Appendix C. Historic Conditionally Accepted Granular Media Filters

Table of Contents for Appendix C.

Granular Media Filters

Granular Media Filters

1. Andritz Ruthner, Inc. - Hydrasand

Description: Upflow, continuous wash filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Silica sand	40	1.30	1.50

References:
- Conditional acceptance letter dated June 23, 2000 from CDPH.
- Report entitled "Microbial Assessment of the Lanai Auxiliary Reclamation Facility to Produce Wastewater Effluent for Unrestricted, Non-potable Reuse" (October 1998).

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter medium every three to four hours.

Comments: Manufacturer has indicated they will warrant the Hydrasand Filter to meet Title 22 requirements. Same principle as the Parkson DynaSand.

Installations: None in California (proposed for City of Corona), installed in Trumansburg NY and Lanai City, HI.

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2. Applied Process Technology - Centra-flo Downflow

Description: Gravity Sand Filter Downflow Continuous Wash Filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	(graded) 0.5 – 3.0	1.50

References:
- Conditional acceptance letter dated January 6, 1999 from CDPH for landscape irrigation.

Conditions of Acceptance:
- Media design specifications as noted above;

– Loading rate limited to 4.4 gpm/ft^2.

Comments: Pilot testing conducted at Union Sanitary District's Alvarado WWTP (1994).

Installations: Tejon Ranch Development '99 (I-5 @ Tejon Pass)

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3. Aqua-Aerobic Systems - Automatic backwash filter (AquaABF)

Description: Shallow bed traveling bridge

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	11	0.55	1.50

References:
– Listed in the CDPH Direct Filtration Guidelines (1988).
– Report entitled "Evaluation of the Aqua-Aerobic Automatic Backwash Filter For Wastewater Reclamation in California" by UC Davis (July 1986).

Conditions of Acceptance:
– Media design specifications as noted above;
– Loading rate limited to 2 gpm/ft^2;
– Maximum influent turbidity <10 NTU.

Comments: None

Installations: Unknown

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4. Alfa Laval Ashbrook Simon-Hartley - Strata-Sand
(Formally Ashbrook Corporation)

Description: Gravity Sand Filter, Downflow Continuous Wash Filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	(graded) Multi-	AWWA B-100

References:
- Conditional acceptance letter dated July 29, 2003 from CDPH.
- Performance report submitted dated June 11, 2003.

Conditions of Acceptance:
- Media design specifications as noted above.

Comments: None

Installations: City of Oceanside (San Luis Rey WWTP)

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5. Blue Water Technology - Centra-flo Upflow
(Formally Applied Process Technology, Inc.)

Description: Upflow deep bed continuous backwash

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	0.92-0.95	1.50

References:
- Conditional acceptance letter dated March 14, 2006 from CDPH.
- Company name change in letter dated June 15, 2011. From Applied Process Tech to Blue Water Tech.

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

Comments: Classified as direct filtration.

Installations: Unknown

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6. Five Star Filtration - Upflow Filter

Description: Upflow deep bed continuous backwash

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	0.92-0.95	1.50

References:
- Conditional acceptance letter dated January 13, 2009 from CDPH.

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

Comments: Classified as direct filtration.

Installations: Unknown

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7. Fluidyne Corporation - Fluidsand

Description: Upflow Continuous Backwash Filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	(graded) 0.8 – 1.0	1.60

References:
- Conditional acceptance letter dated May 3, 2000 from CDPH.
- Engineering Report dated June 9, 1997 submitted by Questa Engineering for the Canada Woods Reclamation Facility.

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

Comments: Classified as direct filtration. Designed for waters containing TSS up to 20 mg/l (per manufacturer). Performance data submitted by the manufacturer demonstrates this technology's ability to comply with the turbidity performance standards. Design and operation conceptually similar to Dynasand.

Installations: Tenaya Lodge located in Fish Camp (Evaluated in a "facilities Review" report by Carollo Engineers dated September 1990). Canada Woods Development (1999) in the Monterey area (without CDPH approval). Castanoa Ranch (1999) in San Mateo County.

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8. Infilco-Degremont - Automatic Backwash (ABW)

Description: shallow bed, traveling bridge

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	11	0.55	1.50

References:
- Listed in the CDPH Direct Filtration Guidelines (1988).
- U.C. Davis Evaluation Report; "Evaluation of the Enelco ABW Automatic Backwash Filter For Wastewater Reclamation in California", dated November 1988.

Conditions of Acceptance:
- Media design specifications as noted above;
- Loading rate limited to 2 gpm/ft^2;
- Max. influent turbidity <10 NTU.

Comments: None

Installations: Sacramento County, Sepulveda Water Reclamation, Folsom WWTP, Victor Valley WWRP, LA City-Tillman WRP, Shasta Lake WWTP, and others.

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9. ITT Water & Wastewater Leopold - elimi-NITE®

Description: Deep Bed Denitrification Granular Media Filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	72	1.8	1.40

References:
- Conditional acceptance letter dated April 10, 2009 from CDPH.

Conditions of Acceptance:
- Media design specifications as noted above;
- Loading rate limited to 5 gpm/ft^2.

Comments: Mono-media granular sand; 6 foot depth; intended for direct filtration with methanol addition.

Installations: Unknown

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10. Micromedia Filtration - Cleanstream

Description: “Cleanstream” Continuous Backwash Up-flow Sand Filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Silica sand	40	0.9 – 1.3	1.50

References:
- Conditional acceptance letter dated September 26, 2006 from CDPH.
- Performance evaluations conducted at Las Gallinas Valley Sanitary District and Santa Margarita Water District (Chiquita Water Reclamation Plant).

Conditions of Acceptance:
- Media design specifications as noted above;
- The technology shall be preceded by a secondary wastewater treatment process that meets the definition of an “oxidized wastewater” in accordance with Section 60301.650.

Comments: Same principle as the Parkson DynaSand.

Installations: Unknown

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11. Nordic Water - Continuous Sand Filter

Description: “Nordic Water Continuous Sand Filter”

Media configuration:

Media Type	Media Depth (m)	Effective Size (mm)	Uniformity Coefficient
Silica sand	1.5	1.0 – 1.5	1.50

References:
- Conditional acceptance letter dated March 7, 2007 from CDPH.

Conditions of Acceptance:
- Media design specifications as noted above;
- Maximum loading rate of 5 gpm/ft^2.

Comments: Same principle as the Parkson DynaSand.

Installations: Unknown

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12. Parkson Corporation - Dynasand

Description: Upflow deep bed continuous backwash

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	1.3	1.50

References:
- Listed in the CDPH Direct Filtration Guidelines (1988).
- Conditional acceptance letter dated December 1, 1986 from CDPH
- Letter dated April 23, 1997 from the San Francisco District Office to the Sewerage Agency of South Marin.
- Memo dated July 18, 1997 from Mike Finn (CDPH) re: two performance studies (S.F. Bureau of water Pollution Control and Sewerage Agency of South Marin).

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

Comments: Classified as direct filtration.

Installations: Sewerage Agency of Southern Marin (Evaluation outlined in a Pilot Test Final Report for the Agency dated June 1989); San Francisco-Bureau of Water Pollution Control has a pilot unit at the Oceanside WWTP, and others.

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13. Parkson Corporation – DynaSand EcoWash

Description: Continuous, upflow, granular media with intermittent backwash

References:
- Conditional acceptance letter dated January 30, 2013 from CDPH.
- Submitted report titled, “Title 22 Performance Testing of the DynaSand EcoWash Filter” Dated January 2013.

Comments: Coagulation shall be added per Title 22, section 60301.320(a).

Installations: Unknown

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14. Siemens Water Technologies Corp. - Astrasand

Description: Upflow deep bed continuous backwash

Media configuration:

Media Type	Media Depth (m)	Effective Size (mm)	Uniformity Coefficient
Sand	1.5	1.0-1.5	1.50

References:
- Conditional acceptance letter dated December 5, 2005 from CDPH.

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

Comments: Classified as direct filtration.

Installations: Unknown

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15. Siemens Water Technologies Corp. - Gravisand

Description: Shallow bed traveling bridge

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Anthracite	6	1.1 – 1.2	1.50
Sand	5	.55 – .65	1.50
Support	-	.8 – 1.2	1.50

References:
- Conditional acceptance letter dated November 08, 2005 from CDPH.

Conditions of Acceptance:
- Media design specifications as noted above;
- Loading rate limited to 2 gpm/ft^2;
- Maximum influent turbidity <10 NTU.

Comments: None

Installations: Unknown

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16. Siemens Water Technologies Corp. - Hydro-Clear

Description: Shallow pulsed bed filter

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	10-12	0.45	1.50

References:
- Listed in the CDPH Direct Filtration Guidelines (1988).
- Conditional acceptance letter dated November 17, 1981 from CDPH.
- U.C. Davis Evaluation Report; "Evaluation of the Pulsed-Bed Filter For Wastewater Reclamation in California", 1981.

Conditions of Acceptance:
- Media design specifications as noted above;
- Minimum bed depth of 10-inches of sand with E.S. of 45 mm;
- At least 6 minutes between pulses and no more than 25 pulses per filter run.

Comments: Classified as direct filtration

Installations: Moulton Niguel WD, San Luis Obispo, San Clemente, Rancho Murrieta, Fallbrook, and others.

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17. Tetra Technologies, Inc. - Tetra-Denit.

Description: Tetra Deep Bed-Denitrification Filters

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Silica sand	48-72	2.2	1.35

References:
- Conditional acceptance letter dated March 17, 1992 signed by M. Kiado (CDPH) re: LADWP.
- Letter dated October 6, 1997 from Parsons Engineering Science regarding LA-Glendale Water Reclamation Plant pilot study.

Conditions of Acceptance:
- Media design specifications as noted above.

Comments: Mono-media granular sand; 4-6 foot depth; intended for direct filtration with chemical addition.

Installations: City of Los Angeles (Glendale WWTP), Lake Arrowhead CSD, Padre Dam MWD, Scotts Valley WD.

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18. Volcano – Downflow Filter

Description: Continuous wash downflow sand filter

References:
- This filter has not yet been reviewed by CDPH.
- Documentation of CDPH approval does not exist. The Recycled Water Unit has no technical data on this process.

Comments: Future proposals for use of this filtration technology will require an acceptability assessment prior to approval.

Installations: Boulder Creek G.C. (Santa Cruz County), Sierra Heights WWTP (Santa Clarita), Carmel Valley WWTP, Shelter Cove (Humbolt)

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19. Waterlink Separations - WATERLINK SuperSand

Description: Upflow deep bed continuous backwash

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	1.3	1.5

References:
- Conditional acceptance letter dated January 14, 2000 from CDPH.

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

- Comments: Classified as direct filtration. Waterlink was purchased by Parkson Corporation, which now holds the patents for the design of the filter approved as the "DynaSand" under licensing agreements. Master file contains all documentation.

Installations: Proposed for Delta Diablo Sanitation District (Pittsburg, CA), Coachella Valley and Escondido.

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20. Westech Engineering - WESTECH TECHNASAND

Description: Upflow deep bed continuous backwash

Media configuration:

Media Type	Media Depth (in)	Effective Size (mm)	Uniformity Coefficient
Sand	40	1.3	1.5

References:
- Conditional acceptance letter dated April 5, 2002 from CDPH.
- Manufacturer has indicated they will warrant the Technasand Filter to meet Title 22 filtration requirements. Same principle as the Parkson Dynasand. Master file contains all documentation.

Conditions of Acceptance:
- Media design specifications as noted above;
- Complete recycling of filter media every three to four hours.

Comments: Classified as direct filtration.

Installations: Proposed for Carmel Valley Ranch.
