 16(1)(i)(J))(J) — All public water suppliers shall~~
 5883 ~~report any high hazard backflow incident within seven (7) days to the Wyoming Department of~~
 5884 ~~Environmental Quality, Water Quality Division. The backflow incident shall be reported on a~~
 5885 ~~form provided by the administrator.~~

5886
 5887 ~~(moved to Section 16(1)(ii))(ii) — Recycling water. Neither steam condensate~~
 5888 ~~nor cooling water from engine jackets or other heat exchange devices shall be returned to the~~
 5889 ~~public water supply after it has passed through the water service connection.~~

5890
 5891 ~~(moved to Section 16(1)(ii) TABLE 1~~
 5892 ~~Backflow Prevention Devices, Assemblies and Methods~~

5893

Device, Assembly or Method	Degree of Hazard				Notes
	Low Hazard		High Hazard		
	Back- Siphonage	Back- Pressure	Back- Siphonage	Back- Pressure	
Airgap	X		X		See Note 1
Atmospheric Vacuum Breaker	X		X		Not allowed under continuous pressure
Spill-proof Pressure-type Vacuum	X		X		

Double Check Valve Backflow Preventer	X	X			
Pressure Vacuum Breaker	X		X		
Reduced Pressure Principle Backflow	X	X	X	X	See Note 2
Dual Check	X				Restricted to residential services

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5924

~~———— Note 1 Minimum Airgap for Water Distribution. For spouts with an effective opening diameter of one-half inch or less, the minimum airgap when the discharge is not affected by side walls shall be one inch. The minimum airgap when the discharge is affected by sidewalls shall be one and one-half inches. For effective openings greater than one-half inch, the minimum airgap shall be two times the effective opening diameter when the discharge is not affected by side walls. The minimum airgap when the discharge is affected by sidewalls shall be three times the effective opening diameter.~~

~~———— Note 2 Extreme Hazards. In the case of any water user’s system where, in the opinion of the water supplier or the administrator, an undue health threat is posed because of the presence of extremely toxic substances or potential back pressures in excess of the design working pressure of the device, the water supplier may require an air gap at the water service connection to protect the public water system.~~

(a) 2018 TSS, parts 6.1-6.1.1(e), location; 6.2, 6.2(b-e), pumping stations; 6.2.1-6.2.1(d), pumping stations, suction well; 6.2.2, 6.2.2(a-b), pumping stations, equipment servicing; 6.3.2, pumps, pump priming; 6.6.1, appurtenances, valves; 6.6.3-6.6.3(d), appurtenances, gauges and meters; 6.6.4-6.6.4(b), appurtenances, water seals; 6.6.5, appurtenances, controls; 6.6.6, appurtenances, standby power; are herein incorporated by reference.

~~(formerly Section 12(f))(b) Stairways and ladders. Stairways or ladders shall be provided between all floors, and in pits or compartments which that must be entered. They shall have handrails on both sides, and treads of non-slip material. The Wyoming Occupational Health and Safety Rules and Regulations shall be complied with.~~

~~(formerly Section 12(g))(c) Heating. Provisions Pumping facilities shall be made for heating heated to maintain a minimum temperature of 40° F degrees Fahrenheit (4° C) if not typically unoccupied and 50° F degrees Fahrenheit (10° C) if normally occupied.~~

5925 ~~(formerly Section 12(h))(d)~~ Pumping station Vventilation: designs shall demonstrate
5926 that: All accessible pumping station areas shall be ventilated. Ventilation may be continuous or
5927 intermittent. If intermittent, ventilation in areas normally visited by operating personnel shall be
5928 started automatically at not greater than 30 minute intervals. Permanently installed drywell
5929 ventilation shall provide at least 6 air changes per hour if continuous, and 12 air changes per hour
5930 if intermittent. Intermittent ventilating equipment shall ensure starting upon entry of operating
5931 personnel. Wetwells shall be designed to permit the use of portable blowers that will exhaust the
5932 space and continue to supply fresh air during access periods.

5933
5934 ~~(formerly Section 12(h))(i)~~ All accessible areas of the pumping station that are
5935 accessible areas shall be ventilated.

5936
5937 ~~(formerly Section 12(h))(ii)~~ Ventilation may be continuous or intermittent.

5938
5939 ~~(formerly Section 12(h))(iii)~~ Permanently installed dDrywell ventilation shall
5940 provide: at least 6 air changes per hour if continuous, and 12 air changes per hour if intermittent.

5941
5942 ~~(formerly Section 12(h))(A)~~ aAt least ~~6~~ six air changes per hour if
5943 continuous; and ~~12 air changes per hour if intermittent.~~

5944
5945 ~~(formerly Section 12(h))(B)~~ At least 30 air changes per hour if
5946 intermittent; with an automatic start upon operator entry into the area. ventilation in areas
5947 normally visited by operating personnel shall be started automatically at not greater than 30
5948 minute intervals. Intermittent ventilating equipment shall ensure starting upon entry of operating
5949 personnel.

5950
5951 ~~(formerly Section 12(h))(iv)~~ Wetwells ventilation shall provide 12 continuous air
5952 changes per hour or 60 intermittent air changes per hour and be designed to permit the use of
5953 portable blowers that will exhaust the space and ~~continue to~~ supply fresh air during the access
5954 periods.

5955
5956 ~~(formerly Section 12(i))(c)~~ Dehumidification: equipment shall be provided in below
5957 ground pumping stations; a means for dehumidification shall be provided. The facilities
5958 equipment shall be sized to maintain the a dewpoint at least 2 two degrees Fahrenheit below the
5959 coldest anticipated temperature of the water to be conveyed in the pipes.

5960
5961 ~~(formerly Section 12(k))(f)~~ Sanitary and other conveniences. All pumping
5962 stations that are manned ~~for~~ four or more hours per day shall be provided with potable water,
5963 lavatory, and toilet facilities. The Wwastes shall be discharged to the sanitary sewer or ~~to~~ an on-
5964 site waste treatment system.

5965
5966 (g) Pumps: design shall comply with the following requirements: At least two
5967 pumping units shall be provided. With the largest pump out of service, the remaining pump or
5968 pumps shall be capable of providing the maximum pumping rate of the system.

5969

5970 ~~(formerly Section 12(l))(i)~~ (i) At least two ~~pumping units~~ pumps shall be
5971 provided. With the largest pump out of service, the remaining pump or pumps shall be capable of
5972 providing the maximum pumping ~~rate~~ capacity of the system.

5973
5974 ~~(formerly Section 12(m))(ii)~~ (ii) ~~Suction lift.~~ Pumps shall be selected ~~so~~ such that the
5975 net positive suction head required ~~at maximum flow~~ (NPSHR) is less than the net positive
5976 suction head available (NPSHA) minus four (4) feet (1.2 m) ~~(1.2 m)~~ based on ~~the~~ hydraulic conditions
5977 and the altitude of the ~~pumping station~~ installation. If this condition ~~is not met~~ cannot be
5978 satisfied, ~~then a means of~~ priming shall be provided.

5979
5980 ~~(iii)(formerly Section 12(n))~~ (iii) ~~Surge control. Piping systems~~ A surge analysis shall
5981 be ~~designed to withstand the maximum possible surge (water hammer) from the pumping station,~~
5982 ~~or adequate surge control~~ provided to demonstrate if surge protection devices will be needed to
5983 protect the piping. Pressure relief valves are not acceptable as surge control.

5984
5985 ~~(formerly Section 12(a))(iv)~~ (iv) ~~Total dynamic head.~~ The calculated total dynamic
5986 head ~~rating of~~ for pumping units shall be based on pipe friction, pressure losses from piping pipe
5987 entrances, exits, appurtenances (~~bends, valves, etc.~~ such as valves and bends), and static head at
5988 the design flow.

5989
5990 (v) The station shall have a flow rate indicator and totalizing meter, and a
5991 method of recording the total water pumped.

5992
5993 ~~(formerly Section 12(o))(h)~~ (h) Booster pumps shall comply with the following
5994 requirements:

5995
5996 ~~(formerly Section 12(o)(i))(i)~~ (i) Booster pumps shall not produce ~~a pressure~~ less
5997 than 5 psi in suction lines. ~~Where~~ If the suction line has service connections, ~~booster pump intake~~
5998 the pressure shall be at least 35 psi (~~138 kPa~~) ~~when the pump is in~~ during normal operation and
5999 shall ~~be provided with~~ have a low-pressure cutoff switch ~~if the suction line pressure is a~~
6000 minimum of to maintain at least 20 psi (~~69 kPa~~).

6001
6002 (ii) For booster pumps used for fire suppression, no person shall install or
6003 maintain a water service connection to any premises where a fire pump has been installed on the
6004 service line to or within such premises unless the pump is equipped with one of the following:

6005
6006 (A) A low suction throttling valve or pilot-operated valve installed in
6007 the discharge piping that maintains positive pressure in the suction piping while monitoring
6008 pressure in the suction piping through a sensing line. The valve shall throttle the discharge of the
6009 pump when necessary so that suction pressure will not be reduced below 20 psi gauge when the
6010 pump is operating; or

6011
6012 (B) A variable-speed suction limiting control that is used to maintain a
6013 minimum positive suction pressure at the pump inlet by reducing the pump driver speed while
6014 monitoring pressure in the suction piping through a sensing line. The limiting control shall be set
6015 so that the suction pressure will not be reduced below 20 psi gauge while the pump is operating.

6016
6017 ~~(formerly Section 12(o)(ii))(iii)~~ Automatic or remote controlled led devices
6018 pumps shall have a range between the start and cutoff pressure ~~which that~~ will prevent the pump
6019 from cycling ~~of~~ more than ± one start every 15 minutes.

6020
6021 ~~(formerly Section 12(o)(iii))(iv)~~ In-line booster pumps shall be accessible for
6022 ~~servicing and repairs~~ maintenance. ~~The~~ There shall be access openings, as needed, ~~and vault~~
6023 ~~shall be large enough to~~ to allow the remove removal of the pump.

6024
6025 ~~(formerly Section 12(o))(v)~~ Individual home booster pumps shall not be allowed
6026 for any individual service from the public water supply main.

6027
6028 ~~(formerly Section 12(p))(vi)~~ ~~Automatic and remote controlled stations.~~
6029 ~~Conditions that may affect continuous delivery of water shall be alarmed at an attended location.~~
6030 Un-manned or remotely controlled pump stations shall have an alarm at an operator attended
6031 location for any conditions that may affect the continuous delivery of water.

6032
6033 (i) Pumping facility valves shall comply with the following requirements:

6034
6035 ~~(formerly Section 12(q)(i))(E)(i)~~ Air release. Air release valves shall be
6036 provided where the pipe crown is dropped in elevation. The discharge pipe from the valve shall
6037 have a minimum of an 8-inch air gap and shall be covered with a #24 mesh non-corrodible
6038 screen.

6039
6040 ~~(formerly Section 12(q)(i))(C)(ii)~~ Each pump shall either have an individual
6041 suction line or the suction lines shall be ~~so~~ manifolded such that they ~~will ensure~~ demonstrate
6042 similar hydraulic and operating conditions.

6043
6044 **Section 15. Laboratory Requirements Finished Water Storage.**

6045
6046 ~~(moved to Section 17(b))(a) — Test procedures. Test procedures for analysis of monitoring~~
6047 ~~samples shall conform to the 15th Edition of Standard Methods for the Examination of Water~~
6048 ~~and Wastewater.~~

6049
6050 ~~(moved to Section 17(c))(b) — Testing requirements. All treatment plants shall have the~~
6051 ~~capability to perform or contract for the self-monitoring analytical work required by the Safe~~
6052 ~~Drinking Water Act and/or state regulation. All plants shall, in addition, be capable of~~
6053 ~~performing or contracting the analytical work required to assure good management and control~~
6054 ~~of plant operation and performance.~~

6055
6056 ~~(moved to Section 17(d))(c) — Minimum requirements.~~

6057
6058 ~~(moved to Section 17(d)(i))(i) Location and space. The laboratory shall be located~~
6059 ~~away from vibrating machinery or equipment which might have adverse effects on the~~
6060 ~~performance of laboratory instruments or the analyst and shall be designed to prevent adverse~~
6061 ~~effects from vibration.~~

6062
6063 (i) ~~Where a full time chemist is proposed to work in the laboratory, a minimum of~~
6064 ~~400 square feet (37.2 m²) of floor space shall be provided in the laboratory. If more than two~~
6065 ~~persons will be working in the laboratory, 100 square feet (9.3 m²) of additional space shall be~~
6066 ~~provided for each additional person.~~

6067
6068 (moved to Section 17(d)(ii))(ii) ~~Materials. Walls shall have an easily~~
6069 ~~cleaned, durable and impervious surface. Two exit doors or openings shall be located to permit a~~
6070 ~~straight exit from the laboratory; one exit shall be directly to the outside of the building. Panic~~
6071 ~~hardware shall be used. Interior doors shall have glass windows.~~

6072
6073 (moved to Section 17(d)(iii))(iii) ~~Cabinets and bench tops. Cabinet and~~
6074 ~~storage space shall be provided for dust free storage of instruments and glassware.~~

6075
6076 (moved to Section 17(d)(iii))(iii) ~~Bench top height shall be 30 inches (0.91 m). Tops~~
6077 ~~should be field joined into a continuous surface with acid, alkali, and solvent resistant cements.~~

6078
6079 (moved to Section 17(d)(iv))(iv) ~~Hoods. Fume hoods shall be provided where~~
6080 ~~reflux or heating of toxic or hazardous materials is required. A hood shall not be situated near a~~
6081 ~~doorway, unless a secondary means of exit is provided. All switches, electrical outlets, and utility~~
6082 ~~and baffle adjustment handles shall be located outside the hood. Light fixtures shall be~~
6083 ~~explosion proof. Twenty four hour continuous exhaust capability shall be provided. Exhaust fans~~
6084 ~~shall be explosion proof.~~

6085
6086 (moved to Section 17(d)(v))(v) ~~Sinks. The laboratory shall have a minimum~~
6087 ~~of 2 sinks per 400 ft² (37.2 m²) (not including cup sinks). Sinks shall be double well with~~
6088 ~~drainboards and shall be made of epoxy resin or plastic. All water fixtures shall be provided with~~
6089 ~~reduced pressure zone backflow preventers. Traps constructed of glass, plastic, or lead and~~
6090 ~~accessible for cleaning shall be provided.~~

6091
6092 (vi) ~~Ventilation and lighting. Laboratories shall be separately heated and~~
6093 ~~cooled, with external air supply for 100 percent makeup volume. Separate exhaust ventilation~~
6094 ~~shall be provided. Ventilation outlet locations shall be remote from ventilation inlets.~~

6095
6096 (vi) ~~Lighting shall provide 100 foot candles at the bench top.~~

6097
6098 (vii) ~~Gas. If gas is required in the laboratory, natural gas shall be supplied.~~

6099
6100 (moved to Section 17(d)(vi)) (viii) ~~Water still. Distilled water shall conform to~~
6101 ~~the quality specified by Standard Methods for the Examination of Water and Wastewater, 15th~~
6102 ~~Edition.~~

6103
6104 (ix) ~~Emergency shower and eye wash. All laboratories shall be equipped with~~
6105 ~~an emergency eye wash and shower that is located within the laboratory.~~

6107 ~~(moved to Section 17(e))(d) — Portable testing equipment. Portable testing equipment~~
6108 ~~shall be provided where necessary for operational control testing.~~

6109
6110 (a) 2018 TSS, parts 7.0.1-7.0.1(c), sizing; 7.0.2-7.0.2(b), location of finished water
6111 storage structures; 7.0.3, protection from contamination; 7.0.4, security; 7.0.5, drains; 7.0.6, stored
6112 water age; 7.0.9-7.0.9(e), vents; 7.0.10-7.0.10(f), roof and sidewall; 7.0.17-7.0.17(c), painting
6113 and/or cathodic protection; 7.0.18-7.0.18(c), disinfection; 7.1.1, treatment plant storage, filter
6114 washwater tanks; 7.2-7.2.4, hydropneumatic tank systems; are herein incorporated by reference.

6115
6116 ~~(formerly Section 13(a))(b) General. Steel finished water storage structures shall be~~
6117 ~~provided using the requirements of the AWWA D100 or AWWA D103. All tank design and~~
6118 ~~foundation design shall be performed by a registered professional engineer and the plans or~~
6119 ~~contractor furnished information shall so designate the registered engineer providing the design.~~
6120 ~~Materials other than steel may be used for water storage tanks.~~ Finished water storage structures
6121 shall comply with the following requirements:

6122
6123 ~~(formerly Section 13(a))(i) Steel finished water storage structures shall be~~
6124 ~~provided using the requirements of the AWWA D100 or AWWA D103.~~ Water storage structures
6125 shall comply with the following standards for storage tanks, standpipes, ground storage
6126 reservoirs that are described in AWWA M42, clearwells, and elevated storage:

6127
6128 (A) AWWA D100;

6129
6130 (B) AWWA D102;

6131
6132 (C) AWWA D103;

6133
6134 (D) AWWA D104;

6135
6136 (E) AWWA D106;

6137
6138 (F) AWWA D107;

6139
6140 (G) AWWA D108;

6141
6142 (H) AWWA D110;

6143
6144 (I) AWWA D115;

6145
6146 (J) AWWA D120; and

6147
6148 (K) AWWA D121;

6149
6150 ~~(formerly Section 13(a))(ii) All tank design and foundation design shall be~~
6151 ~~performed by a Wyoming registered professional engineer. and t~~ The plans or contractor-

6152 furnished information shall ~~so designate the registered engineer providing the design~~ be signed
6153 and sealed by a Wyoming registered professional engineer.

6154
6155 (iii) All new or modified water storage tanks shall have the inlet and outlet
6156 connections separated from each other as much as is practical.

6157
6158 (c) Storage facility designs shall demonstrate:

6159
6160 (ii) The average daily demand will require a daily fill of 20 percent of the total
6161 storage volume for surface water sources and 10 percent for groundwater sources.

6162
6163 (iii) For designs that demonstrate the storage tank has a small daily demand
6164 and a high fire water storage requirement, or the storage tank water age an average is greater than
6165 two days, the design shall demonstrate that a a volume equal to at least 20 percent of the tank
6166 volume will be delivered to the storage tank each time pumping is initiated.

6167
6168 ~~(formerly Section 13(a)(i)(D))(iv) Storage need not be provided in a well~~
6169 ~~supply system where~~ For designs with well systems that provide a minimum of two wells ~~are~~
6170 ~~provided and that can supply either~~ the maximum hourly demand or the fire demand, whichever
6171 is greater, can be supplied with the largest well out of service storage is not required. These
6172 systems shall demonstrate that they will provide alternative power for the finished water pumps.

6173
6174 (d) Storage structure design shall eliminate short-circuiting.

6175
6176 (e) The minimum inlet velocity shall be 10ft/sec unless demonstration of employed
6177 mixing system or lower inlet velocity addresses disinfection by-product formation, stratification,
6178 stagnation, freezing, and other water age issues.

6179
6180 (f) Overflow and drain lines shall:

6181
6182 (i) Be protected with a mechanical device such as:

6183
6184 (A) A sealed flapper valve or duckbill valve; or

6185
6186 (B) A #24 mesh non-corrodible screen.

6187
6188 (ii) For overflow lines that are protected with a mechanical device, include
6189 installation of a #4 mesh non-corrodible screen or finer to prevent the entrance of birds or
6190 rodents;

6191
6192 (iii) For overflow lines that are protected with #24 mesh non-corrodible screen,
6193 demonstrate prevention of screen clogging that would lead to structural storage tank damage;

6194
6195 ~~(formerly Section 13(a)(vi)(B))(iv) Include installation of the screen within~~ the
6196 overflow line of a ground level structure shall open downward and be screened with

6197 ~~noncorrodible screen installed within the pipe~~ at a location that is not least susceptible to ~~damage~~
6198 by vandalism and that allows for the overflow line to be operational during an overflow event;

6199
6200 (v) Provide access to the screen with the smallest openings for replacement;
6201 and

6202
6203 (vi) Demonstrate that the screen with the smallest openings will be the
6204 outermost screen.

6205
6206 (g) Overflow designs shall demonstrate the provisions that will be included to prevent
6207 mechanical devices from freezing shut.

6208
6209 (h) Overflow lines shall not be considered as vents.

6210
6211 ~~(formerly Section 13(a)(viii))(i) Vents. Finished water storage structures shall be~~
6212 ~~vented. Overflows shall not be considered as vents. Open construction between the sidewall and~~
6213 ~~roof is not permissible. Vents shall prevent the entrance of~~ be designed to protect the tank from
6214 contaminants including but not limited to surface water, and rainwater, stormwater runoff,
6215 insects, rodents, and shall exclude birds and animals.

6216
6217 ~~(formerly Section 13(a)(viii)(A))(i) For elevated tanks and standpipes, All~~
6218 openings shall be protected with #24 mesh noncorrodible non-corrodible screen may be used or a
6219 combination of #24 mesh and coarser mesh non-corrodible screen.

6220
6221 (ii) The design shall demonstrate consideration of site conditions, freezing,
6222 frosting, and provide justification including precautions for snow depth.

6223
6224 (A) The design shall demonstrate consideration of frost free or frost
6225 proof vents; and

6226
6227 (B) The design shall demonstrate consideration of a pressure/vacuum,
6228 frost-proof release vents that will need to protect openings with #24 mesh non-corrodible screen.

6229
6230 (j) Down-turned vent openings shall be at least 24 inches above the nearest
6231 horizontal surface.

6232
6233 (k) Elevated tanks shall be designed to remove snow via tank geometry to prevent
6234 snow build-up clogging vents.

6235
6236 (l) Vent designs shall include calculations that verify the required volume of flow is
6237 achievable through the proposed vent pipe and screen combination.

6238
6239 (m) Finished water plant water storage shall comply with the following requirements:

6240
6241 ~~(formerly Section 13(b)(ii))(i) Clearwell.~~ Clearwell storage shall be sized,
6242 in conjunction with distribution system storage, to relieve the filters ~~from~~ of having to follow

6243 fluctuations in water use. Where water is pumped from ~~clearwater~~ clearwell storage to the
6244 system, an overflow shall be provided.

6245
6246 (ii) If unfinished water is stored in compartments adjacent to finished water,
6247 the unfinished and finished water shall be separated by double walls.

6248
6249 ~~(formerly Section 13(b))(iv)(iii) Basins and wetwells.~~ Receiving basins and
6250 ~~pump wetwells for finished water~~ shall be designed as finished water storage structures and shall
6251 comply with the requirements of this Section.

6252
6253 **Section 16. ~~Operation and Maintenance Manuals~~ Distribution Systems.**

6254
6255 ~~(moved to Section 18(a))(a) Where required. Plant operation and maintenance manuals~~
6256 ~~are required for each new or modified treatment or pumping facility. The manuals shall provide~~
6257 ~~the following information as a minimum:~~

6258
6259 ~~(moved to Section 18(a)(i))(i) Introduction.~~

6260
6261 ~~(moved to Section 18(a)(ii))(ii) Description of facilities and unit processes~~
6262 ~~within the plant from influent structures through effluent structures.~~

6263
6264 ~~(moved to Section 18(a)(iii))(iii) Plant control system.~~

6265
6266 ~~(moved to Section 18(a)(iv))(iv) Utilities and systems.~~

6267
6268 ~~(moved to Section 18(a)(v))(v) Emergency operation and response.~~

6269
6270 ~~(moved to Section 18(a)(vi))(vi) Permit requirements and other regulatory~~
6271 ~~requirements.~~

6272
6273 ~~(moved to Section 18(a)(vii))(vii) Staffing needs.~~

6274
6275 ~~(moved to Section 18(a)(ix))(viii) Index to manufacturer's manuals.~~

6276
6277 ~~(moved to Section 18(b))(b) When required. Acceptance of the final operation and~~
6278 ~~maintenance manuals is required prior to plant startup.~~

6279
6280 ~~(c) Description of facilities. The description of facilities and unit processes shall~~
6281 ~~include the size, capacity, model number (where applicable) and intended loading rate.~~

6282
6283 ~~(moved to Section 18(c)(i) Each unit. The manual shall describe each unit,~~
6284 ~~including the function, the controls, the lubrication and maintenance schedule. The manual shall~~
6285 ~~also include start-up operations; routine operations; abnormal operations; emergency or power~~
6286 ~~outage operations; bypass procedures; and safety.~~

6287

6288 (ii) ~~Flow diagrams. The manual shall provide flow diagrams of the entire~~
6289 ~~process, as well as individual unit processes. The flow diagrams shall show the flow options~~
6290 ~~under the various operational conditions listed above.~~

6291
6292 (d) ~~Operating parameters. The O & M manual shall provide the design criteria for~~
6293 ~~each unit process. The data shall include the number, type, capacity, sizes, etc., and other~~
6294 ~~information, as applicable.~~

6295
6296 (moved to Section 18(c)(iii)(e)) ~~Troubleshooting guide. Each equipment~~
6297 ~~maintenance manual shall include a section on troubleshooting. These manuals are to be indexed~~
6298 ~~in the plant O & M manual. The troubleshooting guide shall include typical operation problems~~
6299 ~~and solutions. The guide shall include a telephone number for factory troubleshooting assistance.~~

6300
6301 (f) ~~Emergency procedures. The plant O & M manual shall detail emergency~~
6302 ~~operations procedures for possible foreseeable emergencies, including power outage, equipment~~
6303 ~~failure, development of unsafe conditions, and other emergency conditions. The details shall~~
6304 ~~include valve positions, flow control settings, and other information to ensure continued~~
6305 ~~operation of the facility at maximum possible efficiency.~~

6306
6307 The manual shall also detail emergency notification procedures to be followed to protect
6308 ~~health and safety under various emergency conditions.~~

6309
6310 (g) ~~Safety. The manual shall provide general information on safety in and around the~~
6311 ~~plant and its components. Each unit process discussion shall include applicable safety procedures~~
6312 ~~and precautions. For unit processes or operations having extreme hazards (such as chlorine,~~
6313 ~~closed tanks, etc.), the discussion shall detail appropriate protection, rescue procedures, and~~
6314 ~~necessary safety equipment.~~

6315
6316 (moved to Section 18(c)(iv)(h)) ~~Maintenance manuals. Maintenance manuals shall~~
6317 ~~be required for each piece of equipment. These manuals must meet the requirements of the~~
6318 ~~engineer and contractor for installation and startup of equipment. The information included in the~~
6319 ~~manufacturer's manuals shall not be included in the O & M manual.~~

6320
6321 The manual shall have a neatly typewritten table of contents for each volume arranged in
6322 ~~a systematic order. The general contents shall include product data; drawings; written text as~~
6323 ~~required to supplement product data for the particular installation; and a copy of each warranty,~~
6324 ~~bond and service contract issued.~~

6325
6326 The manuals for equipment and systems shall include a description of unit and
6327 ~~component parts; operating procedures; maintenance procedures and schedules; service and~~
6328 ~~lubrication schedule; sequence of control operation; a parts list; and a recommended spare parts~~
6329 ~~list.~~

6330
6331 (a) 2018 TSS, parts 8.2-8.2.4(b), system design; 8.3, valves; 8.4-8.4.4(d), hydrants;
6332 8.5-8.5.2(c), air relief valves; 8.6, valve, meter, and blow-off chambers; 8.7.3, installation of
6333 water mains, cover; 8.7.4, installation of water mains, blocking; 8.7.6, installation of water

6334 mains, pressure and leakage testing; 8.7.7, installation of water mains, disinfection; 8.7.8,
6335 installation of water mains, external corrosion; 8.7.9, installation of water mains, separation from
6336 other utilities; 8.8.2-8.8.2(b), separation distances from contamination sources, parallel
6337 installation; 8.8.3-8.8.3(b), separation distances from contamination sources, crossings; 8.8.6,
6338 separation distances from contamination sources, sewer manholes, inlets, and structures; 8.9.1,
6339 surface water crossings, above-water crossings; 8.9.2-8.9.2(c); surface water crossings, under
6340 water crossings; 8.11.1, water services and plumbing, plumbing; 8.12, service meters; are herein
6341 incorporated by reference.

6342
6343 ~~(formerly Section 14(a)(i))(b) Types~~ Distribution systems shall be constructed of
6344 commercial pipe approved for water systems include that conform to the following standards:

6345
6346 ~~(formerly Section 14(a)(i)(A))(i)~~ PVC water pipe: ASTM D2241, less
6347 than 4" diameter (10 cm); AWWA C900: 4" (10 cm) and larger diameter.

6348
6349 ~~(formerly Section 14(a)(i)(A))(A)~~ ASTM D2241, Less than 4" four
6350 inches diameter (10 cm), ASTM D 2241; or

6351
6352 ~~(formerly Section 14(a)(i)(A))(B)~~ AWWA C900: 4" (10 cm) Four
6353 inches and larger diameter, AWWA C900.

6354
6355 ~~(formerly Section 14(a)(i)(C))(ii)~~ Ductile iron pipe; AWWA C151;

6356
6357 ~~(formerly Section 14(a)(i)(D))(iii)~~ Glass fiber reinforced thermosetting resin
6358 pressure pipe: Fiberglass pressure pipe, AWWA C950; or

6359
6360 ~~(formerly Section 14(a)(i)(E))(iv)~~ Polyethylene Polyethylene pipe:

6361
6362 (A) ¾ inch through three inches diameter, AWWA C901;

6363
6364 (B) Four inches through 65 inches diameter, AWWA C906; or

6365
6366 (v) Other material submitted with the permit application and approved by the
6367 Administrator.

6368
6369 ~~(formerly Section 14(a)(iii))(c)~~ Joints. Packing and jointing materials used in the
6370 joints of pipe shall be flexible and durable. Flanged piping shall not be used allowed for buried
6371 service except for connections to valves; push-on or mechanical joints shall be used pipe except
6372 for connection to valves.

6373
6374 (d) New water mains shall be sized after the hydraulic analysis required by Section
6375 9(l)(i) of this Chapter and the design shall demonstrate that:

6376
6377 ~~((formerly 14(b)(ii))(i)~~ Pressure. All watermains, including those not
6378 designed to provide fire protection, shall be sized after a hydraulic analysis based on flow
6379 demands and pressure requirements. The system shall be designed to maintain a minimum

6380 ~~pressure of 20 psi (138 kPa) at ground level at all points in the distribution system under all~~
6381 ~~conditions of flow. The normal working pressure in the distribution system shall be not less than~~
6382 ~~35 psi (276 kPa). At maximum day demand plus current State of Wyoming-required fire flow, or~~
6383 ~~the fire flow of an authority having jurisdiction, the pressure in the municipal distribution system~~
6384 ~~will not fall below 20 pounds per square inch (psi); and~~

6385
6386 ~~((formerly 14(b)(ii))(ii))~~ (ii) The normal system working pressure shall be
6387 greater than 35 psi.

6388
6389 ~~(formerly Section 14(b)(iii))(e)~~ (e) ~~Fire protection.~~ When fire protection is ~~to be~~
6390 provided, ~~the system design water main system~~ shall be ~~such that~~ designed to also serve fire
6391 flows ~~can be served.~~

6392
6393 ~~(formerly Section 14(d))(f)~~ (f) Hydrants: ~~shall:~~

6394
6395 ~~(formerly Section 14(d)(i))(i)~~ (i) Hydrant leads. ~~The~~ Have hydrant leads shall be a
6396 that are a minimum of 6 six inches (~~0.15 m~~) in diameter. ~~Valves shall be installed in all hydrant~~
6397 ~~leads.~~

6398
6399 ~~(formerly Section 14(d)(i))(ii)~~ (ii) ~~Have~~ vValves shall be installed in all
6400 hydrant leads.;

6401
6402 ~~(formerly Section 14(d)(ii))(iii)~~ (iii) ~~Be~~ Protection-protected from freezing: at
6403 hydrant leads and barrels. ~~Provisions shall be made to protect fire hydrant leads and barrels from~~
6404 ~~freezing. The use of hydrant weep holes is not allowed when groundwater levels are above the~~
6405 ~~gravel drain area. In these cases it will be necessary to pump the hydrant dry or use other means~~
6406 ~~of dewatering.~~

6407
6408 ~~(formerly Section 14(d)(ii))(iv)~~ (iv) ~~The use of hydrant weep holes is not~~
6409 ~~allowed when groundwater levels are above the gravel drain area. In these cases it will be~~
6410 ~~necessary to pump the hydrant dry or use other means of dewatering.~~ Where groundwater levels
6411 are above the gravel drain area, hydrants shall be pumped dry or otherwise dewatered and
6412 hydrant weep holes shall not be used; and

6413
6414 ~~(formerly Section 14(d)(iii))(v)~~ (v) ~~Drainage.~~ Hydrant Have drains shall ~~not be~~
6415 that are not connected to or located within 10 feet (~~3.05 m~~) of a sanitary sewers or storm drains.

6416
6417 ~~(formerly Section 14(e)(i))(g)~~ (g) Fire hydrants or active service taps may be
6418 substituted for air relief ~~valves on~~ in 6- and 8-inch lines.

6419
6420 ~~(formerly Section 14(f))(h)~~ (h) ~~Excavation, bedding, installation, backfill.~~ Where
6421 excavation is performed for distribution systems:

6422
6423 ~~(formerly Section 14(f)(i))(i)~~ (i) ~~Excavation.~~ The trench bottom shall be excavated
6424 for the pipe bell ~~bell of the pipe;~~ All rock shall be removed within 6 inches (15.2 cm) of the pipe.
6425 ~~The trench shall be dewatered for all work.~~

6426
6427 ~~(formerly Section 14)(f)(i)(ii)~~ All rock shall be removed within 6 six inches ~~(15.2~~
6428 ~~cm)~~ of the pipe.;

6429
6430 ~~(formerly Section 14)(f)(i)(iii)~~ _____ The trench shall be dewatered for all work.;

6431
6432 ~~(formerly Section 14)(f)(ii)(i)~~ Bedding-Distribution system B bedding for rigid pipe shall
6433 be designed in accordance with ASTM C12 ~~-types Classes A, B, or C-for rigid pipe_ and~~
6434 Flexible pipe bedding shall be designed in accordance with ASTM D2321 ~~-types Class I, II, or~~
6435 III -for flexible pipe.;

6436
6437 (j) Distribution system pipe shall be joined to ensure a watertight fitting and installed
6438 in accordance with the following standards, as applicable:

6439
6440 (i) For ductile iron pipe, AWWA C600;

6441
6442 (ii) For PVC pipe, AWWA M23; and

6443
6444 (iii) For HDPE pipe, AWWA M55.

6445
6446 ~~(formerly Section 14)(f)(iv)(k)~~ _____ Backfill-Backfill for distribution systems shall:
6447 be performed without disturbing pipe alignment. Backfill shall not contain debris, frozen
6448 material, unstable material, or large clods. Stones greater than 3 inches (7.6 cm) in diameter shall
6449 not be placed within 2 feet (0.6 m) of pipe. Compaction shall be to a density equal to or greater
6450 than the surrounding soil.

6451
6452 ~~(formerly Section 14)(f)(iv)(i)~~ _____ Bbe performed without disturbing pipe
6453 alignment.;

6454
6455 ~~(formerly Section 14)(f)(iv)(ii)~~ _____ Backfill shall nNot contain debris, frozen
6456 material, unstable material, or large clods.;

6457
6458 ~~(formerly Section 14)(f)(iv)(iii)~~ _____ Not contain rocks or Sstones that are greater
6459 than 3 three inches ~~(7.6 cm)~~ in diameter ~~shall not be placed~~ within 2 two feet ~~(0.6 m)~~ of pipe.;

6460 and
6461
6462 ~~(formerly Section 14)(f)(iv)(iv)~~ _____ Compaction shall be Be compacted to a
6463 density equal to or greater than the surrounding soil.

6464
6465 ~~(formerly Section 14)(g)(l)~~ _____ Distribution systems shall meet the following requirements
6466 for Sseparation of ~~watermains, water mains from~~ sanitary ~~sewers~~ and storm sewers.;

6467
6468 (i) Where the minimum vertical or horizontal separation distances required
6469 by incorporation by reference of 2018 TSS parts 8.8.2 and 8.8.3 of paragraph (a) of this Section
6470 cannot be met, the sewer or water line shall be placed in a separate conduit pipe or meet the
6471 flow-fill requirements of paragraphs (ii) and (iii) of this Paragraph (l);

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(ii) Flow-fill for pipelines shall comply with the following:

(A) Cement-treated fill, non-shrink backfill, low-density concrete backfill, or structural backfill may be used as flow-fill when the material has a 28-day compressive strength of 30-60 psi;

(B) The pipe to be encased shall be laid on a four to six-inch of bed of washed gravel that has been widened, with the walls of the trench benched away from the center-line of the trench, so the pipe is uniformly supported over the length or supported on blocks no further than 10 feet apart;

(C) The flow-fill and washed gravel or blocks shall rest on an undisturbed trench bottom;

(D) The pipe shall not move laterally or float during placement of the flow-fill and the line and grade of the pipe shall be maintained; and

(E) The flow-fill shall extend from trench sidewall to trench sidewall and extend at least two inches above the top of the pipe.

(vii) Flow-fill for pipe crossings shall comply with the following:

(A) To the extent possible, there shall be no joints or taps within nine feet of the crossing;

(B) The flow-fill shall extend from undisturbed earth at the bottom of the lower pipe to at least two inches above the top of the upper pipe;

(C) The block of flow-fill shall be wide enough to ensure the structural integrity of the installation; and

(D) Pipes that cross one another shall be separated by a minimum of two inches when encased in flow-fill.

~~(formerly Section 14(i))(m)~~ Cross-connections shall comply with the following requirements:

~~(formerly Section 14(i)(i))(i) Cross-connections:~~ There shall be no water service connection installed or maintained between a public water supply and any water user whereby unsafe water or contamination may backflow into the public water supply.

~~(formerly Section 14(i)(i)(A))(A) Applicability. In order to~~ protect all public water supplies from the possibility of the introduction of contamination due to cross - connections, the water supplier shall: require backflow prevention devices for each water service connection in accordance with Table 1 which appears at the end of this section , with the

6518 ~~exception of (B)(I) residential water service connections and (B)(II) domestic non-residential~~
6519 ~~water service connections. The water supplier shall take appropriate actions which may include~~
6520 ~~immediate disconnection for any water user that fails to maintain a properly installed backflow~~
6521 ~~prevention device or comply with other measures as identified in Section 14 (i) of these~~
6522 ~~regulations.~~

6523
6524 ~~(formerly Section 14(i)(i)(A))(I)~~ (I) ~~Require~~ Require backflow prevention
6525 devices for each water service connection in accordance with ~~Table 1 which appears at the end of~~
6526 ~~this section~~ Table 4 of this Section, with the exception of (B)(I) residential water service
6527 connections and (B)(II) domestic non-residential water service connections.;

6528
6529 ~~(formerly Section 14(i)(i)(A))(II)~~ (II) ~~The water supplier shall~~
6530 ~~Take~~ Take appropriate actions ~~which~~ that may include;

6531
6532 ~~(formerly Section 14(i)(i)(A))1.~~ 1. ~~i~~ Immediate
6533 disconnection for any water user that fails to maintain a properly installed backflow prevention
6534 device; or

6535
6536 ~~(formerly Section 14(i)(i)(A))2.~~ 2. ~~e~~ Compliance with
6537 other measures as identified in ~~Section 14 (i) of these regulations~~ this Section;

6538
6539 ~~(formerly Section 14(i)(i)(A)(I))(III)~~ (III) Any high hazard non-
6540 residential connection to any public water supply shall be protected by the ~~appropriate~~ backflow
6541 prevention device required by Table 4.

6542
6543 ~~(formerly Section 14(i)(i)(A)(III))(IV)~~ (IV) Water suppliers shall
6544 establish record keeping and management procedures to ensure that requirements of this
6545 regulation for installation and maintenance of backflow prevention devices are being met.

6546
6547 ~~(formerly Section 14(i)(i)(B))(B)~~ (B) The method of backflow control,
6548 selected from Table ~~14~~, shall be determined based upon the degree of hazard of the cross-
6549 connection and the cause of the potential backflow. Hazards shall be classified as high hazard or
6550 low hazard. The potential cause of the backflow shall be identified as being back-siphonage or
6551 back-pressure.

6552
6553 ~~(formerly Section 14(i)(i)(B)(I))(I)~~ (I) Residential water service
6554 connections shall be considered to be low hazard back-siphonage connections; unless determined
6555 otherwise by a ~~h~~ Hazard ~~e~~ Classification.

6556
6557 ~~(formerly Section 14(i)(i)(B)(II))(II)~~ (II) Domestic non-residential
6558 water service connections (such as schools without laboratories, churches, office buildings,
6559 warehouses, and motels) shall be considered to be low hazard back-pressure connections; unless
6560 determined otherwise by a ~~h~~ Hazard ~~e~~ Classification conducted by the water supplier. ~~Examples~~
6561 ~~include schools without laboratories, churches, office buildings, warehouses, motels, etc.~~

6562

6563 ~~(formerly Section 14(i)(i)(B)(III))(III)~~ Any water user's
6564 system with an auxiliary source of supply shall be considered to be a high hazard, back-pressure
6565 cross-connection. A reduced pressure principle backflow device shall be installed at the water
6566 service connection to any water user's system with an auxiliary source of supply.

6567
6568 ~~(formerly Section 14(i)(i)(B)(IV))(IV)~~ All water loading
6569 stations shall be considered high hazard connections. A device, assembly, or method consistent
6570 with Table ~~14~~ shall be provided.

6571
6572 ~~(formerly Section 14(i)(i)(B)(V))(V)~~ Non-domestic
6573 commercial or industrial water service connections (such as restaurants, refineries, chemical
6574 mixing facilities, sewage treatment plants, mortuaries, laboratories, laundries, dry cleaners,
6575 irrigation systems, and facilities producing or using hazardous substances) shall be considered to
6576 be high hazard back-pressure connections, unless determined otherwise by a ~~h~~Hazard
6577 ~~e~~Classification. ~~Examples include restaurants, refineries, chemical mixing facilities, sewage~~
6578 ~~treatment plants, mortuaries, laboratories, laundries, dry cleaners, irrigation systems, facilities~~
6579 ~~producing or utilizing hazardous substances, etc.~~ For some of these service connections, a
6580 ~~h~~Hazard ~~e~~Classification may result in a determination of a back-siphonage or low hazard
6581 classification. The backflow prevention device required shall be appropriate to the degree of
6582 hazard established by the ~~h~~Hazard ~~e~~Classification. Where potential high hazards exist within the
6583 non-residential water user's system, even though such high hazards may be isolated at the point
6584 of use, an approved backflow prevention device shall be installed and maintained at the water
6585 service connection.

6586
6587 ~~(formerly Section 14)(i)(i)(C)(C)~~ Determination of the hazard
6588 classification of a water service connection is the responsibility of the water supplier. The water
6589 supplier may require the water user to furnish a ~~h~~Hazard ~~e~~Classification ~~s~~Survey to be used to
6590 determine the ~~h~~Hazard ~~e~~Classification.

6591
6592 (D) Hazard Classification Surveys that have been conducted by
6593 Hazardous Classification Surveyors that have been certified by another state certification
6594 program shall include the following information for Administrator approval:

6595
6596 (I) Documentation that indicates the Hazard Classification
6597 Surveyor has received certification from the regulatory agency that issued the current
6598 certification that states the name of the Hazard Classification Surveyor, the status of their
6599 certification, the date originally issued, the expiration date, and the classification for which the
6600 Hazard Classification Surveyor is certified; and

6601
6602 (II) Any disciplinary action imposed against the applicant; if
6603 any.

6604
6605 ~~(formerly Section 14(i)(i)(E))(E)~~ All backflow prevention devices
6606 ~~must shall~~ be in-line serviceable (repairable), in-line testable except for devices meeting ASSE
6607 ~~Standard #1024~~, and installed in accordance with manufacturer instructions and applicable
6608 plumbing codes.

6609
6610 ~~(formerly Section 14(i)(i)(F))~~(F) All backflow prevention devices
6611 must have a certification by an approved third party certification agency. Approved certification
6612 agencies are:

6613 ~~(formerly Section 14(i)(i)(F)(I))~~(I) American Society of Sanitary
6614 Engineers (ASSE),

6615
6616 ~~(formerly Section 14(i)(i)(F)(II))~~(II) International Association of
6617 Plumbing/Mechanical officials (IAPMO); and

6618
6619 ~~(formerly Section 14(i)(i)(F)(III))~~(III) Foundation for Cross-
6620 Connection Control and Hydraulic Research, University Of Southern California (USC-
6621 FCCCHR).

6622
6623 ~~(formerly Section 14(i)(i)(G))~~(G) Backflow prevention devices at
6624 water service connections shall be inspected and certified by a certified backflow assembly tester
6625 at the time of installation. Certification of the assembly tester shall be by one of the following:

6626
6627 ~~(formerly Section 14(i)(i)(G)(I))~~(I) The American Society of
6628 Sanitary Engineers (ASSE); or

6629
6630 ~~(formerly Section 14(i)(i)(G)(II))~~(II) American Backflow
6631 Prevention Association (ABPA);

6632
6633 ~~(formerly Section 14(i)(i)(H))~~(H) Backflow prevention devices
6634 installed at high hazard non- residential cross connections shall be inspected and tested on an
6635 annual basis by a certified backflow assembly tester.

6636
6637 ~~(formerly Section 14(i)(i)(I))~~(I) ~~The administrator may conduct~~
6638 ~~inspections of backflow prevention devices.~~ If any device is found to be defective or functioning
6639 improperly, it must shall be immediately repaired or replaced. Failure to make necessary repairs
6640 to a backflow prevention device will be cause for the water service connection to be terminated.

6641
6642 ~~(formerly Section 14(i)(i)(J))~~(J) All public water suppliers shall
6643 report any high hazard backflow incident within seven ~~(7)~~ days to the ~~Wyoming Department of~~
6644 ~~Environmental Quality, Water Quality~~ Division. The backflow incident shall be reported on a
6645 form provided by the ~~a~~AAdministrator.

6646
6647 ~~(formerly Section 14(i)(ii)(ii))~~ ~~Recycling water.~~ Neither steam condensate
6648 nor cooling water from engine jackets or other heat exchange devices shall be returned to the
6649 public water supply after it has passed through the water service connection.

6650
6651 ~~TABLE 1~~ Table 4. Backflow Prevention Devices, Assemblies and Methods

	Degree of Hazard		
	Low Hazard	High Hazard	Notes

Device, Assembly or Method	Back-Siphonage	Back-Pressure	Back-Siphonage	Back-Pressure	
Airgap	X	<u>X</u>	X	<u>X</u>	See Note 1 and Note 2
Atmospheric Vacuum Breaker	X		X		Not allowed under continuous pressure
Spill-proof Pressure-type Vacuum	X		X		
Double Check Valve Backflow Preventer	X	X			
Pressure Vacuum Breaker	X		X		
Reduced Pressure Principle Backflow	X	X	X	X	See Note 2
Dual Check	X				Restricted to residential services

6652
6653 ~~(formerly Section 14, Table 1)~~ Note 1: Minimum Airgap for Water Distribution. For
6654 spouts with an effective opening diameter of ~~one-half~~ 1/2 inch or less, the minimum airgap when
6655 the discharge is not affected by side walls shall be one inch. The minimum airgap when the
6656 discharge is affected by sidewalls shall be ~~one and one-half~~ 1 1/2 inches. For effective openings
6657 greater than ~~one-half~~ 1/2 inch, the minimum airgap shall be two times the effective opening
6658 diameter when the discharge is not affected by sidewalls. The minimum airgap when the
6659 discharge is affected by sidewalls shall be three times the effective opening diameter.

6660
6661 ~~(formerly Section 14, Table 1)~~ Note 2: Extreme Hazards. In the case of any water user's
6662 system where, in the opinion of the water supplier or the Administrator, an undue health threat is
6663 posed because of the presence of extremely toxic substances or potential back pressures in excess
6664 of the design working pressure of the device, the water supplier may require an airgap at the
6665 water service connection to protect the public water system.

6667 **Section 17. Laboratory Requirements.**

6668
6669 (a) 2018 TSS, parts 2.8.1-2.8.1(h), testing equipment, is herein incorporated by
6670 reference.

6671

6672 ~~(formerly Section 15)(a)(b)~~ Test procedures. Test procedures for analysis of monitoring
6673 samples shall conform to the ~~15th Edition of Standard Methods for the Examination of Water~~
6674 ~~and Wastewater~~ Standard Methods for the Examination of Water and Wastewater.

6675
6676 ~~(formerly Section 15)(b)(c)~~ Testing requirements. All treatment plants shall have the
6677 capability to perform or contract for the self-monitoring analytical work required by the Safe
6678 Drinking Water Act, ~~and/or state regulation~~ 42 U.S.C. §300f et seq. All plants shall, in addition,
6679 be capable of performing or contracting the analytical work required to assure good management
6680 and control of plant operation and performance.

6681
6682 ~~(formerly Section 15)(e)(d)~~ All laboratories used for the tests, analysis, and monitoring
6683 required by this Section shall meet the following ~~Minimum~~ requirements.:

6684
6685 ~~(formerly Section 15)(e)(i)(i)~~ Location and space. The laboratory shall be located
6686 away from vibrating machinery or equipment ~~which that~~ might have adverse effects on the
6687 performance of laboratory instruments or the analyst and shall be designed to prevent adverse
6688 effects from vibration.

6689
6690 ~~(formerly Section 15)(e)(ii)(ii)~~ Materials. Walls shall have an easily
6691 cleaned, durable and impervious surface. ~~Two exit doors or openings shall be located to permit a~~
6692 ~~straight exit from the laboratory; one exit shall be directly to the outside of the building. Panic~~
6693 ~~hardware shall be used. Interior doors shall have glass windows.~~

6694
6695 ~~(formerly Section 15)(e)(iii)(iii)~~ Cabinets and bench tops. Cabinet and
6696 storage space shall be provided for dust-free storage of instruments and glassware. ~~(formerly~~
6697 ~~Section 15)(e)(iii)~~ Bench top Benchtop height shall be 30 inches ~~(0.91 m).~~ Tops Benchtops
6698 ~~should~~ shall be field joined into a continuous surface with acid, alkali, and solvent-resistant
6699 cements.

6700
6701 ~~(formerly Section 15)(e)(iv)(iv)~~ Hoods. Fume hoods shall be provided where
6702 reflux or heating of toxic or hazardous materials is required. A hood shall not be situated near a
6703 doorway, unless a secondary means of exit is provided. All fume hood switches, electrical
6704 outlets, and utility and baffle adjustment handles shall be located outside the hood. Light fixtures
6705 shall be explosion-proof. ~~Twenty-four hour~~ 24-hour continuous exhaust capability shall be
6706 provided. Exhaust fans shall be explosion-proof.

6707
6708 ~~(formerly Section 15)(e)(v)(v)~~ Sinks. The laboratory shall have a minimum
6709 of 2 two sinks per 400 ~~ft² (37.2 m²)~~ square feet (not including cup sinks). Sinks shall be double
6710 well with drainboards and shall be made of epoxy resin or plastic. All water fixtures shall ~~be~~
6711 ~~provided with~~ have reduced pressure zone backflow preventers. Traps shall be constructed of
6712 glass, plastic, or lead and be accessible for cleaning ~~shall be provided.~~

6713
6714 ~~(formerly Section 15)(e)(viii)(vi)~~ Water still. Distilled water shall conform to
6715 the quality specified by ~~Standard Methods for the Examination of Water and Wastewater, 15th~~
6716 ~~Edition~~ Standard Methods for the Examination of Water and Wastewater 2018.

6718 ~~(formerly Section 15)(d)(e)~~ Portable testing equipment. Portable testing equipment
6719 shall be provided where necessary for operational control testing.

6720
6721 **Section 18. Operation and Maintenance Manuals.**

6722
6723 ~~(formerly Section 16(a))(a)~~ Where required. Plant operation and maintenance manuals
6724 are required for each new or modified treatment or pumping facility. Each new or modified
6725 treatment or pumping facility shall have an operation and maintenance manual (O & M Manual)
6726 located at the facility. The manuals shall provide the following information as a minimum:

6727
6728 ~~(formerly Section 16(a)(i))(i)~~ Introduction;

6729
6730 ~~(formerly Section 16(a)(ii))(ii)~~ Description of facilities and unit processes
6731 within the plant from influent structures through effluent structures;

6732
6733 (A) The size, capacity, model number (where applicable), and intended
6734 loading rate of facilities and unit processes;

6735
6736 (B) A description of each unit, including the function, the controls, the
6737 lubrication, and maintenance schedule;

6738
6739 (C) A description of start-up operations, routine operations, abnormal
6740 operations, emergency or power outage operations, bypass procedures, and safety;

6741
6742 (D) Flow diagrams of the entire process, as well as individual unit
6743 processes that show the flow options under the various operational conditions listed in paragraph
6744 (a)(ii) of this Section; and.

6745
6746 (E) The design criteria for each unit process, including the number,
6747 type, capacity, sizes, and other relevant information.

6748
6749 ~~(formerly Section 16(a)(iii))(iii)~~ Plant control system;

6750
6751 ~~(formerly Section 16(a)(iv))(iv)~~ Utilities and systems;

6752
6753 ~~(formerly Section 16(a)(v))(v)~~ Emergency ~~operation and response~~
6754 procedures, including:

6755
6756 (A) Details of emergency operations procedures for possible
6757 foreseeable emergencies, such as power outage, equipment failure, development of unsafe
6758 conditions, and other emergency conditions;

6759
6760 (B) Emergency operations valve positions, flow control settings, and
6761 other information to ensure continued operation of the facility at maximum possible efficiency
6762 during emergencies; and

6764 (C) Emergency notification procedures to be followed to protect health
6765 and safety under various emergency conditions.

6766
6767 ~~(formerly Section 16)(a)(vi)(vi)~~ Permit requirements and other regulatory
6768 requirements;

6769
6770 ~~(formerly Section 16)(a)(vii)(vii)~~ Staffing needs;

6771
6772 ~~(formerly Section 16)(a)(viii)(viii)~~ Index ~~to~~ of manufacturer's manuals;

6773
6774 (ix) Index of equipment maintenance manuals; and

6775
6776 (x) General information on safety in and around the plant and its components,
6777 including the following safety information:

6778
6779 (A) Each unit process discussion shall include applicable safety
6780 procedures and precautions; and

6781
6782 (B) For unit processes or operations having extreme hazards (such as
6783 chlorine and closed tanks), the discussion shall detail appropriate protection, rescue procedures,
6784 and necessary safety equipment.

6785
6786 ~~(formerly Section 16)(b)(b) When required. Acceptance of the final operation and~~
6787 ~~maintenance manuals~~ Administrator approval of the final O & M Manual is required prior to
6788 plant startup.

6789
6790 ~~(formerly Section 16)(c)(i)(c) Each unit. The Public water supply facilities shall~~
6791 ~~have an equipment maintenance manual located at the facility for each piece of equipment. Each~~
6792 ~~equipment maintenance manual shall; describe each unit, including the function, the controls, the~~
6793 ~~lubrication and maintenance schedule. The manual shall also include start-up operations; routine~~
6794 ~~operations; abnormal operations; emergency or power outage operations; bypass procedures; and~~
6795 ~~safety.~~

6796
6797 (i) Have a typewritten table of contents for each volume arranged in a
6798 systematic order;

6799
6800 (ii) Include the following general contents:

6801
6802 (A) Product data;

6803
6804 (B) Drawings;

6805
6806 (C) Written text as required to supplement product data for the
6807 particular installation;

6808
6809 (D) Copies of each warranty, bond, and service contract issued;

- 6810
6811 (E) Descriptions of unit and component parts;
6812
6813 (F) Operating procedures;
6814
6815 (G) Maintenance procedures and schedules;
6816
6817 (H) Service and lubrication schedule;
6818
6819 (I) Sequence of control operation;
6820
6821 (J) Parts list; and
6822
6823 (K) Recommended spare parts list.
6824

6825 ~~(formerly Section 16(e))(iii) Troubleshooting guide. Each equipment~~
6826 ~~maintenance manual shall include a section on troubleshooting; that shall include: These~~
6827 ~~manuals are to be indexed in the plant O & M manual. The troubleshooting guide shall include~~
6828 ~~typical operation problems and solutions. The guide shall include a telephone number for factory~~
6829 ~~troubleshooting assistance.~~

6830
6831 ~~(formerly Section 16(e))(A) Typical operation problems and solutions;~~
6832 and

6833
6834 ~~(formerly Section 16(e))(B) aA telephone number for factory~~
6835 ~~troubleshooting assistance; and~~

6836
6837 ~~(formerly Section 16)(h))(iv) Maintenance manuals. Maintenance manuals shall~~
6838 ~~be required for each piece of equipment. These manuals must meet the requirements of the~~
6839 ~~engineer and contractor for installation and startup of equipment. The information included in the~~
6840 ~~manufacturer's manuals shall not be included in the O & M manual.~~

6841
6842 **Section 19. Incorporation by Reference.**

6843
6844 (a) The following codes, standards, rules, and regulations referenced in this Chapter
6845 are incorporated by reference:

6846
6847 (i) American National Standards Institute/National Sanitation Foundation
6848 Standard 53, Drinking Water Treatment Units - Health Effects (2019), referred to as "NSF/ANSI
6849 53," available at <https://webstore.ansi.org/Standards/NSF/NSFANSI532020>;

6850
6851 (ii) American National Standards Institute/National Sanitation Foundation
6852 Standard 55, Ultraviolet Microbiological Water Treatment Systems (2020), referred to as
6853 "NSF/ANSI 55," available at <https://webstore.ansi.org/Standards/NSF/NSFANSI552021>;
6854

- 6855 (iii) American National Standards Institute/National Sanitation Foundation
6856 Standard 61, Drinking Water System Components - Health Effects NSF/ANSI/CAN 61-
6857 2020/NSF/ANSI/CAN 600-2021, referred to as “NSF/ANSI/CAN 61-2020/NSF/ANSI/CAN
6858 600-2021,” available at <https://webstore.ansi.org/Standards/NSF/NSFANSI612021600>;
6859
- 6860 (iv) American National Standards Institute/National Sanitation Foundation
6861 Standard 372, Drinking Water System Components-Lead Content 372-20, referred to as
6862 “NSF/ANSI/CAN 372-20,” available at
6863 <https://webstore.ansi.org/Standards/NSF/NSFANSI3722020>;
6864
- 6865 (v) American National Standards Institute/National Sanitation Foundation
6866 Standard 419, Public Drinking Water Equipment Performance – Filtration, referred to as
6867 “NSF/ANSI 419-2018,” available at
6868 <https://webstore.ansi.org/Standards/NSF/NSFANSI4192018>;
6869
- 6870 (vi) American Petroleum Institute Specification 5L, Line Pipe, Forty-Sixth
6871 Edition (2019), referred to as “API 5L,” available at
6872 https://www.techstreet.com/api/standards/api-spec-5l?gateway_code=api&product_id=2010552;
6873
- 6874 (vii) American Water Works Association Standard A100, Water Wells, A100-
6875 20, referred to as “AWWA A100-20,” available at
6876 <https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/83080725>;
6877
- 6878 (viii) American Water Works Association Standard C200, Steel Water Pipe, 6
6879 In. (150 mm) and Larger, C200-17 (2017), referred to as “AWWA C200,” available at
6880 <https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/63106282>;
6881
- 6882 (ix) American Water Works Association Standard C300, Reinforced Concrete
6883 Pressure Pipe, Steel-Cylinder Type, C300-11 (2011), referred to as “AWWA C300,” available at
6884 <https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/59483818>;
6885
- 6886 (x) American Water Works Association Standard C301, Prestressed Concrete
6887 Pressure Pipe, Steel-Cylinder Type, C301-14 (2014), referred to as “AWWA C301,” available at
6888 <https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/81647229>;
6889
- 6890 (xi) American Water Works Association Standard C600, Installation of
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7129 (b) For these codes, standards, rules, and regulations incorporated by reference:

7130

7131 (i) The Environmental Quality Council has determined that incorporation of
7132 the full text in these rules would be cumbersome or inefficient given the length or nature of the
7133 rules.

7134

7135 (ii) This Chapter does not incorporate later amendments or editions of
7136 incorporated codes, standards, rules, and regulations.

7137

7138 (iii) All incorporated codes, standards, rules, and regulations are available for
7139 public inspection at the Department's Cheyenne office. Contact information for the Cheyenne
7140 office may be obtained at <http://deq.wyoming.gov> or from (307) 777-7937.