

Department of Natural Resources and Parks Wastewater Treatment Division

Barton CSO Control Project with GSI

OPERATIONS AND MAINTENANCE MANUAL

September 14, 2015

Prepared for: King County Wastewater Treatment Division 201 S. Jackson Street, Rm 507 Seattle, WA 98104-3855 Contract E00222E11

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LIST OF APPENDIXES

Preface: Attention to Readers/King County:

The following specification sections and appendices have been prepared for inclusion in Work Order Contracts for the performance of green stormwater infrastructure operation and maintenance work for the Barton Combined Sewer Overflow Control Project. The sections may be edited as appropriate for scope of work order contracts, frequency of work, or anticipated constructor skill sets.

- APPENDIX A SPECIFICATION 02961 GSI SURFACE FACILITIES MAINTENANCE
 APPENDIX B SPECIFICATION 02721 GSI STORM DRAINAGE SYSTEM MAINTENANCE
 APPENDIX C SPECIFICATION 02521 GSI UNDERGROUND INJECTION CONTROL (UIC) WELL MAINTENANCE
 APPENDIX D – EQUIPMENT MANUALS
 APPENDIX E – DRAFT KING COUNTY INTEGRATED PEST MAINTENANCE DOCUMENT
 APPENDIX F – GSI MAINTENANCE REFERENCE LIST
 APPENDIX G – CHECKLISTS
 APPENDIX H – AS-BUILT PROJECT PLANS, REFERENCE PLANT PHOTOS & LINK TO COS STANDARDS
 APPENDIX I – CONTACT CHARTS
- APPENDIX J IRRIGATION WATERING SCHEDULE



1. INTRODUCTION AND BACKGROUND

PURPOSE OF THE BARTON GREEN STORMWATER INFRASTRUCTURE FACILITY

Bioretention (vegetated) swales within the City-owned public right-of-way planter strips are for the purpose of intercepting, treating and reducing the amount of stormwater discharging into the combined sewer pipes. By reducing the amount of stormwater entering the combined sewer the number of combined sewer overflows at the Barton Pump Station will be reduced. The bioretention swales are part of King County's mandate to provide Combined Sewer Overflow (CSO) control for compliance with State of Washington's Department of Ecology requirements.

PROJECT DESCRIPTION & LOCATION

The Project Area is located within the King County's Barton Combined Sewer Subbasin 416. The Project Area northern limit is SW Othello Street and southern limit is SW Barton Street. The western limit of the Project Area is an alley just west of 34th Avenue SW and the eastern limit is approximately 30th Avenue SW.





O&M MANUAL

The purpose of this O&M Manual is to ensure the function of the Green Stormwater Infrastructure facilities. These facilities provide control of Combined Sewer Overflow events at the Barton Pump Station. For the facilities to function, stormwater runoff from the street and adjacent parcels flows to and then filters through the bioretention soil of the bioretention swales located in the right-of-way planter strip. After runoff passes through the bioretention soil, the stormwater discharges into an underdrain that conveys the flows into an Underground Injection Control (UIC) well for deep infiltration into a soil layer identified as Vashon Advance Outwash. Maintenance and monitoring of the drain curb cuts, storm drainage structures diverting flow to the bioretention swales, UIC wells, trees, and pavement within and adjacent to the bioretention swales is required to ensure the function of the facilities.



Fifteen streets with bioretention swales

ABBREVIATIONS AND DEFINITIONS

СВ	Catch Basin
COS	City of Seattle
CSO	Combined Sewer Overflow
Ecology	State of Washington Department of Ecology
EPA	Environmental Protection Agency
GSI	Green Stormwater Infrastructure
KC	King County
KCWTD	King County Wastewater Treatment Division
MH	Maintenance Hole
UMH	Underdrain Maintenance Hole
UIC MH	Underground Injection Control Maintenance Hole
O&M	Operations and Maintenance
ROW	Public Right-of-Way owned by the City of Seattle
UIC	Underground Injection Control
USDC	United States District Court
SDOT	Seattle Department of Transportation
SPU	Seattle Public Utilities

Bioretention/Bioretention swale – "Bioretention" or "bioretention swale" is a water quality treatment system for stormwater runoff. In other documentation associated with this project including outreach materials, "bioswale" and "rain gardens" are other terms used interchangeably with bioretention.

Large Storm Event / Large Storm – 1 inch or more rainfall in 24 hours and/or winds 20 mph or greater.



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DESIGN CRITERIA

The bioretention swales are part of an effort by King County to provide CSO control of no more than one overflow event per year on a 20 year rolling average for compliance with Department of Ecology requirements. See the Consent Decree in the case entitled *United States of America and the State of Washington v. King County* (USDC Civil Action No. 2:13-cv-677 lodged on April 16, 2013). The bioretention swales are located within the City of Seattle's right-of-way and must also meet the City's street design requirements for drainage and vegetation as agreed to during the SDOT Street Improvement Plan permitting process (SDOT Project No. 163005).



STORMWATER RUNOFF FLOW PATH DIAGRAM

The diagram represents stormwater flowing through the bioretention swales into an underdrain and then conveyed to the UIC well for deep infiltration.

2. PREVENTATIVE MAINTENANCE

Maintenance will be performed through work order contracts and miscellaneous King County staff effort.

SURFACE FACILITY MAINTENANCE

This section specifies maintenance of GSI surface facilities to ensure that the facilities function properly for CSO control. Maintenance includes the following:

- 1. Drainage structure grates, drain curb cuts and weirs.
- 2. Paved pathways and sidewalks.



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3. Soils and mulch.

- 4. Vegetation including street trees, shrubs, groundcover, and emergent.
- 5. Irrigation.
- 6. Other miscellaneous landscape items.
- 7. Pest management.

Surface facilities maintenance is detailed in Appendix A – Specification 02961 GSI Surface Facilities Maintenance

See Appendix E for the Draft King County Integrated Pest Management Document.

See Appendix J for the Irrigation Watering Schedule.

STORM DRAINAGE SYSTEM MAINTENANCE

This section provides maintenance recommendations for subsurface GSI storm drainage infrastructure before the stormwater runoff enters the UIC well. Maintenance includes the following:

1. Catch basins with storm drains/culverts that discharge (daylight) runoff into a bioretention swale.

- 2. The bioretention swale underdrain pipes.
- 3. The underdrain maintenance holes and cleanouts that connect to a downstream UIC well.
- 4. Street sweeping (optional).

Storm drainage system maintenance is detailed in Appendix B – Specification 02721 GSI Storm Drainage System.

UIC WELL MAINTENANCE

The section provides maintenance recommendations for UIC wells. All UIC wells will require some degree of maintenance or rehabilitation, regardless of construction methods or materials used. The time span for maintenance or rehabilitation depends upon many factors including water quality, aquifer characteristics, well design, well materials, well installation procedures, inflow rates and equipment quality. Maintenance of UIC wells will require the participation of a variety of persons including field inspectors, licensed well drillers, licensed hydrogeologists and/or professional engineers. Maintenance will include the following:

- 1. General inspections of the UIC wells and associated maintenance hole structures.
- 2. Water level and depth measurements.
- 3. Down-hole color video camera survey.
- 4. Sediment removal.
- 5. UIC well flow testing.
- 6. UIC well screen rehabilitation
- 7. Maintenance of records required by and/or requested by the County Representative.

Maintenance of the UIC wells is detailed in Appendix C - Specification 02521 GSI UIC Well Maintenance.

SPILL PREVENTION AND RESPONSE

Contractors and KC staff shall be trained to recognize, prevent and clean up hazardous waste, excessive oil, spills and sediment. Follow Specification 01560 Environmental Management for spill prevention and response. The following web site has contains useful information in developing a spill plan:

http://www.kingcounty.gov/healthservices/health/ehs/toxic/HazSpills.aspx



EQUIPMENT MANUALS

Equipment manuals are a submittal requirement for the KCWTD construction contract (C00794C13) that will construct the GSI facilities for CSO control. Equipment manuals submitted under the GSI construction contract are included in Appendix D.

EQUIPMENT LIST

The landscape and storm drainage maintenance will require public works industry standard equipment. The UIC well maintenance equipment is specified in Appendix C.

3. GENERAL RESOURCE

REFERENCE MATERIALS

A list of suggested reference materials is located in Appendix F.

PERSONNEL

Personnel will be required to follow standard KCWTD procedures. For the purposes of this document personnel are defined as follows:

- 1. City Inspector: City of Seattle Inspector or Reviewer
- 2. KCWTD Inspector: King County Wastewater Treatment Department Inspector
- 3. Crew: Contractor or King County Staff

COMMUNICATION FLOW CHART

In Appendix I, there are two communication flow charts for two types of scenarios. The "Construction in the right of way through WTD GSI facility" denotes the process for future construction work that is permitted by the City of Seattle but needs to occur within a WTD GSI facility such as replacing or adding a water service or gas service. The "Resident Observation" flow chart describes the process for whom to contact when a resident calls to report an issue (such as the swales are not draining within 24 hours or there was a spill) to the County hotline.

WARRANTIES

Warranties are for a year per the terms of the KCWTD construction contract C00794C13.

The following group of streets will be warranted from October 2014 to October 2015

34TH AVENUE SW - OTHELLO TO WEBSTER 34TH AVENUE SW - WEBSTER TO HOLDEN 34TH AVENUE SW - KENYON TO ELMGROVE 31ST AVENUE SW - OTHELLO TO WEBSTER 31ST AVENUE SW - WEBSTER TO HOLDEN 31ST AVENUE SW - HOLDEN TO KENYON 31ST AVENUE SW - HOLDEN TO ELMGROVE SW KENYON ST – 34th TO 32ND 34TH AVENUE SW - THISTLE TO CLOVERDALE 34TH AVENUE SW - CLOVERDALE TO TRENTON

The following group of streets will be warranted from September 2015 to September 2016.

32ND AVENUE SW - OTHELLO TO WEBSTER 32ND AVENUE SW - WEBSTER TO HOLDEN

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31st AVENUE SW - ELMGROVE TO THISTLE 31ST AVENUE SW - CLOVERDALE TO TRENTON 30TH AVENUE SW - OTHELLO TO WEBSTER

RECORD KEEPING AND CHECKLISTS

Maintenance checklists will be utilized by KCWTD Inspectors, crew and may be referenced by City Inspectors. They are located in Appendix G.

The checklists (in Appendix G) should be filled out based on the maintenance Schedule-At-A-Glance for each facility elements, described in Appendix A-C. The checklist include:

- "GSI Surface Facilities Maintenance Checklist for Establishment"
- "GSI Storm Drainage System Maintenance Checklist"
- "UIC Well Maintenance Checklist"
- "UIC Well MH Inspection Checklist"

Additional reviews shall occur as needed with major deficiencies reported and repaired.

At the time of this update the GSI SPU/WTD Program is in the process of developing tables/checklists. Recommend continuing to use these lists until establishment is complete (2017 for first 10 streets and 2018 for the last 5 streets). After establishment, begin to use the routine and troubleshooting program tables/checklists developed by the GSI program.

Project Plans and Reference Plant Photos are located in Appendix H. Note that the project plans include the 15 streets permitted with City of Seattle Department of Transportation (SDOT) under SDOT Project Number 163005 and constructed between 2013-2015.

NOTE: Nineteen streets with GSI were permitted under SDOT 163005 but 15 streets were constructed in 2013-2015. KCWTD is monitoring CSO overflows to determine the combined performance of the GSI in the 15 streets and upgrades to the Barton pump station completed in 2015. Based upon monitored results, KCWTD will use adaptive management to further control CSO events. Copies of the complete permitted plan set may be obtained from SDOT via Vault Plan Number 774-991.

GENERAL SAFETY AND SECURITY

Safety and security are per KCWTD standard protocol for work order contracts.

PERMITS

Review project specific term permit for required permits and submittals. Street use permits may be required for major repair work including but not limited to tree planting or pruning, sidewalk repair, meter adjustment and traffic control.

WEATHER

Weather conditions affect the operation and maintenance of natural drainage systems.

- 1. Anticipated Large Storm Event:
 - In the event of a large storm event the following steps should be taken;
 - a) Anticipate the event and clean curb cut inlets and catch basins prior to storm
 - b) Clean curb cut inlets and catch basin during the storm event
 - c) After the event remove accumulated sediment and leaf litter. If damaged, restore soils and plants.



2. Severe Winds:

After a severe wind storm remove downed branches and excessive leaf litter prior, especially if a wet weather storm event is anticipated to follow.

3. Extreme Drought:

In the event a drought condition exists that requires the reduction of water as directed by City of Seattle. The following steps can be taken; reset controller to water less frequently, adjust nozzle to spray only bioretention swale plants and trees, retrofit irrigation to a drip system. System should be monitored to protect trees and emergent vegetation as a priority.

CONTINGENCIES

Future improvements to the streets or on adjacent properties could impact the GSI facilities or provide opportunities to remove additional stormwater runoff from the combined sewer. Those improvements may require design by a landscape architect, civil engineer or hydrogeologist/geotechnical engineer to mitigate impacts to the GSI facilities or to provide additional facilities for CSO control. It is recommended that King County review future improvements to mitigate impacts to the GSI facilities for additional CSO control facilities.

Modifications may include but are not limited to:

- 1. New utility services (See also Appendix I).
- 2. Retrofitting for pedestrian access when a home requires accessible access
- 3. Unanticipated UIC well modification
- 4. Improvements/Redevelopment at the Westside School

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SECTION 02961 APPENDIX A

GSI SURFACE FACILITIES MAINTENANCE

SECTION 02961 APPENDIX A

GSI SURFACE FACILITIES MAINTENANCE

PART 1 GENERAL

1.01 PURPOSE

A. The primary purpose of the Barton CSO Control Project Facilities is to intercept the stormwater runoff from the street and sidewalks into the bioretention swales for treatment and into the UIC wells for deep infiltration in order to reduce the amount of stormwater flowing into the combined sewer system and causing a CSO event downstream at the Barton pump station. Gutter flow discharges into the bioretention swales via drain curb cuts. Stormwater then filters downward through the bioretention plants and soil for treatment. Once it has been filtered it flows into an underdrain pipe that conveys the flows to a UIC well located in a MH for deep infiltration.

1.02 SUMMARY

A. This section specifies maintenance of GSI surface facilities to ensure that the facilities function properly for CSO control. Maintenance of the GSI surface facilities includes the drainage grate collection structures and drain curb cuts, paved pathways and sidewalks, swales, vegetation (landscape), irrigation and other miscellaneous items.

1.03 REFERENCES

- A. Referenced Standards: This section incorporates documents by reference. These references are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of a listed document, the requirements of this Section shall prevail. Also see section 01012 – Reference Material. For the work related to the Contract, the latest revision of the following are considered reference documents:
- B. See Appendix D Equipment Manuals
- C. See Appendix E Draft King County Integrated Pest Management Document
 - 1. Use of pesticides and herbicides is prohibited.
 - 2. This reference covers use of natural landscape practices.
- D. See Appendix F GSI Maintenance Reference List for recommended publications, resources and references
- E. See Appendix H As-built Project Plans, Reference plant photos & Link to COS Standards
- F. See Appendix G Checklists.
- G. See Appendix I Contact Charts
- H. See Appendix J Irrigation Watering Schedule
- City of Seattle (COS) Standard Specifications for Road, Bridge and Municipal Construction, current edition; City of Seattle Standard Plans, current edition; and Seattle Department of Transportation Director's Rule 5-2009 for Street and Sidewalk Pavement Opening and Restoration (current edition) (The Contractor shall have a complete set of these documents at the project site at all times).

1.04 DEFINITIONS

- A. Large Storm Event / Large Storm: 1 inch or more rainfall in 24 hours and/or winds 20 mph or greater.
- B. Bare Area/Bare Spot: Location with dead or missing plants or without mulch.



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- C. BMP: Best Management Practices
- D. COS: City of Seattle
- E. CSO: Combined Sewer Overflow
- F. ECOLOGY: State of Washington Department of Ecology
- G. GSI: Green Stormwater Infrastructure
- H. KCWTD: King County Wastewater Treatment Division
- I. MH: Maintenance Hole
- J. ROW: right-of-way
- K. SDOT: Seattle Department of Transportation
- L. UIC: Underground Injection Control Well

1.05 SUBMITTALS

- A. Materials List submit yearly
- B. Draft King County Integrated Pest Management Document submit Barton GSI specific modifications to document, as applicable.
- C. Maintenance Checklists submit guarterly.

1.06 REGULATORY REQUIREMENTS AND STANDARDS

- A. City of Seattle Permits
 - 1. See specifications in Division 0 and 1.
 - 2. Refer to SDOT Street Use Division requirements.
- B. Personnel: Field personnel to wear safety vests and carry business cards identifying contact information per County representative.

1.07 QUALIFICATIONS

A. See specifications in Division 1.

1.08 PROTECTION

A. See specifications in Division 1.

PART 2 PRODUCTS

2.01 EQUIPMENT – SEE APPENDIX D

2.02 MATERIALS FOR REPAIR AND REPLACEMENT

- A. This section describes materials that may need to be purchased GSI maintenance.
- B. Bioretention Soil Mix (for areas requiring more than two cubic feet of material):
 - Bioretention Soil Mix shall conform to Bioretention Soil Mix per COS Section 9-14.1(3).
 - Mineral Aggregate shall conform to COS Section 9-03.2(2) with exception of the а. passing for sieve #200 shall be 1-3%.
 - b. Fine compost shall conform to COS Section 9-14.4(9).
- C. Bioretention Minor Soil Replacement Mix (for areas smaller than two cubic feet of material), the following mix of materials that are available at a local hardware store can be used. 1.
 - Mix well the following quantities of material.
 - a. 1 bag of pea gravel (1/2 cubic foot)
 - 1 bag of play sand (1/2 cubic foot) b.

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- c. 1 bag of Cedar Grove compost (1 cubic foot)
- 2. Cedar Grove's Rain Garden/Bioretention soil mix may also be used.
- D. Arborist Wood Chip Mulch: Shall conform to COS Section 9.14.4(5) Arborist Wood Chip Mulch with the exception that it shall not be longer than 4-inches and shall not be derived from recycled lumber.
- E. Compost / Compost Mulch: Shall conform to COS Section 9.14.4(9) Composted Material Coarse Compost. Provide testing and documentation as noted in specification.
- F. Culvert Geotextile Fabric shall conform to Mirafi 140N, US Fabrics US 120 NW, or an approved equivalent product.
- G. Compost Sock, Coir Log, Wattle shall conform to Ecology's 2005 Best Management Practices (BMP) C235 and COS Section 9-14.16/WSDOT Section 9-14.5(5).
- H. Plant Materials
 - 1. General:
 - a. Plants to be nursery grown in climatic conditions similar to the site. Measurements, caliper, branching, grading, quality, balling and burlapping are to follow Code of Standards of American Association of Nurserymen in the most current American Standard for Nursery Stock unless otherwise specified.
 - b. See Project Plans for specific plants.
 - c. If substituting a plant with another species or variety match height and growth pattern of original plant for right of way use.
 - 2. Form:
 - a. Trees to have an overall form typical of the species, uniformly branched, with a symmetrical crown. Trees with curved or leaning trunks, damaged leaders, damaged bark, sunscalds, disfiguring knots or fresh cut limbs over 3/4" will be rejected. Coniferous trees to be in native form (not sheared) with a single dominant leader.
 - b. Shrubs to have an overall form typical of the species, uniformly branched, with a symmetrical crown.
 - 3. Container Grown: Plants to have been grown in container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole. No plants shall be loose in the container. Container stock shall not be pot bound.
 - 4. Balled and Burlapped: Plants to have firm, natural balls of soil in sizes shown in ANSI Z20.1, wrapped firmly with burlap or approved material, and bound carefully with twine, cord, or wire mesh.
 - 5. Damaged Plants: Damaged plants shall not be installed.
- I. Tree Staking Materials
 - 1. Tree Tie: Shall conform to COS Section 9-14.7.
 - 2. Wood Stakes: 2 inch by 2 inch by 8 foot long (2"x 2"x 8') Lodgepole pine wood stakes.
- J. Fertilizer and Amendments
 - 1. Compost
 - a. Compost and arborist wood chip mulch that is applied semi-annually provides the fertilizer required for the system.
 - 2. Tree fertilizers shall meet the following guidelines:
 - a. Contains all natural ingredients.
 - b. Fertilizer product to be approved by an ISA certified arborist.
 - c. Approved products may include:
 - 1) Plant Health Care, MycorTree Injectable
 - 2) Plant Health Care (PHC) for Trees (select specific blend based on tree health, soil testing and location)
- K. Herbicides
 - 1. Use is prohibited.





- L. Pesticides
 - 1. Use is prohibited.
- M. Irrigation: See Project Plans.
- N. Cobbles: Three-inch minimum to six-inch maximum well-graded washed rounded cobblestone rock or an approved equivalent product. Cobbles shall not be procured from natural stream bed channels.
- O. Boulders:
 - 1. Pipe Protection Boulders shall be of a similar color and type in accordance with the size noted on the plans.
 - 2. Weir Boulders shall be in accordance with the size noted on the plans and COS Section 9-03.17. Boulders shall be High Cascade Granite smooth finish, free of cracking and flaking.
- P. Precast Concrete Pad: County representative to review drawing and specification for construction of replacement pads.
- Q. Pervious Concrete: County Representative to review drawings and specifications when pervious concrete paths require major repair.

PART 3 EXECUTION

3.01 EXTENT OF WORK

- A. See Project Plans for limits of maintenance for each street.
- B. See Maintenance schedule, checklists and submittal requirements.

3.02 REPORTING

- A. See Checklist located in Appendix G.
- B. Recommend County Representative fills out at least twice a year to report conditions.

3.03 GSI SURFACE FACILITIES MAINTENANCE SCHEDULE AT-A-GLANCE (ESTABLISHMENT)

MONTH	DRAINAGE STRUC	PAVED PATHS & SIDEWALKS				
	Check for Vegetation Blockage	Remove Surface Debris, Sediment & Fall Leaf litter	Check Damage to Drain Curb Cuts, Grates & Weirs	Vacuum/Sweep, Moss Removal	Review Surface Condition	
Jan.	1X plus before & after large storms	4X plus as needed after storm events	1X			
Feb.	1X plus before & after large storms	4X plus as needed after storm events	1X			
Mar.	1X plus before & after large storms	4X plus before & after large storms	1X	1X		
April	1X plus before & after large storms	1X plus as needed after storm events	1X			
Мау	1X	1X	1X		min. 1X	
June	1X	1X	1X			
July	1X	1X	1X			
Aug.	1X	1X	1X			
Sept.	1X plus before & after large storms	4X plus before & after large storms	1X	1X		
Oct.	1X plus before & after large storms	4X plus as needed after large storms	1X			
Nov.	1X plus before & after large storms	4X plus as needed after large storms	1X			
Dec.	1X plus before & after large storms	4X plus as needed after large storms	1X			
Every 3+/- Yrs						

A. See Descriptions of tasks in Paragraphs 3.04 through 3.19



GSI SURFACE FACILITIES MAINTENANCE SCHEDULE AT-A-GLANCE (ESTABLISHMENT) CONT.

MONTH	sc	SOILS VEGETATION (LANDSCAPE)										
	Repair Erosion, Washouts, Sediment & Settlement	Monitor/ Repair Compacted Soils, Ponding & Swale Function	Remove Trash & Debris	Weed Planted Areas	Apply Mulch	Trim Perennials & Grasses	Trim along Pavement	Prune Trees & Accent Shrubs	Rectify Vegetative Overgrowth	Plant Replacement & Relocation	Monitor Plant Health	Irrigation System
Jan.	every visit plus after large storms	every visit plus after each large storms	every visit (min. 1X)									
Feb.	every visit plus after large storms	every visit plus after large storms	every visit (min. 1X)									
Mar.	every visit	every visit	every visit (min. 1X)	1X	top dress after weeding	cut back perennial grasses & hand rake evergreen grasses	1X	prune trees during late dormant season	1X	1X	1X	
April	every visit	every visit	every visit (min. 2X)	2X								
Мау		schedule major repair	every visit (min. 3X)	2X		cut back collapsed perennial grass foliage		prune shrubs post bloom (optional)	1X			system start up, annual backflow test & reporting
June			every visit (min. 3X)	2X		deadhead & trim for clearance				1X	1X	manual operation walk-thru
July			every visit (min. 3X)	2X					1X			manual operation walk-thru
Aug.			every visit (min. 3X)	2X		trim at intersection for sight clearance		prune at intersection for sight clearance			1X	manual operation walk-thru
Sept.	1X	every visit	every visit (min. 3X)	2X	after weeding as needed	deadhead	1X			1X	1X	manual operation walk-thru
Oct.	every visit	every visit	every visit (min. 3X)	1X		cut back spent perennials		prune bleeding sap trees	1X	1X		winterize system
Nov.	every visit plus after large storms	every visit plus after large storms	every visit (min. 1X)									
Dec.	every visit plus after large storms	every visit plus after large storms	every visit (min. 1X)									
Every 3+/- Yrs		test soil (every 5 years)				cut back/ thin evergreen grasses in March						irrigation audit

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3.04 DRAINAGE STRUCTURE GRATES, DRAIN CURB CUTS AND WEIRS

- A. Check for Vegetation Overgrowth and Blockage
 - 1. Check for vegetation overgrowth and blockage (that would prevent water from flowing into the swale) from plantings at Pipe Outlets, Curb Discharge and Drain Curb Cuts See also Vegetation Overgrowth in this Section.
- B. Drain Curb Cuts
 - 1. Drain curb cuts are one of the critical elements for diverting gutter flow into the bioretention swales. The drain curb cuts need to be free and clear of debris in order to not inhibit the flow path.
 - 2. Routine Maintenance:
 - a. Remove any accumulated debris within the drain curb cut opening. Dispose of debris properly.
 - b. Check drain curb cuts during each site visit to ensure proper function.
 - c. In planted swales where vegetation and weeds blocks flow from entering through the drain curb cut, adjust location of plants located within 2 feet of curb cut opening and manually remove weeds. See Plant Relocation and Plant Replacement Sections.
 - d. Report any damage to the drain curb cut opening such as chipped concrete or cracking to County Representative. Coordinate with County Representative on repair and/or replacement.
 - e. Report any damage to grates, catch basin, pipe outlets or weirs that impede drainage from flowing.
 - f. Report sediment accumulation at drain curb cut openings on Maintenance Checklist Sheet and submit to County Representative.
 - g. Where continued gutter line ponding or blockage occurs at drain curb cut opening due to improper soil elevation, slight lowering of grade at edge of bioretention swale may improve flow. See Soils Section.
 - 3. Channelization: Continued erosion and channelization in the swale at the drain curb cut indicates the need for energy dissipation. A small amount of cobbles can be added to reduce erosion at these points. See Soils Erosion Section.
 - 4. Blockage from Excess Plantings at Drain Curb Cuts See Vegetation Overgrowth Section.
- C. Leaves, Debris, and Sediment Removal
 - 1. Clear the first upstream drain curb cuts (in each swale cell on each street), catch basin grates that drain into the swale, and inlets/catch basins grates that drain to combined sewer.
 - 2. Clear leaves, trash debris, and sediment from all drainage structure grates, drain curb cuts, culverts and drain inlets at least once a month.
 - 3. Fall Maintenance: remove leaves weekly to prevent excessive transport and buildup of leaves on the Barton CSO bioretention system, CB grates, drain curb cuts, inlets, along gutter, etc.
- D. Check for damage to drain curb cuts, CB grates and weirs twice yearly.
- E. Check for blockage, sediment build-up and debris at CB grates and drain curb cuts before and after major storm events.

3.05 PAVED PATHS AND SIDEWALKS

- A. Pervious Concrete Paths
 - 1. The pervious concrete paths do not perform a drainage function; it is not critical to maintain the filtering capability of the pervious concrete paths for this project application. It is critical to keep the path clear of vegetation for access. If more than 25% of path area is impacted by moss or other vegetation, then more involved maintenance is required.



- 2. Manually sweep or vacuum with shop vacuum paths to maintain appearance.
- 3. Pressure wash, vacuum, use broom (during dry weather) or some combination of the two, for when more involved maintenance is required for moss removal.
- 4. Watch for washouts from planted areas where soil, mulch or sediment is deposited on walks. Monitor washout occurrences to identify problem areas.
- 5. Remove grass and other miscellaneous weeds from paved paths by pulling, sweeping, cutting or burning.
- 6. For problem areas where trimming cannot keep up with growth See Trim Vegetation along Paved Areas Section.
- 7. When working on adjacent landscape areas, cover the pervious concrete path to prevent debris accumulation. If debris is deposited from the adjacent maintenance work, remove debris from path.
- 8. Access Modification minor access modification includes installation of paved path at crossings zones and pervious concrete path replacement with wider path. County Representative will notify Contractor of work and provide Contractor with direction and specifications for work.
- B. Public Sidewalks:
 - 1. Residents are responsible for debris, leaf, litter and snow removal from public sidewalk adjacent to their property.
 - 2. Trimming back plantings along hardscape areas is covered in Trim Vegetation along Paved Areas paragraph below.
 - 3. If sidewalks are uplifted by trees maintained by King County then sidewalks shall be shimmed to provide smooth transition between sidewalk panels so that they are not a tripping hazard in accordance with City requirements (see SDOT CAM 2208). If a tree continues to uplift sidewalk, sidewalk section replacement may be required or the tree evaluated. Notify County Representative
 - 4. Clean sidewalks of all debris resulting from maintenance work.

3.06 SOILS

- A. Protecting Bioretention Soils during Maintenance
 - 1. Care must be taken when working in such areas to avoid soil compaction, which would alter their stormwater function for CSO control.
- B. Erosion
 - 1. Excessive erosion may be caused by higher and/or more frequent flows than expected, and may occur where flows are concentrated, such as at pipe outfalls or at drain curb cuts.
 - 2. Check for channels or cuts over 2-inches wide throughout the swale:
 - a. One time per month.
 - b. Within 1 week after large storm events.

cobbles poorly placed at

pipe outlet



sediment buildup in drain curb cut





moss on pervious concrete pavement

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- 3. Report erosion on Maintenance Checklist sheet and submit to County Representative with the following information:
 - a. Note channel or cut location on map provided with checklist
 - b. Clearly describe location
 - c. Note if channel or cut is a recurring issue that may have an upstream cause.
- 4. Temporary erosion control measures shall be put in place until permanent repairs can be made. Install coir logs or compost berms across the path of erosion, as a temporary measure during seasons or weather when plants will not have time to establish and hold soil in place. When weather permits, eroding areas shall be filled with Bioretention Soil Mix and compacted lightly with hand tamper.
- 5. When working in bioretention swales, protect from compaction following guidelines in Protecting Bioretention Soils during Maintenance Section.
- 6. Replace plants at proper grade and provide appropriate spacing. Use original plants or replace with in-kind material matching maximum height restrictions. Apply mulch in newly/restored planted areas.
- 7. Check area within 6 weeks of correction to see all exposed soils within the facility are covered by erosion control material (vegetation, mulch, or the like).
- 8. If repeated erosion occurs:
 - a. Install rounded cobbles at top of erosion channel. Added cobbles shall not reduce or block in any way stormwater flow into the swale.
 - b. Cobble area should be 3 times the width of the erosion channel and 12 inches minimum length.
- C. Washout
 - 1. A washout occurs when stormwater flows out of planted areas or swales and deposits soil, mulch or sediment on paving or elsewhere.
 - 2. Identify what is causing the stormwater to flow outside of the planted area and take steps to remedy the problem.
 - 3. Clean deposited soil or other materials from pervious pavement or other adjacent surfacing. See Pervious Concrete Path Section.
 - 4. If washout leaves the surface elevation too high at edge of planted area:
 - a. Protect pervious pavement by covering with plastic and secure covering in place prior to start of grade correction.
 - b. Remove or plants at edge of planted area.
 - c. Remove soil so it slopes away from washout.
 - d. Replace plants at proper grade and provide appropriate spacing. Use original plants or replace with in-kind material. Replace mulch.









channeling and erosion in swale

sediment in swale

ponding at swale bottom

washout on pavement

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- 5. If swale channel grading needs adjustment:
 - a. Protect pervious pavement by covering with plastic and secure covering in place prior to start of grade correction.
 - b. Remove plant material where work is to be done.
 - c. Grade at bottom and edges to match sections on Barton CSO Project Plans or as directed by County Representative.
 - d. Add Bioretention Soil Mix and if necessary replace plants with in-kind material matching heights.
 - e. Replace mulch.
- 6. If there are blockages (plant material, mulch build-up) in the channel redirecting water:
 - a. Protect pervious pavement by covering with plastic and secure covering in place prior to start of work.
 - b. Remove plant material or mulch causing blockage.
 - c. Replace plants at proper grade and provide appropriate spacing. Use original plants or replace with in-kind material matching heights. Replace mulch.
- D. Sediment Accumulation
 - 1. Sediment accumulation may indicate erosion above the swale facility or a location getting debris fallout from vehicles.
 - 2. Attempt to identify the source of sediment and reduce its input into the swale.
 - 3. Monitor sediment accumulation to identify problem areas. If the site is in a higher traffic area such as just off an arterial, you may need to target that location/site for more frequent cleaning or notify County Representative.
 - 4. Repeated Sediment Buildup
 - a. Remove sediment build-up at drain curb cuts to ensure that stormwater can flow into and out of the bioretention facility.
 - b. Where sediment accumulation is visible remove it manually, using shovels, shop vacs or other. It is most effective to remove sediment when the facility is dry.
 - c. Replace any vegetation damaged or destroyed by sediment accumulation and removal with in-kind plant material. Mulch around newly planted vegetation.
 - d. Report areas of heavy or frequent sediment buildup on Maintenance Checklist Sheet and submit to County Representative.
 - e. Monitor sediment accumulation to identify problem areas, as time allows.
- E. Soil Settlement
 - 1. If the surface elevation at edge of planted area is 1 to 4 inches below adjacent pavement grades add mulch to level of adjacent walks, pavements and curbs.
 - 2. If the surface elevation at edge of planted area is about 4 inches below adjacent pavement grades:
 - a. Protect pervious pavement by covering with plastic and secure covering in place prior to start of work.
 - b. Remove plants at edge of planted area.
 - c. Add 2 inches of soil.
 - d. Replace removed plants with in-kind material.
 - e. Replace mulch.

f. Fine grade planted areas to the level of adjacent walks, pavements and curbs.

- F. Compacted Soils
 - 1. Compacted soils can lead to longer periods of ponding, as well as poor plant health and growth.
 - 2. Aerate the soil by probing the soils to a depth of at least 6 inches approximately 6 inches on center in compacted areas.
 - 3. Hand till compost into the surface.
 - 4. Minimize work within cells during saturated conditions.
 - 5. Observe swale to see if steps to remedy compacted soils improved plant health and swale ponding.



- G. Soil Testing
 - 1. County is performing soil testing in response to comments from the community. Soil testing is not an agency or regulatory requirement.
 - 2. Test the soils of 3 streets every 5 years for metals and nutrients (tests to be determined).
 - 3. First test to start in approximately 2017.
 - 4. Report results to County Representative.
- H. Ponding
 - 1. The bioretention swales are designed to have a maximum ponding level of 12 inches at the downstream end of the swale cell during rain events and to drain completely (no ponding) within 24 hours after the rain event has stopped. Standing water within swales is an indicator of slower infiltration of stormwater through the bioretention soil mix to the underdrain and UIC well or a blockage along the system. Understanding storms often occur back to back and the coordination required to organize site visits, report to County Representative on observed ponding within 48 hours after a rain event has stopped.
 - 2. Investigate cause and take the following steps as applicable:
 - a. See Soils Bioretention Landscape Routine Maintenance Section.
 - b. Check the vegetation accumulation for blockages in or near the structures and remove blockage.
 - c. Determine if sediment is built up within the top 2 to 3 inches of cell. If so, remove sediment and replace with mulch. See Soils Sediment Accumulation Section.
 - d. Fill any unintentional depressions with Bioretention Soil Mix and grade to smooth.
 - e. Fine grade soil to direct water to the designated drainage point.
 - f. Remove soil to a depth of 2 inches more than the accumulated sediment and replace with Bioretention Soil Mix.
 - g. Check irrigation system and storm drainage for broken pipes.
 - h. Observe swale within 48 hours of next rain event to determine if maintenance activity has improved performance to drain.
 - i. If water ponds for more than 72 hours mosquitoes larvae may develop.
- I. Swale Function
 - 1. If it is observed that there may be blockage in a GSI storm drainage structure below the surface (catch basins, pipes, maintenance holes, clean outs, etc.), immediately notify the County Representative.
 - 2. See Section 02721 GSI Storm Drainage System Maintenance

3.07 VEGETATION TASKS

A. Major categories are listed in Sections 3.08 through 3.20 and noted in the schedule at a glance.

3.08 TRASH AND DEBRIS REMOVAL

- A. General Debris Removal: Excessive debris can block water from entering the bioretention facilities at the drain curb cuts, pipes daylighting into the swale and/or at catch basin grates across the street that collect and divert flows to the swale via a culvert pipe.
 - 1. Clear trash and other debris.
 - 2. When feasible rake or sweep debris. Minimize dust generation during blowing operations. DO NOT blow material onto private property or parked vehicles.
 - 3. Collect and properly dispose of vegetative debris from all areas in and adjacent to bioretention facilities. Vegetative debris should be collected for green waste pick up or offsite disposal to a composting facility.
- B. Large Storm Event: If a large storm event is forecasted, verify all drain curb cuts and CB grates are clear of debris and monitor during storm event.
- C. Trash/Litter: Collect and properly dispose of trash/litter from all areas in and adjacent to bioretention facilities. Pay particular attention to drain curb cuts, grates at catch basins and inlets,



weirs and other locations in which trash is likely to block flows from entering the bioretention swales. Dispose of trash in a legal waste collection and/or recycling facility.

- D. Pet Waste: Collect and properly dispose of pet waste from all areas in and adjacent to bioretention facilities. If pet waste is a repeated problem, report location on Maintenance Checklist Sheet and submit to County Representative.
- E. Contaminants: Immediately report any contaminants found in landscape areas (paint, oil, gas, antifreeze, or other spilled/dumped pollutants) to the County Representative.
 - 1. Clean up spills as soon as possible to prevent contamination of stormwater.
 - 2. Clean accidental spills associated with work provided and in accordance with Contractor's Spill Plan and Specification 01560 Environmental Management.
 - 3. If a vehicle is associated with the spill, record and report the license number.
 - 4. Provide a detailed description of type and extent of the spill.

3.09 WEED PLANTED AREAS

- A. The Owner requires environmentally-sensitive maintenance practices. Mechanical or hand control of weeds is the expected methods of control.
- B. Weed all planted areas in the Barton CSO bioretention facilities as noted on the Plans.
- C. Remove weeds with their roots manually with shovels, pincer-type weeding tools, flame weeders, or hot water weeders as appropriate.
- D. For stubborn weed infestations or invasive weeds
 - 1. Use of herbicides is prohibited.
 - 2. Consider removing the portion of the landscape that is 70% weeds or more, covering with cardboard and three inches of mulch for 6 months and replanting the next season.
- E. Noxious Weeds Watch for and respond to new occurrences of especially aggressive weeds such as Himalayan blackberry, Japanese knotweed, morning glory, English ivy, reed canary grass, horsetail and first succession plants like Red Alder and Cottonwood to avoid invasions.
 - 1. Refer to Appendix F GSI Maintenance Reference List for information on noxious weeds and noxious weed removal.
 - 2. See Appendix E –. Draft King County Integrated Pest Management Document
- F. When installed plants appear overly aggressive, see Plant Species Replacement When a Landscape Plant Becomes a Weed Section.

3.10 MULCH

- A. Mulch reduces the ability of weeds to establish, keeps soil moist longer and replenishes nutrients in the soil. Arborist wood chip mulch shall be used for topdressing. Compost mulch can be used to replenish nutrients or in the late fall when wood chips may float and clog drain curb cut outlets.
 - 1. Apply 2 inches of mulch and provide a uniform finished surface.
 - 2. Mulch can also be applied if the depth is deficient or non-existent. Mulch depth should be maintained at 3" to 4" on the side slopes of the swale.
 - 3. If plants are exhibiting nutrient deficiencies apply mulch and/or see Plant Health Monitoring - Nutrient Landscape Fertilization and Nutrient Deficiencies Section.

3.11 TRIM PERENNIALS AND GRASSES

- A. Evergreen grasses hand-rake with a small rake or fingers to remove dead growth. Cut when grasses become too tall or if foliage becomes brown and tattered. Thin grasses if overcrowding occurs. Cutting every year reduces the life span of the grass. If the foliage collapses cut back approximately 12 inches above ground when smothering other plants.
- B. Perennial grasses leave dry foliage for winter interest. Cut it back to within three to five inches from the soil before new growth emerges. If the foliage collapses cut back approximately 12 inches above ground when smothering other plants.
- C. Perennials cut back dying or dead and fallen foliage and stems.
- D. Flowering plants remove spent flowers (deadhead) by cutting just above the nearest branch or bud.
- E. See Appendix F GSI Maintenance Reference List for additional information on plant specific grooming methods and timing. See the Grooming Perennials and Ornamental Grasses table below for a general grooming schedule.

3.12 TRIM VEGETATION ALONG PAVED AREAS

- A. Edge and trim planted areas to control ground covers and shrubs from overreaching the sidewalks, to maintain access to paths and street edges and to improve appearance.
- B. Redefine edges with mechanical blade-type edger 2 times a year once in early to mid-March and once in early to mid-September
- C. Remove clippings and debris.
- D. Do not use edger or trimmer within 2 feet of tree trunks.
- E. Pavement and Groundcover Migration
 - 1. Where fast-spreading ground covers are planted adjacent to pavement, the ground cover may spread too aggressively and root in the pavement. This migration is of particular concern since it may cover over the hardscape used for access (pervious concrete path, public sidewalk, curb, etc). Ground cover plantings must be trimmed back if they begin to migrate on to the hardscape areas used for access.
 - a. Regularly trim ground covers along pavement edge.
 - 1) Time trimming as needed to keep plants from rooting or spreading onto adjacent pavement.
 - 2) Remove sediment if it has collected onto the pavement.
 - 3) Note areas where ground cover is removed on the Maintenance Checklist map and submit to County Representative.
 - For problem areas where removal cannot keep up, submit a list of retrofit plantings for County Representative Approval. See Plant Replacement and Plant Species Replacement Sections.

3.13 PRUNE TREES AND SHRUBS



bad pruning - cut at the wrong angle & torn bark



good pruning – branch collar left in tact



perennial grasses provide winter interest – foreground shows trim height



new growth emerging from trimmed grasses

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- A. Monitor the plants and prune for the following reasons:
 - 1. If broken or crossing branches are present.
 - 2. To remove dead wood.
 - 3. If disease/pest infestation are present.
 - 4. To maintain proper sight lines for pedestrian, vehicular, and bicycle safety.
 - 5. To provide clearance from overhead wires.
 - 6. To provide a minimum height clearance and horizontal access at roadways and walkways for pedestrian, vehicular and bicycle traffic.
 - 7. To remove visual obstructions of street signs, traffic signs, and streetlights to provide clear visibility, especially at intersections.
 - 8. To keep ADA ramps and sidewalks at intersections visible by pruning trees, shrubs and ground covers to allow full access and clear visibility.
 - 9. To prevent shrub branches from over shading grasses and emergents.
- B. General Pruning Procedures & Timing
 - 1. See Appendix F GSI Maintenance Reference List for pruning guidelines.
- C. Tree Pruning
 - 1. Tree shall be pruned (limbed up) as growth allows.
 - 2. For the first three years after planting: Deciduous trees maintain 5 to 6 feet min. clearance from grade and Coniferous trees maintain 3 feet min. clearance from grade
 - 3. Limb up as growth allows to eventually achieve 8 feet clearance over sidewalk and 14 feet along roadway.
 - 4. Thin internal branches as appropriate for species.
 - 5. Do not top trees, selectively prune for overhead wires.
- D. Accent Shrub Pruning
 - 1. Pruning for visibility through and around.
 - 2. Prune into a small tree form when feasible
- E. Pruning Trees on Private Property
 - 1. Maintenance of trees on private property is the responsibility of the resident/homeowner.
 - 2. If a tree is overhanging the ROW and is blocking pedestrian movement, blocking sightlines and interfering with maintenance of the biorentention swales, notify the County Representative.
 - 3. If a tree is overhanging the ROW and is blocking pedestrian movement or blocking sightlines notify SDOT.



accent shrub windowing



3.14 VEGETATION OVERGROWTH

- A. Monitor vegetation for potential interference with stormwater flows and vegetation blocking sight lines and encroaching on sidewalk, paved surfaces, water meter boxes and other structures.
 - 1. For Pruning see Prune Trees and Shrub Section.
 - 2. Major Plant Removal and Replacement
 - a. Vegetation shall not block the flow of stormwater entering into the swale at the drain curb cuts. Remove vegetation and restore area with cobbles to clear flow path. Transplant the removed vegetation in other areas of the facility that would not block the flow path into the swale nor cause drainage to overflow onto adjacent sidewalks.
 - b. Use the following general guidelines for modifications to areas with excessive vegetation:
 - 1) Remove plants that are weak, broken or not true to form.
 - 2) Thin grass clumps at even spacing at a ratio of 1:6.
 - 3) Thin grass or plants so as not to leave visual holes or bare soil areas.
 - 4) Smooth bare soil areas.
 - c. Determine that pruning or other routine maintenance are not adequate or feasible to maintain proper plant density and aesthetics in an efficient manner.
 - d. Determine if planting type should be replaced to avoid ongoing maintenance issues. An aggressive grower under perfect growing conditions should be transplanted to a location where it will not impact flow. See Plant Replacement and Plant Species Replacement Sections.
 - e. Look for areas that were planted too densely. A group of moderate growing plants installed too densely should be thinned by transplanting some individuals to make space for future growth while allowing for adequate flow-through.
 - f. When working in swales, protect from compaction following Soils Protecting Bioretention Soils during Maintenance Section.
 - g. Corrections should not noticeably alter the character of the planting layout.
- B. During transplanting and replacement, follow guidelines in Plant Replacement and Plant Relocation Sections.

3.15 PLANT REPLACEMENT

- A. Plant Species Replacement
 - The plant species in the Barton CSO bioretention facilities were carefully selected for their locations. However, as-built site conditions can differ from anticipated, sometimes resulting in poor performance, mortality, or overly vigorous growth, and the need for replacement plants with different requirements – see Relocating Plants Section. Use the following guidelines when a different plant species must be selected:
 - a. Replacement species must meet COS height restrictions.
 - b. Replace any non-native, disease-prone species with hardy, native species appropriate to the planting location and conditions.
 - c. Identify basic desired characteristics of replacement plant, including type (shrub, perennial, ground cover), size and form and function (flowering, water quality, weed suppression)
 - d. Narrow down choices matching plant requirements to as-built conditions such as sun/shade, wet/dry, soil type, foot traffic.
 - e. Submit proposed replacement plants to County Representative for review/approval.
 - 1) Provide notes outlining replacement on a Maintenance Checklist Sheet noting location on map (included with checklist).
 - 2. Steppable Groundcovers
 - a. Sturdy groundcovers may become excessively worn from pedestrian use at crossing zones and along the curb at the parking step-out zones. If original ground cover type



is too fragile for this application replace with more durable species or replace with arborist wood chips as approved by County Representative.

- 3. When a Plant Becomes a Weed: Plants intended for use in the landscape may begin to exhibit invasive characteristics and may be reclassified as a weed. This is especially common when plants are new to the region and have a limited horticultural track record. Invasive plants will exhibit weedy characteristics that may be used to identify them as problem plants needing extra maintenance or requiring removal.
 - a. Watch for plants exhibiting the following invasive characteristics:
 - 1) Highly self-sowing many seeds
 - 2) Broad germination high germination and success rate
 - 3) Early maturing can germinate and reproduce within same season
 - 4) Quick colonizing
 - 5) Outcompete other plants
 - 6) Difficult to remove seedlings or spreading growth
 - 7) Plants near Barton CSO bioretention facilities with potential invasive character should be monitored.
 - 8) Report potential invasive landscape plants to the County Representative, noting its location on the checklist map.
- B. Swale Bottom Plant Coverage Infill
 - 1. During the first three years following construction, it is expected that the swale bottoms and lower side slopes will consist of emergent plugs, other vegetation and mulch where the vegetation hasn't filled in. After the third year post construction, the emergents should grow together completely, leaving no bare areas or exposed mulch. If a spot without emergents or other vegetation becomes visible install additional emergents, with species and spacing per the Plant Palettes. Mulch replacement should not be necessary in the swale bottoms and lower side slopes once there is complete coverage by the emergents and other vegetation.
 - 2. See Plant Palettes in Appendix H.
- C. Planting Pit Preparation
 - 1. See City of Seattle planting details in Appendix H.
 - 2. Use care when planting near existing plants.
- D. Tree and Shrub Placement
 - 1. See City of Seattle planting details in Appendix H.
 - 2. Avoid disturbing liner when replacing streets trees.
 - 3. Backfill planting pit with native soil that is not frozen or muddy. For areas needing bioretention soil replacement less than 2 cubic feet, use Bioretention Minor Soil Replacement Mix.
- E. Groundcover Placement
 - 1. See City of Seattle planting details in Appendix H.
 - 2. Follow plant placement guidelines in the previous section.
 - 3. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants and to avoid damaging roots of adjacent plants.
 - 4. Plant to within 18 inches of tree trunks and shrubs and to within 12 inches of the planting bed edge.
- F. Mulching Replacement Plantings
 - 1. Mulch all replacement plantings to reduce weed establishment and keep the soil moist for longer periods see Mulch Section.
- G. Staking Replacement Plantings
 - 1. Stake all deciduous and coniferous trees immediately after planting to prevent leaning during establishment.



3.16 RELOCATING PLANTS

- A. Relocating plants is labor intensive and can be hard on the plant. There are times, however, when this is the best course of action. The most common reasons for relocating plants are blocking of flow, when shrubs grow too large for their location and when as-built conditions do not match plant requirements. The following are guidelines for electing to relocate a plant:
 - 1. Plant blocks the flow of water into the swale or through the swale.
 - 2. A shrub requires frequent, extensive pruning or shearing to maintain visual sight lines for safety or clearances along a walk or roadway.
 - 3. Understory plants overtaken by adjacent shrubs are shaded out and will die if shrubs not moved.
 - 4. Initial understory plantings are too dense.
 - a. Consider moving to underplanted or otherwise bare areas of landscape.
 - 5. A plant is suffering due to as-built conditions that will not change.
 - a. Wet-loving in dry location
 - b. Dry-loving in wet location
 - c. Sun-loving in full shade
 - d. Shade-loving in full sun
- B. When relocation is the best option, follow these guidelines to lessen the impact on plants:
 - Move plants when conditions are best.
 - a. During cool weather
 - b. When plants are dormant or semi-dormant
 - 2. Presoak the plant several days before moving to ease digging and hold the root ball together.
 - 3. Replant the same day.

1.

- 4. Prepare the new location first to shorten transition time.
- 5. Trench around the plant outside of the drip line.
 - a. For larger shrubs consider a partial root prune at least three months ahead of time.
 - b. Trench should be as deep as root ball width.
- 6. It may be necessary to hold together the root ball of larger plants with burlap or chicken wire during transfer.

3.17 PLANT HEALTH MONITORING

- A. Healthy trees, shrubs and ground covers show growth, habit and flowering according to their species. Signs of ill-health can include poor growth, areas devoid of growth, dying branches, yellowing or spotted leaves, pest infestations and few or excessive buds on flowering plants.
- B. The Owner requires environmentally-sensitive maintenance practices. Biological and Mechanical control of Disease and Pest are the expected methods of control.
- C. Prior to replacing trees, large accent shrubs, and or a significant loss of a single species contact County Representative. Documentation will be required for replacement. Replace singe loss of plant as noted below.
- D. Landscape Disease Control
 - 1. Look for plants to have a color, growth habit and character typical of their species. Spotting, rust, blackened leaves and other irregularities can be signs of disease.
 - For more information see to Appendix F GSI Maintenance Reference List and Appendix E

 Draft King County Integrated Pest Management Document on Integrated Pest
 Management Plan. Biological and Mechanical control of Disease and Pest is the expected
 method of control.
 - 3. Use extreme care not to spread or track any soil or plant material from site of diseased plants to other areas of site.
 - 4. Clean and disinfect any equipment used to remove, handle, or transport any diseased plant material or soil.



- 5. Diseased plant material disposal: Any whole diseased plants and all plant material removed from plants that appear to be diseased should be removed from site and disposed of in commercial compost or landfill, to avoid risk of spreading the disease to other plants. Pay particular attention to potentially diseased coniferous trees, especially cypress and cedar.
- E. Landscape Fertilization and Nutrient Deficiencies
 - 1. Compost and arborist wood chip mulch that is applied twice a year provides the basic fertilizer for the bioretention system.
 - a. No use of fertilizers for the first two years.
 - 2. Nutrient Deficiencies: Look for plants to have a color, growth habit and character typical of their species. Yellowing, poor growth, weak flowering, spotting or weakness may be a sign of nutrient deficiencies.
- F. Plants may die due to unsuitable conditions or microclimates, disease, pests (insects, birds, rodents, noxious weeds), crowding or shading by other plants, lack of water, or other unforeseen issues. These plants must be removed/replaced to avoid the spread of disease, establishment of weeds in bare areas and reduction of Barton CSO bioretention system functionality. Proper and careful installation of plant material will increase establishment rates and reduce maintenance requirements. Unless otherwise noted, the information in this section can be applied to B&B, bare root and container plants.
 - 1. Report multiple dead and dying plants with suspected cause of death, to County Representative to obtain direction regarding their replacement.
 - 2. Review water coverage and condition of irrigation system.
 - 3. Coordinate removal and replacement of dead and dying plants within 30 days of notification by King County.
 - 4. Replacement vegetation shall be of equal size, conditions, and variety (when appropriate) to original plantings.
 - 5. For species replacement guidelines, see Plant Species Replacement Section.
 - 6. Confirm that as-built conditions are appropriate for species planted there. When conditions are not working for the original plantings, see Plant Species Replacement Section.

3.18 VEHICLE, PEDESTRIAN AND LANDSCAPE EDGE CONFLICTS

- A. Over time areas of vehicular conflict may become apparent, where vehicles cross into landscaped areas at driveway entrances. These areas should be monitored for excessive wear and retrofitted or protected as appropriate.
 - 1. Where edge plantings are impacted at drive entrances:
 - a. If after a period of one year, plants do not establish (compacted soil little or no plant cover) replace with 12" wide gravel strip 6 inches in depth.
- B. Over time bare areas may appear near paths or walking cut-throughs of swales may occur.
 - 1. Notify County Representative of cut-throughs that develop.
 - 2. Bare areas if not too large may become arborist wood chip mulch areas.
 - 3. Replanting and temporary fencing may be needed.

3.19 IRRIGATION

- A. During the first year the Irrigation System is under warrantee by the Contractor who installed it. Contact County Representative if major issues are encountered during this first year.
- B. Irrigation Schedule
 - 1. Program the irrigation schedule to promote strong establishment of planted areas. To encourage the development of healthy plants with vigorous root systems, both drought and overwatering should be avoided.
 - 2. Establishment of landscaped areas throughout the Barton CSO bioretention facilities will require regular irrigation during the growing season. See establishment watering schedule located in Appendix J. As the landscape becomes established irrigation should be decreased so that watering matches the maturity of plantings. A general guideline is that



once plantings are established and stable (3 years), the irrigation schedule may be cut back to two deep waterings per week. The tree bubblers can be turned off after two to three years. Ongoing monitoring of plant and root system health should inform the irrigation schedule.

- C. Tree, Shrub and Ground Cover Irrigation
 - 1. Irrigate to achieve approximately 1 inch of water per week for perennials, groundcovers and shrubs and 1.5 inches of water per week for trees. Adjust controller in accordance with manufacturer's recommendations for this amount.
 - 2. Avoid irrigation during times of heavy rainfall.
 - 3. Monitor bed areas for dry patches, over-saturated areas or other inconsistent water conditions.
 - 4. Contact a professional irrigation specialist to correct problem conditions.
- D. Extreme Drought Conditions: In the event of extreme drought conditions resulting in mandated city-wide irrigation reductions, the biorention swales emergents are the highest priority for receiving irrigation. Cut back irrigation in the following order:
 - 1. First: cut back water to trees and other level planted areas (not swales areas).
 - 2. Continue limited irrigation to maintain health and function of all swale areas.
- E. Irrigation Systems Maintenance
 - 1. Irrigation maintenance records may identify areas where conflicts occur between the installed system and use of certain areas. The primary issues will likely be related to accidental damage by users, vandalism and vehicular impacts.
 - 2. Avoid damage to liner during repair activities.
 - 3. Refer to owner's manual for proper irrigation system maintenance.
 - 4. Monitor and repair irrigation heads, controllers, automatic control valves and quick coupler valves for damage or improper function.
 - 5. Test double check valve assembly yearly by a certified tester and provide test report to Seattle Public Utilities and King County. See Appendix I for Contact Lists.
 - 6. Replace batteries yearly during spring start up.
 - 7. Carry out the following visual walk through tests of irrigation system:
 - a. First: beginning of growing season, spring irrigation start up (May)
 - b. Ongoing: one time per month during the growing season (June September).
 - 8. During walk-through run irrigation for coverage and breakage.
 - 9. Winterize in October.
 - 10. Repair and note broken sprinkler and pop up head locations on Maintenance Checklist.
 - 11. Maintain a record of locations to identify problem areas associated with vandalism or vehicular conflicts.
- F. Irrigation Systems Winterization
 - 1. Due to the shallow depth of the main and lateral lines, the lines need to be blown out before freezing temperatures occur, typically in October.
 - 2. Refer to Appendix F GSI Maintenance Reference List for Rain Bird's "Homeowner's Guide to Winterization" for information on irrigation system winterization by air blow-out.
- G. Audit
 - 1. An Irrigation audit by outside certified auditor shall be conducted every 3 years. Maintain a record of the dates of the audits on Maintenance Checklist.

3.20 MISCELLANEOUS MAINTENANCE

- A. Plants Pulled by Crows: if crows pull smaller plants (plugs and 4" pots) use a 3/8" diameter by 8" long bamboo stake to secure plant in place. Drive stake diagonally through plant with top of stake below top of plant foliage.
- B. Snow Removal from Broadleaf Evergreen Trees when young: if more than 2 inch of snow accumulates on tree leaves and branches, remove snow to prevent broken limbs.
- C. Insects: Standing water observed in the basin for time periods suitable for insect development (designed to drain in 24 hours). Identify the cause of the standing water and take appropriate actions to address the problem.
- D. Rodents: Rodent holes are present near the facility. Fill and compact soil around the holes.

3.21 MAJOR REPAIRS

- A. Severe Weed Infestation If a severe weed infestation is observed, notify the County Representative. Use of chemicals requires Ecology approval and community notification.
- B. Plugged Pipes If plugged pipes are observed, notify the County Representative.
- C. Drainage Facilities Modifications If a swale area appears not to function and solutions are not covered within the above sections notify the County Representative.
- D. Notify County Representative if you see or observe utility service line repairs. County Representative to provide appropriate information so homeowner can repair to like conditions and maintain bioretention swale function. See also Appendix I of the Barton CSO Control with GSI O&M Manual for "Construction in the Right of Way Through WTD GSI Facility" for more information on the process and communication flow chart.

END OF SECTION

SECTION 02721 APPENDIX B

GSI STORM DRAINAGE SYSTEM MAINTENANCE



SECTION 02721 APPENDIX B

GSI STORM DRAINAGE SYSTEM MAINTENANCE

PART 1 GENERAL

1.01 PURPOSE

A. The primary purpose of subsurface GSI storm drainage infrastructure is to collect and convey stormwater runoff, which has filtered through bioretention swales (for treatment), and discharge the runoff into downstream UIC wells for deep infiltration.

1.02 SUMMARY

- A. This Section specifies maintenance of underground storm drainage infrastructure to ensure that facilities function properly for CSO control. The GSI storm drainage infrastructure includes:
 - 1. Catch basins (across the street from the bioretention swales) with storm drains/culverts that discharge (daylight) the stormwater runoff into a bioretention swale.
 - 2. Underdrain pipes that are part of a network that connects to a downstream maintenance hole.
 - 3. Underdrain maintenance holes (UMH) and cleanouts that connect to a downstream UIC well.
- B. Maintenance of other catch basins, maintenance holes, and pipes that connect directly to the City of Seattle's combined sewer system are the responsibility of the Seattle Public Utilities.
- C. Maintenance of Underground Injection Control well Maintenance Holes (UIC MH) per Appendix C.

1.03 REFERENCES

A. Referenced Standards: This Section incorporates documents by reference. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail. Also see 01012

 Reference Material. For the work related to the Contract, the latest revision of the following are considered reference documents:

Reference Title

COS

City of Seattle Standard Specifications for Road, Bridge and Municipal Construction, current edition; City of Seattle Standard Plans, current edition; and Seattle Department of Transportation Director's Rule 5-2009 for Street and Sidewalk Pavement Opening and Restoration (current edition) (The Contractor shall have a complete set of these documents at the project site at all times).

Ecology SWMMWW Department of Ecology Stormwater Management Manual for Western Washington, 2012 Edition, Volume V.

- B. Project Record Drawings for SDOT Project No. 163005, SDOT Vault No. 35952. See Appendix H of the Barton CSO Control Project with GSI O&M Manual for as-built drawings.
- C. See Appendix G for the GSI storm drainage maintenance checklist in the Barton CSO Control Project with GSI 0&M Manual.
- D. City of Seattle (COS) Standard Specifications for Road, Bridge and Municipal Construction, current edition; City of Seattle Standard Plans, current edition; and Seattle Department of Transportation Director's Rule 5-2009 for Street and Sidewalk Pavement Opening and Restoration (current edition) (The Contractor shall have a complete set of these documents at the project site at all times).

1.04 REGULATORY REQUIREMENTS AND STANDARDS

A. See Specifications in Division 0 and 1 for permit requirements.

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- B. City of Seattle Permits
 - 1. Refer to SDOT Street Use Division requirements.
- C. Personnel
 - 1. Field personnel shall wear safety vests and carry business cards identifying contact information per County Representative.

1.05 DEFINITIONS

- A. Large Storm Event / Large Storm: 1 inch or more rainfall in 24 hours and/or winds 20 mph or greater.
- B. BMP: Best Management Practices
- C. CB: Catch Basin
- D. COS: City of Seattle
- E. CSO: Combined Sewer Overflow
- F. GSI: Green Stormwater Infrastructure
- G. KCWTD: King County Wastewater Treatment Division
- H. SPU: Seattle Public Utilities
- I. UMH: Underdrain Maintenance Hole
- J. UIC MH: Underground Injection Control well Maintenance Hole

1.06 QUALIFICATIONS

A. Contractor shall be a licensed Side Sewer Contractor registered with the City of Seattle Department of Planning and Development (DPD) or a KCWTD maintenance staff member.

1.07 SUBMITTALS

- A. Operations and Maintenance Inspection Log:
 - 1. A daily log listing observations and maintenance performed as identified in Part 3 of this Section.

1.08 PROTECTION

- A. Provide protection of property, persons, structures, utilities, walls, walks, curbs, paved surfaces, existing native vegetation, irrigation systems, plant materials and other structures and features from damages incurred arising from this Contract. All damages from Contractor operations to be restored to original conditions at no additional expense to the Owner.
- B. Keep paved surfaces free of dirt, debris and chemical applications at all times, unless otherwise approved by the County Representative. Immediately clean paved surfaces to prevent staining resulting from chemical application.
- C. See Division 01 and County and COS standards for additional requirements including but not limited to safety, temporary facilities, and traffic control.

PART 2 PRODUCTS - NOT USED


PART 3 EXECUTION

3.01 SCHEDULE

A. GSI Storm Drainage System Maintenance Schedule at-a-Glance

В.

	CATCH BASIN DISCHA	S (CB) AND STO ARGING TO SW	ORM DRAINS ALES	MAINT CLEANOUTS	ENANCE HOLES S, AND UNDERD	; (MH), RAIN PIPES	OPTIONAL STREET SWEEPING	
	Remove Trash, Sediment & Debris	Check CB and Storm Drain pipe daylighting into swale for Blockage	Check Interior of CBs for Damage	Remove Trash, Sediment & Debris in Underdrain MHs	Check Underdrain Pipe for Blockage	Check interior of UMH and Cleanouts for Damage	Clean Street with Street Sweeper	
Jan.	after large storms	after large storms						
Feb.	after large storms	1 X			1 X		1 X	
Mar.	after large storms							
April	after large storms							
Мау	1 X		1 X	1 X		1 X		
June								
July								
Aug.								
Sept.								
Oct.	1 X	1 X		1 X	1 X		1 X	
Nov.	after large storms	after large storms						
Dec.	after large storms	after large storms						
Every 2 Yrs								
Every 10-15 years					CCTV Pipe (as required)			

3.02 CATCH BASINS AND PIPES THAT CONVEY FLOWS TO BIORETENTION SWALES

- A. Place no parking signage notification three days in advance in order to avoid having cars parked on catch basin structure during the day of cleaning out the sediment. Coordinate notifications with King County community relations. Grates of King County catch basins are engraved with "Property of King County". See as-built plans for locations.
- B. Remove trash, debris and obstructions from catch basins grates and outlet pipes.
- C. If sediment has accumulated more than 6 inches deep, remove all accumulated sediment. If pipes from catch basin to swale are clogged, remove the sediment build-up and/or obstructions in the pipe and in the catch basin sump.
- D. Check interior of catch basins annually to confirm they are structurally sound.



3.03 CATCH BASINS AND INLETS THAT CONNECT TO COMBINED SEWER (NOT SWALE)

- A. Catch basins and inlets that connect directly to the combined sewer are to be maintained by the City of Seattle.
- B. If a catch basin and/or inlet maintained by the City of Seattle is observed to be plugged/clogged or not operation property during a site visit, notify SPU 24/7 Operations Response Center at 206-386-1800.

3.04 UNDERDRAIN MAINTENANCE HOLES (UMH) AND CLEANOUTS

- A. Prior to removing access lid of UMH, remove any debris from lid (e.g. sweep off debris) to avoid having the debris fall into the MH as the lid is being removed. Locking mechanism for access lid is typically in the hole that is closet to "G" in "GSI Drain" label.
- B. Remove debris and obstructions from interior of UMHs (MH access locking lid labeled "GSI Drain") and cleanouts. If UMHs or cleanouts are clogged, remove the sediment build-up and/or obstructions in the inlet and/or outlet pipe(s). Temporarily plug outlet pipe at UMH and inlet at Underground Injection Control well Maintenance Hole (UIC MH) to avoid sediment discharging into UIC MH during cleaning operations. Sediment shall not be discharged into the UIC MH or pipe between the UMH and the UIC MH.
- C. If sediment has accumulated more than 1 inch deep in UMHs, remove all accumulated sediment.
- D. Inspect condition of UMH annually.
 - 1. Check interior of UMHs annually to confirm they are structurally sound (i.e. no signs of cracking, leakage, defects or other damage).
 - 2. Check ladder rungs annually to confirm they are structurally sound.
 - 3. Inspect UMH lid annually to confirm it is in operating condition.

3.05 STORM DRAIN PIPES (ROADWAY CATCH BASINS TO DAYLIGHT AT BIORETENTION SWALES)

- A. Review pipe inlets and outlets (at least twice per year and preferably during or after a large storm event as referenced in the schedule at a glance chart) that are draining from catch basins on one side of the street into bioretention swales (daylight) on the opposite side of the street to ensure pipes are clear for conveying stormwater.
 - 1. If water does not freely flow through pipe that daylights to bioretention swale then remove blockage.
 - 2. If pipe appears to be broken/ damaged, then conduct video of pipe interior, to review the pipe condition and provide recommended repairs to County Representative.
- B. Check pipes to confirm the elements are in sound condition.
- C. If pipes become clogged, remove the sediment build-up in the pipe.

3.06 UNDERDRAIN PIPES



municipal casting cover with lettering "GSI Drain" indicates structures that are underdrain maintenance holes and provide access to underdrain pipe



daylighted pipe/ pipe outlet



vaned grate at catch basin with storm drain daylighting to swale



- A. Review underdrain pipe inlets and outlets at maintenance holes and cleanouts (at least twice per year and preferably during or after large storm event) to ensure pipes are clear for conveying stormwater.
 - 1. If water does not freely flow through underdrain pipe then remove blockage.
 - 2. If pipe appears damaged, then conduct video of pipe interior to review the pipe condition and provide recommended repairs to County Representative.

3.07 STREET SWEEPING

- A. When required by the County Representative (due to excessive debris observed in the street upstream of bioretention cells) street sweeping shall be conducted as follows:
 - 1. Install no parking signs along streets that are to have street sweeping a minimum one (1) week in advance, unless approved otherwise by County Representative. Coordinate with King County community outreach for notifying residents.
 - 2. On blocks where GSI facilities are located, perform street sweeping as follows:
 - a. Sweep the street along both curb lines for the entire length of the block (intersection to intersection) with a street sweeper.
 - 3. On streets intersecting a block where GSI facilities are located, perform street sweeping as follows:
 - a. On east-west intersecting streets, sweep along both curb lines for one full block with a street sweeper. Sweep both the east and the west intersecting streets, both upstream and downstream of the GSI facilities.
 - b. On north-south intersecting streets, sweep along both curb lines for a minimum of half of the block with a street sweeper. Sweep only the intersecting street upstream from the GSI facilities.
- B. Street Sweeping after Snow Storms: if the City sands the residential street during a snow event and does not sweep the street after snow melts, depending upon amount of debris accumulated in the street the County Representative may require street sweeping. When required by the County Representative, a street sweeper shall be used to collect sand, preventing the sand from entering the bioretention facilities.

3.08 POSSIBLE EMERGENCY CONDITIONS (NOT A COMPREHENSIVE LIST)

- A. Earthquake
 - 1. If an earthquake of Richter Magnitude 5.0 or greater and the epicenter is within 30 miles of Project Area, or Modified Mercalli Intensity Scale of V or greater has been reported in the vicinity of the Project Area or the responsible individual(s) has felt ground motions and experienced damages from a large earthquake characterized by the following:

"Felt by all. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books etc. knocked off shelves. Furniture moved or overturned. Weak plaster and masonry cracked. Trees bushes shaken visibly, or heard to rustle. Pendulum clocks may stop",

- 2. Conduct a general overall visual inspection of the pipes, maintenance holes, bioretention swales for any signs of settlement, slumps, cracks, seeps and leakage. Document observations and submit to County Representative for review.
- B. Contaminants/Unexpected Spills
 - 1. Immediately report unexpected spills and any contaminants found in landscape areas, pipes, culverts, catchbasins, maintenance holes (paint, oil, gas, antifreeze, or other spilled/dumped pollutants) to the County Representative.
 - 2. Clean accidental spills associated with work provided and in accordance with Contractor's Spill Plan.
 - 3. If a vehicle is associated with the spill, record and report the license number.
 - 4. Provide a detailed description of type and extent of the spill/contaminants.



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3.09 MAJOR REPAIRS

- A. Underdrain Maintenance Holes, Underdrain Pipes, catch basins and Storm Drains pipes that daylight to bioretention swales:
 - 1. When existing facilities are observed to be damaged and/or do not function after routine maintenance activities are conducted as noted in this Section, then notify County Representative. County Representative to then assess and provide direction if applicable
 - 2. If repairs are required, then coordinate repairs with King County and Seattle Department of Transportation so that the appropriate permits and inspections are completed for construction.
 - 3. Construction of repairs should be made using the project's original contract documents (Plans and Specifications) and in accordance with COS. Contact County Representative for original construction specifications and review with current COS standards.
- B. Utility Service Line Repairs By Others If a private parcel utility service line (e.g. water, sewer, gas, etc) or new service is to cross through the subsurface GSI storm drainage system, the full section of the GSI facility (bioretention soil, plants, soils, underdrain, liner etc) is to be restored and repaired by a private parcel property owner to County Representative's requirements. County Representative shall provide restoration requirements. Property owner shall repair GSI facility to like conditions and function in accordance with County requirements. County Representative may provide the following information Project Plans, Specifications and product information to the Property Owner for reference. Property owner shall obtain necessary permits with City of Seattle and utility purveyor for work in the right-of-way and on their property. See also Appendix I of the Barton CSO Control with GSI O&M Manual for "Construction in the Right of Way Through WTD GSI Facility" for more information on the process and communication flow chart.

END OF SECTION

SECTION 02521 APPENDIX C GSI UNDERGROUND INJECTION CONTROL (UIC) WELL MAINTENANCE

Note: The UIC Well Maintenance recommendations in the Barton CSO Control Project's Operation and Maintenance Manual were prepared by Associated Earth Sciences, Inc.



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APPENDIX C GSI UNDERGROUND INJECTION CONTROL (UIC) WELL MAINTENANCE

PART 1 GENERAL

1.01 PURPOSE

- A. This section provides a basic level of maintenance recommendations for UIC wells.
- B. All UIC wells will eventually require some degree of maintenance or rehabilitation, regardless of construction methods or materials used. This time span depends upon many factors including water quality, aquifer characteristics, well design and materials, well installation procedures, inflow rates and equipment quality.
- C. Maintenance of UIC wells will require the participation of a variety of persons including field inspectors, licensed well drillers and licensed hydrogeologists and/or professional engineers.

1.02 SUMMARY

- A. This section provides the necessary maintenance procedures for UIC wells located in the UIC well maintenance holes as shown on the plans. Work in this section includes, but is not limited to:
 - 1. General inspections of the UIC wells and associated maintenance hole structures
 - 2. Water level measurements
 - 3. Well depth measurements
 - 4. Down-hole color video camera survey
 - 5. Sediment removal
 - 6. UIC well flow testing
 - 7. UIC well screen remediation
 - 8. Maintain records required by and/or requested by the County Representative.

1.03 REFERENCE STANDARDS

- A. For Project Plans and Specifications see Appendix H Project Plans & Link to COS Details of the Barton CSO Control Project with GSI Operations and Maintenance Manual.
- B. Other sections and appendices of the Barton CSO Control Project with GSI Operations and Maintenance Manual.
- C. Project Record Drawings for SDOT Project No. 163005, Vault No. 35952.
- D. Referenced Standards: This Section incorporates documents by reference. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail. For the work related to the Contract, the latest revision of the following are considered reference documents:

E. Reference Title

Plans	Street Improvement Plan for King County WTD's Barton CSO control project (SDOT Project No. 163005, SDOT Vault No. 35952)
As-Builts	UIC Well Construction As-Built Diagrams
WAC 173-160	Washington Administrative Code (WAC) 173-160 Minimum Standards for Construction and Maintenance of Wells
WAC 173-218	Washington Administrative Code (WAC) 173-218 Underground Injection Control Program

Ecology 2006	Washington State Department of Ecology 2006 Guidance for UIC Wells that Manage Stormwater
AWWA A100-06	American Water Works Association A100-06 Water Wells
RCW 49.17	Washington Industrial Safety and Health Act (WISHA)
RCW 39.04.180	Trench Safety Systems, Safty Systems Required

1.04 SUBMITTALS

- A. Materials List
- B. Certification of the inspectors' qualifications as specified in this Section.
- C. Product data for materials and equipment that will be used in maintenance of the wells.
- D. Traffic Control Plan as required by the local permitting jurisdiction; such as the City of Seattle.
- E. Procedures
 - 1. Water level and well depth measurement: procedure to be used;
 - 2. UIC well screen rehabilitation: procedure to be used; descriptive data, concentration and dosages;
 - 3. Well development tools: procedure to be used; drawing showing dimensions and materials;
 - 4. Water discharge containment: procedure to be used; descriptive data, drawing showing dimensions and materials;
 - UIC well inflow test plan: procedure to be used; descriptive data on source of water, equipment, and materials to be used to provide storage and conveyance of water into the UIC wells;
 - 6. Down-hole color video camera and tools: procedure to be used; descriptive data, drawing showing dimensions and materials;
 - 7. Sediment removal from UIC well sump: procedure to be used; descriptive data, drawing showing dimensions and materials.
 - 8. If the work impacts pedestrian or traffic access; provide the County Representative with a description of the work and its impact at least 2 weeks prior to the start of the work to ensure timely community notification.
- F. Records: Inspector shall keep a log and progress record for each UIC well inspection. The records shall include general observations, water level and well depth measurements, results of flow testing, cleaning procedures, color video camera survey, and well screen rehabilitation activities.
 - 1. The inspector shall maintain records of general site observations, the water level measurements, including date and time of day measured, depth of well measurements, the condition of the well head and air vent, and the silt/sediment accumulation in the maintenance hole. Copies of records shall be transmitted to the County Representative within 7 calendar days of collection.
 - 2. Video inspection: the inspector shall perform downhole color video camera survey. The video record (Digital Versatile Disc [DVD]) shall become the property of the County at the time the survey is completed.
 - 3. The datalogger and pressure transducer data files shall be transmitted to the County Representative within 7 calendar days of collection.

1.05 REGULATORY REQUIREMENTS AND STANDARDS

- A. See specifications in Division 0 and 1 for permit requirements.
- B. Department of Ecology permits as required.
- C. King County Industrial Waste Discharge Permit as required.

1.06 DEFINITIONS

- A. Large Storm Event / Large Storm: 1 inch or more rainfall in 24 hours.
- B. BMP: Best Management Practices
- C. UIC: Underground injection control
- D. UMH: Underdrain maintenance hole
- E. UIC MH: Underground injection control maintenance hole

1.07 QUALIFICATIONS

- A. Regular inspections of the UIC well head and maintenance hole, including water level, well depth and sediment accumulation measurement shall be performed by a technician with a minimum 5 years of experience in water level and well measurements.
- B. Screen rehabilitation shall be performed by a licensed well driller experienced with well rehabilitation.
- C. UIC flow testing shall be performed under the direction of a licensed hydrogeologist or professional engineer experienced with aquifer testing methods.
- D. Downhole video camera survey shall be performed by a contractor with a minimum 5 years of experience in downhole well camera video or well screen rehabilitation survey.

1.08 PROTECTION

- A. Refer to Division 1, Section 01063; Health and Safety, if not already specified in the permit requirements by the local jurisdiction.
- B. Field personnel to wear safety vests and carry business cards identifying contact information per County Representative.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Water level indicator for the measurement of depth to standing water to 0.01 feet
- B. Weighted tape measure for the measurement of well depth to 0.1 feet
- C. Downhole color video survey camera equipment. The camera used for the survey shall be equipped with vertical- and side-view cameras. The equipment used to complete the video survey shall produce a DVD with an automatic depth indication (to the nearest 0.1 feet), and shall include equipment that allows for the well image to be observed on a video monitor and simultaneously recorded, with the depth that the camera is currently at superimposed onto the video image and also recorded. The camera is required to be able to switch from a downhole view to a side scan view.
- D. Electronic data loggers and pressure sensitive transducers and equipment to download data
- E. Hand tools and equipment broom, maintenance hole opening hooks, engineers or construction retractable tape measure.

- F. Signage, barricades, cones and other traffic control measures.
- G. Portable field parameter meter for pH, temperature, specific conductivity and turbidity
- H. Vactor truck

PART 3 EXECUTION

3.01 SCHEDULE

- A. All maintenance procedures in Execution shall follow the UIC Well Maintenance Schedule-At-A-Glance, except as noted.
- B. UIC Well Maintenance Schedule at-a-Glance

				UIC Wells		
Maintenance Year	Schedule	General Well Inspection	UIC Well MH Inspection	Downhole Video Survey	Inflow Testing	Well Screen Rehabilitation
1	Jan.	1 X				
1	Feb.	1 X				
1	Mar.	1 X				
1	April	1 X				
1	Мау	1 X				
1	June	1 X		1 X		
1	July					
1	Aug.					
1	Sept.		1X			
1	Oct.	1 X following first large storm event or at the end of the month		1 X		
1	Nov.	1 X				
1	Dec.	1 X				
As noted	Year 2	9 X (monthly Oct June)	1X	2 X (Oct. & June)		
As noted	Year 3 and on	2 X (Oct. & Mar.)	1X			
As noted	Years 5, 10, 15 and 20			1 X (Sept.)	1 X	
As noted	Year 20					1 X

3.02 MAINTENANCE

- A. General Inspection: Define work area with appropriate signage, barricades, cones and traffic control measures. Install traffic control measures. The October inspection shall verify the UIC wells are in normal operating condition following the 'first flush' of the winter rains. Subsequent monthly inspections during Year 1 and Year 2, or subsequent March inspection during Year 3 onward, are to verify the UIC wells are in normal operating condition during the course of the winter rainy season. See Appendix G for "UIC Well Maintenance Checklist". General inspection shall include:
 - 1. Manual UIC Well Water Level Measurement:
 - a. Prior to removing UIC MH access lid, remove any accumulated debris on lid (e.g. sweep off debris) in order to avoid having debris fall into UIC MH or UMH structure.
 - b. Lower a water level indicator into the UIC well through the two inch diameter monitoring port to determine if water is standing in the well. A typical water level indicator uses a flat "measuring tape" to transmit a signal to a buzzer when water is encountered. These tapes (minimum of 100 feet long) are usually less than 1/2 inch wide, incremented in an engineering scale, and accurate to 1/100 of a foot. The depth-to water measurements are read directly off the measuring tape relative to an established datum point on the monitoring port casing or other reference point determined by the County Representative.
 - c. From the ground surface, without entering the maintenance hole, measure the manual water level and well depth through the monitoring port. Record depth and time of measurement.
 - d. If the water level meter indicates water, check for a cascading water effect by reducing the tape sensitivity and obtaining additional measurements.
 - e. If two feet of standing water is observed in the well 24 hours after inflow has ceased, contact County Representative.
 - f. If well depth is less than the as-built well depth by six inches or more, contact County Representative.
 - 2. Automated Water Level Measurement:
 - a. Year 3 and on: Unless determined otherwise by County Representative, UIC wells shall remain outfitted with electronic dataloggers and pressure transducers to continue the automatic water level monitoring.
 - b. Prior to removing UIC MH access lid, remove any accumulated debris on lid (e.g. sweep off debris) in order to avoid having debris fall into UIC MH or UMH structure.
 - c. From the ground surface, without entering the maintenance hole remove, download and re-install datalogger. Record time of removal and re-installation.
 - d. Use the continuous water level measurements to create a visual record (hydrograph) of water level fluctuations over time, and to identify any water level measurements that appear anomalous due to changes in conditions (e.g., screen plugging, or other reduction in well performance).
 - e. If two feet of standing water is observed in the well 24 hours after inflow has ceased, review datalogger data with County Representative.
 - 3. Manual UIC MH and UMH Water and Sediment Observations
 - a. Prior to removing UIC MH and UMH access lid, remove any accumulated debris on lid (e.g. sweep off debris) in order to avoid having debris fall into UIC MH or UMH structure.
 - b. Note qualitative water conditions in UIC MH and UHM structure including:
 - 1) Presence of inflow
 - 2) Water depth. Using a standard retractable tape measure, measure distance to surface of water from inner rim of MH lid or other established datum point. Then measure distance to base of MH structure. The difference between distance to surface of water and base of MH structure is the depth of standing water in the structure.
 - 3) Estimate water clarity. Estimate clarity using a standard retractable tape measure. Measure the distance from inner rim of MH lid or other established datum point at which the end the tape is no longer visible below the surface of the standing water.

Subtract the distance to the water surface from the distance to where the tape is no longer visible. Record as the clarity depth.

- 4) Presence of foam, debris or scum on the surface of the water
- 5) Odor
- 6) Year 1 and Year 2, collect sample of standing water with extendable dipstick and record field parameters (pH, temperature, specific conductivity and turbidity) using portable field meter(s) by submerging the probe from portable field meter into a beaker filled with collected water.
- 7) Take reference digital photographs of UIC MH and UMH interiors and surface conditions.
- c. Observe sediment accumulation in UIC MH and UMH structure.
 - 1) If one inch or more of sediment has accumulated, remove sediment with hand tools or a vactor truck.
 - 2) For heavy or ongoing sediment accumulation, inspect bioretention swale conveyance as possible source of sediment.
- d. Observe condition of monitoring port and cap. Visually inspect for evidence of damage or deterioration without entering UIC MH structure.
- e. Observe UIC MH structure without entering structure for hazards such as rodents or other contamination hazards.
- f. If deterioration or hazards are observed, contact County Representative.
- B. UIC Well MH Inspection: Inspect the UIC wells and the UIC well maintenance holes (UIC MH). Define work area with appropriate signage, barricades, cones and traffic control measures. Install traffic control measures. Provide personnel and equipment for confined space entry. See Appendix B for inspection of underdrain maintenance hole (UMH) structures. See Appendix G for "UIC Well MH Inspection" checklist.
 - a. Prior to removing UIC MH access lid, remove any accumulated debris on lid (e.g. sweep off debris) in order to avoid having debris fall into UIC MH structure.
 - b. UIC Well Seal.
 - 1) Check the water well compression seal for signs of cracking or other damage. Contact licensed well driller if well seal is damaged.
 - 2) Check the grout between the steel casing and the UIC MH base for signs of settlement, cracking or other damage.
 - c. Pipe Supports and Drop Pipe Assembly within UIC MH
 - 1) Annually inspect pipe supports, drop pipe & fittings appurtenances for signs of corrosion, damage, deterioration.
 - d. Maintenance Hole
 - 1) Check interior of UIC MH annually to confirm they are structurally sound (i.e. no signs of cracking, leakage, defects or other damage).
 - 2) Check ladder rungs annually to confirm they are structurally sound.
 - e. Lids
 - 1) Inspect lid annually to confirm it is in operating condition
- C. Downhole Video Survey:
 - 1. Schedule:
 - a. As noted in the UIC Well Maintenance Schedule at-a-Glance
 - b. Additional surveys shall be performed if standing water in excess of two feet is observed during periods of no inflow, a minimum of 24 hours after the storm event has stopped.
 - 2. Lower the down-hole camera into the well via the two inch diameter monitoring port the image shall be observed on a video monitor and simultaneously recorded. The depth that the camera is currently at is superimposed onto the video image and shall be recorded. The camera shall be able to switch from a downhole view to a side scan view. Downhole video cameras will need a minimum reach of 100 feet from ground surface. The video will serve as a baseline reference for long-term performance inspection and testing. The video survey is run to confirm the "as-built" construction of the well, and to inspect for damage such as well screen plugging, filter pack damage, pipe corrosion, casing breaks, holes, splits, and other

deformities. The video survey shall determine the source of sand, gravel, or other material entry into the well or falling production rates. Video surveys to be conducted prior to and after cleaning or repair operations to assess the effectiveness of the maintenance.

- 3. From the ground surface, without entering the maintenance hole, inspect through monitoring port with the down-hole video camera.
- 4. If two feet of standing water is observed in the well 24 hours after inflow has ceased, contact County Representative.
- 5. If well depth is less than the as-built well depth by 0.5 feet or more, contact County Representative.
- 6. The video survey DVD shall become the property of the County at the time the video survey is completed.
 - a. Video shall be reviewed by County representative to assess the condition of the screen well. The video shall be compared to historic video logs.
 - b. If portions of the well screen appear fouled or clogged then County Representative to assess if an inflow test should be conducted.
 - c. If no fouling is observed, it does not mean that the well is not fouled. Evidence of fouling becomes visible only when fouling material accumulates on the interior of the well screen or penetrates the screen openings. Well screen clogging whether from microbial activity, chemical precipitation or sanding, if left untreated, becomes progressively more difficult to rehabilitate with time, resulting in permanent capacity reduction. County Representative shall review overall system performance (i.e. how well water levels respond during and after a series of rain events through review of datalogger information) in conjunction with video to assess if inflow testing is required to assess the condition of the well.
- D. UIC Well Inflow Testing:
 - 1. UIC well inflow testing should be performed under the direction of a licensed hydrogeologist and/or professional engineer experienced with aquifer testing methods.
 - 2. The UIC well inflow testing procedure shall consist of stepped rate and constant rate inflow tests where clean water is pumped into the well at controlled rates consistent with initial inflow testing procedures at the time of construction (See Table C-1).
 - 3. Prepare and submit to the County Representative a UIC Well Inflow Testing Plan which details the source of water, the equipment and methods to be used to introduce the water into the well. Coordinate well testing procedure with the County Representative.
 - 4. The UIC inflow test will include a two-step flow test at the flow rates identified in Table C-1 of this Section. Step 1 will be conducted for 6 hours at the constant flow rate listed in Table C-1, followed by Step 2, conducted for 2 hours at an increased flow rate listed in Table C-1.
 - a. The flow rate, total volume, and stage height/water level shall be recorded at a minimum 15-minute interval.
 - b. Collect continuous (30-second-increment) measurements during inflow testing and falling head or recovery water level measurements immediately after ceasing in-flow using automated measurement equipment, such as a pressure transducer installed in the monitoring pipe. Pressure transducer shall remain until UIC well is dry (typically overnight).
 - c. The inflow shall not be interrupted for a period greater than one percent of the elapsed pumping time. If a test is interrupted, the UIC well water level shall be allowed to fully drain for a minimum of 24 hours or as determined by the County Representative, after which the test shall be restarted.
 - 5. Data derived during each inflow test shall be compared with the values measured at the time of construction (also called the "as-built performance testing for the well") and specific capacity and available head rise should be recorded. When the specific capacity of the well has declined by 15%, the UIC well screen rehabilitation may be required. Losses in capacity on the order of 5 to 15% can normally be overcome by effective rehabilitation treatments. Decline in well specific capacity is indicative of overall well system integrity. Well screen clogging, if left untreated, becomes progressively more difficult to rehabilitate with time, resulting in permanent capacity reduction. County Representative shall also review overall system performance (i.e.

downhole video, how well water levels respond during and after a series of rain events through review of datalogger information) to assess if and when rehabilitation is required.

3.03 MAJOR REPAIRS

- A. UIC Well Screen Rehabilitation:
 - 1. If two feet of standing water is observed in the well 24 hours after inflow has ceased and other maintenance measures have not resulted in normal UIC well infiltration, review conditions with County Representative and determine if well screen rehabilitation by licensed well driller experienced in well rehabilitation is required.
 - 2. To rehabilitate the well screen, the following steps should be taken:
 - a. Downhole video survey of the well screen
 - b. Contact well driller for screen rehabilitation. Typical sequence shall include:
 - 1) Remove the drop pipe, set aside drop pipe for re-installation following remediation
 - 2) Physical swab of well screen
 - 3) Chemical application in accordance with AWWA A100-06 Water Wells, current standard, by American Water Works Association
 - 4) Flush/swab the well screen
 - 5) Vactor out sediment
 - 6) Downhole video confirmation survey
 - 7) Re-install drop pipe assembly
 - 3. The rehabilitation techniques should be recorded.
 - 4. Following rehabilitation, the UIC well should be flow-tested as described in UIC Inflow Testing Section and the results compared with initial well capacity data.

	Step 1 Flow Rate	Observed Step 1	Step 2 Flow Rate	Observed Step 2
UIC Well No.	(gallons per minute)	Head Rise	(gallons per minute)	Head Rise
	for 6 hours	(feet) after 6 hours	For 2 hours	(feet) after 2 hours
1-31	32.5	26.0	104	61.2
2-31	19.1	23.7	102	59.1
4-32	26.4	26.7	100	62.0
5-31	28.1	14.0	105	26.1
6-31	19.2	15.0	102	30.7
7-31	23.7	9.4	105	21.5
8-31	20.3	6.3	102	14.7
10-31	41.0	23.7	102	52.3
11-31	24.3	14.9	105	50.2
12-31	34.5	14.6	106	35.4
13-31	29.8	16.3	103	32.7
14-31	22.0	21.4	102	53.9
15-31	25.3	20.3	106	32.5
16-31	28.6	13.5	98	22.5
18-31	41.9	14.7	104	23.4

Table C-1- As-built Inflow Testing/Performance Testing during Construction

END OF SECTION

APPENDIX D

EQUIPMENT MANUALS





PO Box 1419, 22035 SE Wax Rd #14, Maple Valley, WA 98038 - ph.: 425-432-2202 fax: 425-432-1555

LETTER OF TRANSMITTAL	2660 107

- TO: Fred Tervet King County 1200 Monster Road SW Renton, WA 98057-2962
- RE: Barton CSO Control Project # C00794C13

WE ARE SENDING YOU:

🖂 Manual	Schedule	🗌 RFI	Logs
Certification	Pay Estimate	Affidavits	Photo

Сору	DATE	Sheets	DESCRIPTION
1	August 13, 2014	90	Irrigation O & M Manual: Barton Combined Overflow Control Project -

THESE ARE TRANSMITTED as checked below:

For approval Approved as submitted

For your use Approved as noted

Return for corrections

As requested

REMARKS:

Resubmit copies for approval

Submit copies for distribution

Todd Flanagan

Goodfellow Bros., Inc.

Sign and send back to GBI

SIGNED:

	Measurements and Co noted otherwise in the By: Remarks:	Contractor costifies to	4	Item No. P/C		Submittal		6	
	Support		02810.1.04B	Spec. Paragraph			By halley	RECEIV	Date Stamp
	oe/14/14			Contractor's Cat. or Dwg, No.	This secti		/m at 12:22 p	IED	
4 Comments Attached- Resubmit 5 Rejected P - Partial C- Complete	Legend-Review Action 1 No exceptions taken 2 Note Markings 3 Comments Attached-		Irrigation O & M Manual	Descrip	on to be completed by Contracto	Contractor: Goodfellow Bro	m, Aug 18, 2014		C00794C13 Barton CSO Control Proj
Final Review Returned To Contractor	Distribution: Initial Review Completed Tervet, Wohleb, SVR			tion of Item	or,	s., Inc.			ect
	By (P			Copies Submit		Previous submit	Resubmittal	Date	Submittal No.
	B B			Review Action	This Sectic By H	tal No.		August 1	690
	Date 8/18/14			Notes	on to be Completed King County			4, 2014	

Submittal Transmittal Form 01300-A

01300-A SUBMITTAL/TRANSMITTAL FORM Back of Form

Engineer's review is for genera	al conforman	ce with the c	design	
concept and contract docume	nts_Marking	s or comme with nlans a	and Ints shall	
specifications nor any requir	ements of t	he Contrac		
Documents.				
The Contractor remains respo	onsible for d	etails and a	ecuracy,	
selecting fabrication processe	s, for technic	and diffiences	embly	
and for performing his work in	a safe man	ner.		
Engineer's Review	Routing	Initial	Date	
No Exceptions Taken				
Note Markings				
Deiorten				
Comments Attached				
Response Required of Contra	Cronstruct	ion Division l	Use Only	
	Reviewed	Copies To:	Date	
Confirm	Constr. Div	vision Files		
	Resident E	Engineer		
	Contractor	Proj. Eng.		
Resubmit				



CONTRACTOR: T Yorozu Gardening Co. 13335 32nd Ave S Tukwila 98168 Tel. (206) 660-7706

O&M: Barton Combined Sewer Overflow Control Project

H.D FOWLER COMPANY

Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax



Barton Combined Sewer Overflow Control Project

PIPE & FITTINGS

H.D FOWLER COMPANY

Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax

SOLVENT WELD



SUBMITTAL AND DATA SHEET

PVC SOLVENT WELD - (SCHEDULE SERIES) Dual marking for both Pressure and Drain, Waste, Vent (DWV) Applications

JM EAGLE[™] PVC SCHEDULE 40, DWV PIPE

Specifications: ASTM D1785 & ASTM D2665 : :

Listed : ANSI/NSF-PW NSF-DWV Standard 61, Standard 14

NOM. PIPE SIZE (IN)	O.D. (IN)	NOM. I.D. (IN)	MIN. T. (IN)	WATER PRESSURE RATING AT 23°C (73°F)	APPROX. WEIGHT (LBS/FT)
1/2	0.840	0.609	0.109	600	0.164
3/4	1.050	0.810	0.113	480	0.218
1	1.315	1.033	0.133	450	0.324
1-1/4	1.660	1.363	0.140	370	0.439
1-1/2	1.900	1.593	0.145	330	0.525
2	2.375	2.049	0.154	280	0.705
2-1/2	2.875	2.445	0.203	300	1.118
3	3.500	3.042	0.216	260	1.463
4	4.500	3.998	0.237	220	2.083
6	6.625	6.031	0.280	180	3.663
8	8.625	7.942	0.322	160	5.512
10	10.750	9.976	0.365	140	7.815
12	12.750	11.889	0.406	130	10.333
14	14.000	13.073	0.437	130	12.220
16	16.000	14.940	0.500	130	15.980

: : Standard Color: White, Standard Length 10' & 20', Plain End and Belled End Purple color for reclaim, contact your sales rep for availability

JM EAGLE[™] PVC SCHEDULE 80 PIPE

Specifications: ASTM D1785 : :

Listed : ANSI/NSF-PW Standard 61, Standard 14

NOM. PIPE SIZE (IN)	O.D. (IN)	NOM. I.D. (IN)	MIN. T. (IN)	WATER PRESSURE RATING AT 23°C (73°F)	APPROX. WEIGHT (LBS/FT)	
1/2	0.840	0.528	0.147	850	0.210	
3/4	1.050	0.724	0.154	690	0.285	
1	1.315	0.936	0.179	630	0.419	
1-1/4	1.660	1.255	0.191	520	0.579	
1-1/2	1.900	1.476	0.200	470	0.701	
2	2.375	1.913	0.218	400	0.969	
2-1/2	2.875	2.290	0.276	420	1.479	
3	3.500	2.864	0.300	370	1.979	
4	4.500	3.786	0.337	320	2.892	
6	6.625	5.709	0.432	280	5.516	
8	8.625	7.565	0.500	250	8.336	
10	10.750	9.493	0.593	230	12.375	
12	12.750	11.294	0.687	230	17.027	

: Standard Color: Dark Gray, Standard Length: 20' overall, Plain End Only

[†] Available in Western Region Only.

I.D. : Inside Diameter

O.D. : Outside Diameter

T. : Wall Thickness

Product Standard: Pipe Compound: Installation: ASTM D1785 Pressure Pipe ASTM D1784 Cell Class 12454 JM Eagle™ Installation Guide **M**ROYAL ndustrial Solutions

131 Regalcrest Court Woodbridge, ON L4L 8P3 Tel: (905) 856-7550 Fax: (905) 856-4367 Toll free: 1-800-263-2353

TECHNICAL SPECIFICATION

Royal Schedule 40 Pressure Pipe Solvent Weld Bell End or Plain End

ROYAL Building Products

<u>SCOPE</u>

This specification covers the requirements for PVC (polyvinyl chloride) Schedule 40 pressure pipe for potable water with solvent weld bell end or plain end. Nominal sizes 1/2" to 12" are manufactured to meet the requirements of the American Society for Testing and Materials (ASTM) standard D 1785 and certified to Canadian Standards Association (CSA) Standard B137.3 and NSF-pw.

MATERIALS

The pipe is manufactured from virgin PVC compound meeting the cell classification requirements of 12454 as defined by the American Society of Testing and Materials (ASTM) Standard D1784: *Standard Specification for Rigid PVC Compounds and CPVC Compounds.*

MARKING

Pipe markings are as specified in CSA B137.3, NSF-pw and ASTM D 1785.

TEST REQUIREMENTS

Quality testing is as per Royal's Quality Control program and in accordance with CSA B137.3, NSF-pw and ASTM D 1785.

PIPE DIMENSIONS AND PRESSURE RATINGS (Schedule 40):

Nominal Size	Pressure Rating psi	Outside Diameter in	Wall Thickness in
1⁄2" (12)	595	0.836 – 0.844	0.109 – 0.129
³ ⁄ ₄ " (19)	479	1.046 – 1.054	0.113 – 0.133
1" (25)	450	1.310 – 1.320	0.133 – 0.153
1-1/4" (32)	368	1.655 – 1.665	0.140 - 0.160
1-1/2" (38)	329	1.894 – 1.906	0.145 – 0.165
2" (50mm)	275	2.369 – 2.381	0.154 – 0.174
2-1/2" (62mm)	303	2.868 – 2.882	0.203 – 0.227
3" (75mm)	262	3.492 - 3.508	0.216 - 0.242
3-1/2" (89mm)	239	3.992 - 4.008	0.226 - 0.256
4" (100mm)	222	4.491 – 4.509	0.237 – 0.265
5" (125mm)	193	5.553 – 5.573	0.258 – 0.289
6" (150mm)	175	6.614 – 6.636	0.280 - 0.314
8" (200mm)	155	8.610 - 8.640	0.322 – 0.361
10" (250mm)	139	10.735 – 10.765	0.365 – 0.409
12" (300mm)	130	12.735 – 12.765	0.406 - 0.455



TECHNICAL SPECIFICATION

Royal Schedule 80 Pressure Pipe Solvent Weld Bell End or Plain End

SCOPE

This specification covers the requirements for PVC (polyvinyl chloride) Schedule 80 pressure pipe with solvent weld bell end or plain end. Nominal sizes 1/2" to 12" are manufactured to meet the requirements of the American Society for Testing and Materials (ASTM) standard D 1785.

This product is certified to Canadian Standards Association (CSA) Standard B137.3, NSF-pw and Underwriters Laboratories of Canada CAN/ULC S102.2.

MATERIALS

The pipe is manufactured from virgin PVC compound meeting the cell classification requirements of 12454 as defined by the American Society of Testing and Materials (ASTM) Standard D1784: *Standard Specification for Rigid PVC Compounds and CPVC Compounds.*

MARKING

Pipe markings are as specified in CSA B137.3, NSF-pw, CAN/ULC S102.2 and ASTM D 1785.

<u>PIPE</u>

According to CAN/ULC S102.2, Royal PVC Schedule 80 pressure pipe manufactured from Compound 16 has the following rating:

Flame Spread (FSC):20Smoke Developed (SD):460-520

TEST REQUIREMENTS

Quality testing is as per Royal's Quality Control program and in accordance with CSA B137.3, NSF-pw, CAN/ULC S102.2 and ASTM D 1785.

PIPE DIMENSIONS AND PRESSURE RATINGS Schedule 80):

	Nominal Size	Pressure Rating psi	Outside Diameter in	Wall Thickness in
	1⁄2" (12)	845	0.836 - 0.844	0.147 – 0.167
	³⁄₄" (19)	683	1.046 – 1.054	0.154 – 0.174
	1" (25)	628	1.310 – 1.320	0.179 – 0.200
	1-1/4" (32)	518	1.655 – 1.665	0.191 – 0.214
	1-1/2" (38)	468	1.894 – 1.906	0.200 – 0.224
	2" (50mm)	403	2.369 – 2.381	0.218 – 0.244
	2-1/2" (63mm)	423	2.868 – 2.882	0.276 – 0.309
	3" (75mm)	374	3.492 – 3.508	0.300 – 0.336
	3-1/2" (89mm)	345	3.992 - 4.008	0.318 – 0.356
V	4" (100mm)	323	4.491 – 4.509	0.337 – 0.377
	5" (125mm)	289	5.553 – 5.573	0.375 – 0.420
	6" (150mm)	278	6.614 – 6.636	0.432 – 0.484
	8" (200mm)	245	8.610 – 8.640	0.500 – 0.560
	10" (250mm)	233	10.735 – 10.765	0.593 – 0.664
	12" (300mm)	226	12.735 – 12.765	0.687 - 0.769



Pressure Rated Pipe

IPS Pressure-Rated PVC

Schedule 40

NSF.)

Conforms to ASTM D 1785 &

ASTM D 1784, cell class 12454 (PVC 1120)

Certified to ANSI/NSF 61.

Product manufactured with one integral solvent-weld bell standard per length. Plain end may be available.

Standard coloring of Schedule 40 pipe is white. Available in purple for reclaimed water.

All pipe is produced in 20-foot lengths. 10-foot lengths may be available.

Plain-end 1-½" – 8" Schedule 40 products also conform to the drain, waste & vent (DWV) standard ASTM D 2665.

Part		Dimensions (inches)		Minimum Approximate Wall Weight		Water Pressure	Standard Crate	
Number	Size	OD (Avg)	ID (Approx)	(inches)	per 100'	Rating (psi)	Quantity	
5405020	1⁄2"	0.840	0.60	0.109	16	600	7,200	
5407520	3⁄4″	1.050	0.80	0.113	22	480	8,000	
5410020	1″	1.315	1.03	0.133	32	450	5,600	
5412520	1 ¼"	1.660	1.36	0.140	43	370	4,400	
5415020	1 ½"	1.900	1.59	0.145	52	330	3,600	
5420020	2″	2.375	2.04	0.154	69	280	2,100	
5425020	2 ½"	2.875	2.44	0.203	110	300	1,460	
5430020	3″	3.500	3.03	0.216	144	260	1,500	
5440020	4"	4.500	3.99	0.237	205	220	1,140	
5460020	6″	6.625	6.02	0.280	360	180	520	
5480020	8″	8.625	7.93	0.322	542	160	280	

2220 Nugget Way - Eugene, OR 97403 - Phone (877) 811-7473 - Fax (541) 746-6111



Pressure Rated Pipe

IPS Pressure-Rated PVC

Schedule 80



Conforms to ASTM D 1785 & ASTM D 1784, cell class 12454

Certified to ANSI/NSF Standard 14 including the health effects and potability requirements of ANSI/NSF 61.

Product manufactured as plain end. Bell end may be available.

Standard coloring of Schedule 80 pipe is grey.

All pipe is produced in 20-foot lengths. 10-foot lengths may be available.

Part		Dimensions (inches)		Minimum Wall	Approximate Weight	Water Pressure	Standard Crate
Number	Size	OD (Avg)	ID (Approx)	(inches)	per 100'	Rating (psi)	Quantity
5805020P	1⁄2"	0.840	0.52	0.147	21	850	7,200
5807520P	3⁄4"	1.050	0.72	0.154	28	690	8,000
5810020P	1″	1.315	0.93	0.179	41	630	5,600
5812520P	1 ¼"	1.660	1.25	0.191	57	520	4,400
5815020P	1 ½"	1.900	1.47	0.200	69	470	3,600
5820020P	2″	2.375	1.90	0.218	95	400	2,100
5825020P	2 ½"	2.875	2.28	0.276	145	420	1,460
5830020P	3″	3.500	2.85	0.300	194	370	1,500
5840020P	4"	4.500	3.77	0.337	284	320	1,140
5850020P	5″	5.563	4.76	0.375	394	290	760
5860020P	6"	6.625	5.70	0.432	542	280	520

2220 Nugget Way - Eugene, OR 97403 - Phone (877) 811-7473 - Fax (541) 746-6111



PVC PRESSURE PIPE SCH-40 & SCH-80

CNWPVC-3

PLEASE ORDER BY PART NUMBER.

MAY, 2006

	SIZE	O.D.	MIN. WALL	WEIGHT PER 100'	FEET PER PALLET	PALLETS PER T.L.	LGTH.	PART NO.
	1⁄2"	.840	.109	16.18	8400	44	20'	42015
SCH 40	3⁄4	1.050	.113	21.58	6600	40	20	42030
PRESSURE PIPE	1	1.315	.133	32.00	5400	32	20	42046
PVC1120	1¼	1.660	.140	43.40	4000	32	20	42056
ASTM D-1785	11⁄2	1.900	.145	51.83	3600	28	20	42070
\frown	2	2.375	.154	69.71	2800	24	20	42085
(NSF.)	2 ½	2.875	.203	110.57	2240	20	20	42102
\bigcirc	3	3.500	.216	144.82	1500	20	20	42111
POTABLE WATER	4	4.500	.237	213.06	580	28	20	47675
	6	6.625	.280	375.47	400	20	20	47720
	8	8.625	.322	581.77	280	16	20	47735

SCH 40 PIPE IS FURNISHED IN BELLED END LENGTHS AND IS NOT RECOMMENDED FOR THREADING.

	1⁄2"	.840	.147	20.63	5200	60	20'	43010
SCH 80	3⁄4	1.050	.154	28.02	4400	48	20	43025
PRESSURE PIPE	1	1.315	.179	41.23	5200	32	20	43045
PVC1120	1¼	1.660	.191	57.06	4000	32	20	43065
ASTM D-1785	1 ½	1.900	.200	69.19	2360	40	20	43080
\frown	2	2.375	.218	95.89	1860	32	20	43095
(NSF.)	2 ½	2.875	.276	146.24	1160	36	20	43115
	3	3.500	.300	195.88	1500	20	20	43120
POTABLE WATER	4	4.500	.337	286.26	580	28	20	43135
	6	6.625	.432	546.56	400	20	20	43150
	8	8.625	.500	830.24	280	16	20	43165

SCH-80 PIPE IS RECOMMENDED FOR THREADING.

SCH-80 PIPE IS FURNISHED IN PLAIN END LENGTHS AND IS GRAY COLOR.

Schedule	40						
ASTM D1	785		So	Ivent Weld Joint	<u>(BE)</u>	Plain End	
Size	O.D	Min. Wall	Weight	Potable	Reclaimed	Potable	Pressure Rating, psi
1/2"	0.840	0.109	0.163	000784	000814	000791	600
3/4"	1.050	0.113	0.218	050727	000982	000968	480
1"	1.315	0.133	0.323	051021	001187	001163	450
1-1/4"	1.660	0.140	0.438	001347	001378	001354	370
1-1/2"	1.900	0.145	0.521	001545	001576	001552	330
2"	2.375	0.154	0.700	001873	001903	001880	280
2-1/2"	2.875	0.203	1.105	002078	002092	002085	300
3"	3.500	0.216	1.445	002351	002382	002368	260
4"	4.500	0.237	2.059	002788	002818	002801	220
5"	5.563	0.258	2.776	003037		003044	190
6"	6.625	0.280	3.603	003365	003389	003372	180
8"	8.625	0.322	5.422	003716		003723	160
10"	10.750	0.365	7.651	004010		004027	140
12"	12.750	0.408	10.115	004287		004294	130

Schedule 40 not available with gasketed joints

Packaging

	Feet P	er Lift		Fe	et Per Trucklo	ad
Size	Solvent Weld Joint	Gasketed Joint	Lift Percent of Truckload	Size	Solvent Weld Joint	Gasketed Joint
1/2"	8000	-	2.9%	1/2"	272,000	
3/4"	8000	-	3.8%	3/4"	208,000	
1"	4800	-	3.3%	1"	144,000	
1-1/4"	4000	-	3.8%	1-1/4"	104,000	
1-1/2"	2700	-	3.1%	1-1/2"	86,400	
2"	1800	1800	3.1%	2"	57,600	57,600
2-1/2"	1400	1400	3.6%	2-1/2"	39,200	39,200
3"	1200	1200	4.2%	3"	28,800	28,800
4"	1080	1080	6.3%	4"	17,280	17,280
5"	700	-	6.3%	5"	11,200	
6"	600	600	8.3%	6"	7,200	7,200
8"	280	300	6.3%	8"	4,480	4,800
10"	220	240	8.3%*	10"	2,640	2,880
12"	180	120/160	8.3%*	12"	2,160	2,240

* Percent of Truckload on 10" and 12" applies to Solvent Weld Joints only – call for information on Gasketed Joints.

General Notes

- All pressure ratings are working pressures, not including a surge allowance, at 73°F.
- Dimensions in all tables are in inches. Weights are approximate and are shown in lbs. per ft.
- All dimensions and weights are subject to normal manufacturing tolerances.

CertainTeed

PVC Pressure Pipe

Spec Sheet

CertainTeed pressure pipe is performance proven for a broad range of piping applications. Available in a wide variety of sizes, classes, and joining systems, CertainTeed has a PVC pipe product to suit virtually all of your requirements for transporting potable or reclaimed water. CertainTeed piping products conform to American Society for Testing and Materials (ASTM) standards, as applicable and as shown below. International Association of Plumbing and Mechanical Officials – Uniform Plumbing Code (IAPMO-UPC) listings are also shown in the tables below. All products are NSF61 listed as safe for use with potable water.

Sizes:	1/2" - 12" (IPS Diameters)
Pressure Classes:	Class 100, Class 125, Class 200, Class 315, Schedule 40, Schedule 80
Joining Systems:	Solvent Weld Belled-End (BE) and Plain End (PE) 20' overall lengths* Gasketed Integral Bell 20' laying lengths
Applications:	Potable and non-potable water distribution. Reclaimed water pipe is purple in color and isdesigned for non-potable water applications.
The PVC Advantage:	PVC is lightweight, easy to handle and flexible, and offers excellent corrosion and chemical resistance. In addition, the smooth interior surface of PVC pipe provides exceptional flow characteristics. PVC material used in the production of CertainTeed pipe meets the requirements of ASTM D1784, cell classification 12454 (PVC 1120).
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WARNING: Do not use or test PVC pipe with compressed air or gas, as the sudden release of stored energy can result in a catastrophic failure. *Inquire regarding availability of 10' or special lengths

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ASTM D224	1		S	Solvent Weld Joint			Gasketed Joint		
Size	O. D.	Min. Wall	Weight	Potable	Reclaimed	Weight	Potable	Reclaimed	
3"	3.500	0.085	0.603	002429					
4"	4.500	0.110	0.993	002870		1.022	002887		
5"	5.563	0.136	1.518	003099					
6"	6.625	0.162	2.144	003464		2.222	003471		
8"	8.625	0.210	3.601	003785		3.763	003808		
10"	10.750	0.262	5.573	004065		5.838	004072		
12"	12.750	0.311	7.846	004348		8.265	004355		

Class 125 (SDR 32.5) – Pressure Rating = 125 psi

Class 100 (SDR 41) - Pressure Rating = 100 psi

ASIM DZZ41			S	olvent Weld Join	t	Gasketed Joint			
Size	O. D.	Min. Wall	Weight	Potable	Reclaimed	Weight	Potable	Reclaimed	
1-1/4"	1.660	0.060	0.192	001408					
1-1/2"	1.900	0.060	0.231	001620					
2"	2.375	0.073	0.335	001989					
2-1/2"	2.875	0.088	0.492	002122					
3"	3.500	0.108	0.754	002436		0.772	002443		
4"	4.500	0.138	1.238	002894		1.274	002900		
5"	5.563	0.171	1.888	003105					
6"	6.625	0.204	2.669	003488		2.767	003495		
8"	8.625	0.265	4.493	003822		4.695	003839		
10"	10.750	0.331	6.994	004102		7.326	004119		
12"	12.750	0.392	9.778	004379		10.301	004386		



ASTM D2241			Solv	vent Weld Joint (BE)	Gasketed Joint (BE)			
Size	O. D.	Min. Wall	Weight	Potable	Reclaimed	Weight	Potable	Reclaimed	
3/4"	1.050	0.060	0.125	001071	001101				
1"	1.315	0.063	0.165	001279	001293				
1-1/4"	1.660	0.079	0.259	001422	001439				
1-1/2"	1.900	0.090	0.338	001651	001668				
2"	2.375	0.113	0.526	002016	002030	0.537	002023		
2-1/2"	2.875	0.137	0.772	002177	002191	0.792	002184	006151	
3"	3.500	0.167	1.140	002474	002498	1.170	002481	006007	
4"	4.500	0.214	1.869	002955		1.923	002962	002979	
6"	6.625	0.316	4.043	003532		4.191	003549	006168	
8"	8.625	0.410	6.798	003884		7.104	003891	006311	
10"	10.750	0.511				11.009	004157	006298	
12"	12.750	0.606				15.498	004423	006304	

Class 200 (SDR 21) - Pressure Rating = 200 psi

Class 315 (SDR 13.5) - Pressure Rating = 315 psi ASTM D2241

			Solvent Weld Joint (BE)			
Size	O.D	Min. Wall	Weight	Potable	Reclaimed	
1/2"	0.840	0.062	0.101	000906	000913	
2"	2.375	0.176	0.792	002047	002054	
2-1/2"	2.875	0.213	1.155	002207	002214	
3"	3.500	0.259	1.702	002504	002511	
4"	4.500	0.333	2.814	002986	002993	

Schedule 80

ASTN D17	85		Solvent Weld Joint (PE)			Pressure
Size	O.D	Min. Wall	Weight	Potable	Reclaimed	Rating, psi
1/2"	0.840	0.147	0.209	000838		850
3/4"	1.050	0.154	0.283	001002		690
1"	1.315	0.179	0.416	001217		630
1-1/4"	1.660	0.191	0.572	001385		520
1-1/2"	1.900	0.200	0.693	001590		470
2"	2.375	0.218	0.958	001941		400
2-1/2"	2.875	0.276	1.455	002115		420
3"	3.500	0.300	1.947	002412		370
4"	4.500	0.337	2.845	002849		320
6"	6.625	0.432	5.400	003419		280
8"	8.625	0.500	8.200	003730		250
10"	10.750	0.593	12.098	004034		230
12"	12.750	0.687	16.566	004300		230

HD Fowler Company Submittal Sec. 2: Ln 3: Sec. 2: Ln 5 Vendor: 73760





PVC SCHEDULE 40 IPS SOLVENT WELD PLAIN END/BELLED END PRESSURE PIPE¹

LETTER OF COMPLIANCE

Scope:

This letter of compliance covers the requirements for ¹/₂" through 24" (12 mm – 600 mm) PVC **Schedule 40** Solvent Weld Plain End/Belled End Pressure Pipe made to Iron Pipe Sizes (IPS). These products meet or exceed performance standards set by the American National Standards Institute (ANSI), the American Society of Testing and Materials (ASTM), CSA International (CSA) and NSF International (NSF).

Material:

Rigid PVC Poly(Vinyl Chloride) used in the manufacturing of **Schedule 40** Solvent Weld Plain End/Belled End Pressure Pipe complies with the material requirements of ASTM D 1784, *Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.* The compound has a cell classification of 12454. The compound is listed with NSF for potable water service.

Extruded Pipe:

Extruded **Schedule 40** Solvent Weld Plain End/Belled End Pressure Pipe conforms to the following standards:

ANSI/NSF 61 "Drinking Water System Components - Health Effects"

ASTM D 1785 "Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120"

CSA B137.3 "Rigid Poly(Vinyl Chloride) (PVC) Pipe for Pressure Applications."

<u>Markings:</u>

Schedule 40 Solvent Weld Plain End/Belled End Pressure Pipes are marked as prescribed in the above applicable standards to indicate size of the pipe, material designation, compliance to standard, and manufacturer's name or trademark.

Color Coding:

Schedule 40 Solvent Weld Plain End/Belled End Pressure Pipes are color coded; Grey Schedule $40 - \frac{1}{2}$ " through 24" (12 mm - 600 mm) White Schedule $40 - \frac{1}{2}$ " through 24" (12 mm - 600 mm)

Yours truly,

attistin, Eng.

André Battistin, Eng. Vice President, Manufacturing & Sourcing

Issue Date: 2012-05-03

¹ Products are manufactured by IPEX Inc. and/or IPEX USA LLC.



PVC SCHEDULE 40 FITTINGS

40-2-0604

Performance Engineered & Tested



SPEARS[®] Schedule 40 PVC fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure the very best PVC fittings available.

Full 1/4" Through 12" Availability

Spears[®] comprehensive line of PVC fittings offers a variety of injection molded configurations in Schedule 40 sizes 1/4" through 12" conforming to ASTM D 2466.

Exceptional Chemical & Corrosion Resistance

Unlike metal, PVC fittings never rust, scale, or pit, and will provide many years of maintenance-free service and extended system life.

High Temperature Ratings

PVC thermoplastic can handle fluids at service temperatures up to 140°F (60°C), allowing a wide range of process applications, including corrosive fluids.

Lower Installation Costs

Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

Sample Engineering Specifications

All PVC Schedule 40 fittings shall be produced by Spears[®] Manufacturing Company from PVC Type I cell classification 12454, conforming to ASTM D 1784. All injection molded PVC Schedule 40 fittings shall be Certified for potable water service by NSF International and manufactured in strict compliance to ASTM D 2466. All fabricated fittings shall be produced in accordance with Spears[®] General Specifications for Fabricated Fittings.

Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Additional Fabricated Configurations through 36"

Extra large, hard-to-find, and custom configurations are fabricated from NSF Certified pipe. Fittings are engineered and tested to provide full pressure handling capabilities according to Spears[®] specifications.

PVC Valves

SPEARS[®] PVC Valve products are available for total system compatibility and uniformity; see SPEARS[®] THERMOPLASTIC VALVES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS (V-4).

Advanced Design Specialty Fittings

Spears[®] wide range of innovative, improved products include numerous metal-to-plastic transition fittings and unions with Spears[®] patented special reinforced (SR) plastic threads.



PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY Visit our web site: www.spearsmfg.com

PVC Thermoplastic Pipe Temperature Pressure De-Rating

To determine the maximum internal pressure rating at an elevated temperature, simply multiply the pipe pressure rating at 73°F by the percentage specified for the desired temperature.

System Operating	73	80	90	100	110	120	130	140
Temperature °F (°C)	(23)	(27)	(32)	(38)	(43)	(49)	(54)	(60)
PVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTE: Valves, Unions and Specialty Products have different elevated temperature ratings than pipe.

PVC Basic Physical Properties

Properties	ASTM Test Method	PVC				
Mechanical Properties, 73°F						
Specific Gravity, g/cm ³	D 792	1.41				
Tensile Strength, psi	D 638	7,200				
Modulus of Elasticity, psi	D 638	440,000				
Compressive Strength, psi	D 695	9,000				
Flexural Strength, psi	D 790	13,200				
Izod Impact, notched, ft-lb/in	D 256	.65				
Thermal Properties						
Heat Deflection Temperature, °F at 66 psi	D 648	165				
Thermal Conductivity, BTU/hr/sq ft/°F/in	C 177	1.2				
Coefficient of Linear Expansion, in/in/°F	D 696	3.1 X 10⁵				
Flammability						
Limiting Oxygen Index, %	D 2863	43				
UL 94 rating	94V-0					
Other Properties						
Water Absorption, % 24 hr.	D 570	.05				
Industry Standard Color	White / Dark Gray					
ASTM Cell Classification	D 1784	12454				
NSF Potable Water Approved	Yes					

PVC Chemical Resistance

PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. For more information on PVC chemical resistance refer to the Chemical Resistance of Rigid Vinyls Based on Immersion Test, published by the GEON[®] Company.

NOT FOR USE WITH COMPRESSED AIR OR GAS

Spears[®] Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.



SPEARS® MANUFACTURING COMPANY • CORPORATE OFFICE

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PVC - White Pressure Fittings

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8212 South 228th Street Kent, WA 98032 425-272-0990 888-285-2726 Fax: 425-272-0995

Limited Warranty

LASCO Fittings, Inc. products are warranted to be free from manufacturing defects in materials and workmanship. They are warranted against rot, rust, and electrolytic corrosion for a period of three years from date of installation. If LASCO products prove defective due to manufacturing defects in material or workmanship during that period, the manufacturer will provide new replacement units of the same type and size. No remedy will be granted under this warranty if LASCO products are not used strictly in accordance with LASCO's directions with respect to use and storage or if the products have been modified in any way. THE MANUFACTUR-ER'S LIABILITY UNDER EXPRESSED OR IMPLIED WARRANTY OR FOR ANY REASON IS LIMITED TO FURNISHING REPLACEMENT UNITS OR GRANTING A CREDIT FOR DEFECTIVE UNITS. NO LABOR EXPENSE OR CONSEQUENTIAL DAMAGES WILL BE PAID BY LASCO. THIS WARRANTY IS IN LIEU OF ALL OTHER GUARANTEES AND WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE, EXCEPT FOR ANY WARRANTIES IMPLIED BY LAW FOR NONCOMMERCIAL CONSUMERS. ANY SUCH WARRANTIES ARE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY.

DO NOT USE LASCO FITTINGS FOR COMPRESSED AIR OR GASES. DO NOT TEST PVC PIPING SYSTEMS WITH COMPRESSED AIR OR GASES. DO NOT USE FITTINGS WITH LIQUIDS NOT RECOMMENDED BY LASCO. MODIFICATIONS OF FITTINGS VOIDS THE WARRANTY.

STANDARDS AND SPECIFICATIONS - Schedule 40

- ASTM D-1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly Vinyl Chloride) (CPVC) Compounds.
- ASTM D-2466 Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- ASTM F-1970 Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems.
- MATERIAL LASCO Schedule 40 Fittings are produced from PVC Type 1, Cell Classification 12454-B. – O-rings are produced from a Buna-N (Nitrile) material.
- LISTINGS NSF/ANSI Standard 61, Annex G: Drinking Water System Components Weighted aver age lead content of ≤0.25% and is in compliance with California's Health & Safety Code Section 116875 (commonly known as AB1953) NSF/ANSI Standard 14: Plastics Piping system Components and Related Materials. Includes /ANSI Standard 61, Annex G

Standard Terms and Conditions of Sale

- 1. Terms: 2% 35 days, net 45 days.
- 2. Freight: FOB LASCO warehouses. Prepaid on orders totaling \$1500 net for one shipment to single destination within the contiguous United States.
- 3. Minimum Order: \$50 net. Smaller orders billed at this minimum charge.
- 4. Claims for shipping errors must be made within 15 days to LASCO. Claims for damage or shortages should be directed promptly to the common carrier by the consignee.
- 5. Returns will be accepted only by prior authorization and if shipped freight prepaid. Returned merchandise subject to a MINIMUM 20% handling/restocking charge.
- 6. Pricing is subject to change without prior notice. However, prior notification will be given in the event of price changes in the period between order placement and scheduled shipment.
- 7. Offer to sell is not implied by possession of this or other LASCO price lists.



PVC SCHEDULE 80 FITTINGS AND PIPE

80-2-0610

Performance Engineered & Tested



SPEARS[®] Schedule 80 PVC product designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure obtaining the very best PVC fittings available.

Full 1/4" Through 12" Availability

Spears[®] comprehensive line of PVC injection molded fittings and extruded pipe offers a variety of configurations in sizes 1/4" through 12". Schedule 80 fittings are manufactured to ASTM D 2467 and pipe is produced to ASTM D 1785. Spears[®] exclusive CL150 Flanges are produced in sizes 1/2" - 18" with ANSI B16.5 bolt patterns, plus numerous Unions, Saddles, Transition and Specialty fittings in a variety of sizes.

Exceptional Chemical & Corrosion Resistance

Unlike metal, PVC fittings and pipe never rust, scale, or pit, and will provide many years of maintenance-free service and extended system life.

High Temperature Ratings

PVC thermoplastic can handle fluids at service temperatures up to 140° F (60° C), allowing a wide range of process applications, including corrosive fluids.

Lower Installation Costs

Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.



Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Additional Fabricated

Configurations through 36''

Extra large, hard-to-find, and custom configurations are fabricated from NSF Certified pipe. Fittings are engineered and tested to provide full pressure handling capabilities according to Spears[®] specifications.

Advanced Design Specialty Fittings

Spears[®] wide range of innovative, improved products include numerous metal-to-plastic transition fittings and unions with Spears[®] patented special reinforced (SR) plastic threads.

PVC Valves

SPEARS[®] PVC Valve products are available for total system compatibility and uniformity; see SPEARS[®] THERMOPLASTIC VALVES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS (V-4).

Sample Engineering Specifications

All PVC Schedule 80 pipe and fittings shall be produced by Spears[®] Manufacturing Company from PVC Type I, cell classification 12454, conforming to ASTM Standard D 1784. All PVC injection molded Schedule 80 fittings and extruded pipe shall be Certified for potable water service by NSF International. All Schedule 80 fittings shall be manufactured in strict compliance to ASTM D 2467 and Schedule 80 pipe shall be manufactured in strict compliance to ASTM D 1785. All fabricated fittings shall be produced in accordance with Spears[®] General Specifications for Fabricated Fittings. All PVC flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and rated for a maximum internal pressure of 150 psi, non-shock at 73° F.

PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY Visit our web site: www.spearsmfg.com
PVC Thermoplastic Pipe Temperature Pressure De-Rating

To determine the maximum internal pressure rating at an elevated temperature, simply multiply the pipe pressure rating at 73° F by the percentage specified for the desired temperature.

System Operating	73	80	90	100	110	120	130	140
Temperature ° F (° C)	(23)	(27)	(32)	(38)	(43)	(49)	(54)	(60)
PVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTE: Valves, Unions and Specialty Products have different elevated temperature ratings than pipe.

Properties	ASTM Test Method	PVC					
Mechanical Properties, 73°F							
Specif c Gravity, g/cm ³	D 792	1.41					
Tensile Strength, psi	D 638	7,200					
Modulus of Elasticity, psi	D 638	440,000					
Compressive Strength, psi	D 695	9,000					
Flexural Strength, psi	D 790	13,200					
Izod Impact, notched, ft-lb / in	D 256	.65					
Thermal Properties							
Heat Def ection Temperature, ° F at 66 psi	D 648	165					
Thermal Conductivity, BTU / hr / sq ft / $^\circ$ F / in	C 177	1.2					
Coeff cient of Linear Expansion, in / in / $^\circ$ F	D 696	3.1 x 10⁻⁵					
Flammability							
Limited Oxygen Index, %	D 2863	43					
UL 94 Rating	94	V-0					
Other Properties							
Water Absorption, % 24 hr.	D 570	.05					
Industry Standard Color	White / [Dark Gray					
ASTM Cell Classif cation	D 1784	12454					
NSF Potable Water Approved	Ň	YES					

Typical Material Properties

PVC Chemical Resistance

PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. For more information on PVC chemical resistance refer to the Chemical Resistance of Rigid Vinyls Based on Immersion Test, published by the GEON[®] company.

NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears® Manufacturing Company DOES NOT **RECOMMEND** the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY **RESULT IN EXPLOSIVE FRAGMENTATION OF** SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.



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Schedule 80

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8212 South 228th Street Kent, WA 98032 425-272-0990 888-285-2726 Fax: 425-272-0995

Limited Warranty

LASCO Fittings, Inc. products are warranted to be free from manufacturing defects in materials and workmanship. They are warranted against rot, rust, and electrolytic corrosion for a period of three years from date of installation. If LASCO products prove defective due to manufacturing defects in material or workmanship during that period, the manufacturer will provide new replacement units of the same type and size. No remedy will be granted under this warranty if LASCO products are not used strictly in accordance with LASCO's directions with respect to use and storage or if the products have been modified in any way. THE MANUFACTURER'S LIABIL-ITY UNDER EXPRESSED OR IMPLIED WARRANTY OR FOR ANY REASON IS LIMITED TO FURNISHING REPLACEMENT UNITS OR GRANTING A CREDIT FOR DEFECTIVE UNITS. NO LABOR EXPENSE OR CONSEQUENTIAL DAMAGES WILL BE PAID BY LASCO. THIS WARRANTY IS IN LIEU OF ALL OTHER GUARANTEES AND WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, WAR-RANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE, EXCEPT FOR ANY WARRANTIES IM-PLIED BY LAW FOR NONCOMMERCIAL CONSUMERS. ANY SUCH WARRANTIES ARE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY.

DO NOT USE LASCO FITTINGS FOR COMPRESSED AIR OR GASES. DO NOT TEST PVC PIPING SYSTEMS WITH COMPRESSED AIR OR GASES. DO NOT USE FITTINGS WITH LIQUIDS NOT RECOMMENDED BY LASCO. MODIFICATIONS OF FITTINGS VOIDS THE WARRANTY.

- STANDARDS AND SPECIFICATIONS Schedule 80
- ASTM D-1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 ASTM D-2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 ASTM D-2467 Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 ASTM F-1970 Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PUC) are Chlorinated Poly (CDUC) Sustame
- in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems. MATERIAL – LASCO Schedule 80 Fittings are produced from PVC Type 1, Cell Classification 12454- B. - O-Rings are produced from a fluorocarbon elastomer (VITON).
- LISTINGS NSF (National Sanitation Foundation) for potable water services.

Standard Terms and Conditions of Sale

- 1. Terms: 2% 35 days, net 45 days.
- 2. Freight: FOB LASCO warehouses. Prepaid on orders totaling \$1500 net for one shipment to single destination within the contiguous United States.
- 3. Minimum Order: \$50 net. Smaller orders billed at this minimum charge.
- 4. Claims for shipping errors must be made within 15 days to LASCO. Claims for damage or shortages should be directed promptly to the common carrier by the consignee.
- 5. Returns will be accepted only by prior authorization and if shipped freight prepaid.
- Returned merchandise subject to a MINIMUM 20% handling/restocking charge.
- 6. Pricing is subject to change without prior notice. However, prior notification will be given in the event of price changes in the period between order placement and scheduled shipment.
- 7. Offer to sell is not implied by possession of this or other LASCO price lists.

EDMUND A. GRAY COMPANY CERTIFICATE OF CONFORMANCE & COMPLIANCE APPLICABLE STANDARDS AND SPECIFICATIONS



Certification of Compliance

The Edmund A. Gray Company, Inc. certifies that all of our domestic pipe nipples are manufactured in Southern California, and that those products along with other domestic products supplied to us are manufactured in accordance with the Standards and Specifications listed herein. The Edmund A. Gray Company has inquired with our finished goods suppliers and, to the best of our knowledge, based on their responses to us, the domestic and imported product(s) being supplied to us are manufactured in accordance with the Standards and Specifications listed herein. However, we have no control over their manufacturing processes. Therefore, we cannot be held responsible for changes to their processes which may inadvertently result in products which may not comply with the Standards and Specifications listed below. Please contact our sales office with any questions or should you require further information.

Cordially,





EDMUND A. GRAY COMPANY, Inc. 2277 E. 15th Street Los Angeles, CA 90021-2841 (213) 625-2723 Fax: 625-5734 http://www.eagray.com

<u>NOTES</u>

--The pipe we purchase, use, convert and sell, as well as our manufacturing processes, meet or exceed all of the applicable Standards and Specifications. Although raw materials may come from non-domestic manufacturers, the material undergoes a 'Substantial Transformation', as defined by Federal Guidelines. Per these guidelines, a substantial majority (at least 51%) of the total product cost is incurred in the U.S.A., therefore these pipe nipples are classified as, and appropriately termed Domestic Product.

--Federal Pipe Nipple Specification **WW-N-351** was canceled 3/5/1990 and is obsolete. It was superseded by ASTM A733 and ASTM B687.

--Copper Alloy C230 is a Copper/Zinc alloy. Other elements, including silicon, lead and iron, are not intentionally added to the alloy. These elements may exist, but will exist ONLY as impurities.

STEEL WELDED PIPE NIPPLES Sch40/80 - (Domestic AND Import)

Steel PipeASTWelded Steel NipplesASTNPT Pipe Nipple ThreadsASNOverseas Manufacturing FacilityISO

<u>80 - (Domestic AND Im</u> Astm **A53 (A120)** Astm **A733** Asme **B1.20.1** Iso **9001:2000**

STEEL SEAMLESS PIPE NIPPLES Schedule 40/80/160/XXHVY (Domestic)

Seamless Steel Pipe Seamless Steel Nipples NPT Pipe Nipple Threads ASTM **A106** Grade B ASTM **A733** ASME **B1.20.1**

 STAINLESS STEEL NIPPLES Sch 40/80 Type 304/316 Welded & Seamless

 Stainless Steel Pipe
 ASTM A312, ASME SA312

 Stainless Steel Nipples
 ASTM A733

 NPT Pipe Nipple Threads
 ASME B1.20.1

 NPT Pipe Nipple Threads
 ASME B1.20.1

 SEAMLESS RED BRASS PIPE NIPPLES
 (Schedule 40/80)

 Seamless Red Brass Pipe
 ASTM B43 (Copper

Brass Pipe Nipples (incl.Chrome Plated)

<u>(Schedule 40/80)</u> ASTM **B43 (Copper Alloy C230)** ASTM **B687-88**

ASME **B1.20.1**

SEAMLESS ALUMINUM PIPE NIPPLES Sch 40/80 Type 6061-T6

Aluminum Pipe NPT Pipe Nipple Threads

NPT Pipe Nipple Threads

ASTM **B241** ASME **B1.20.1**

ASTM A197

ASTM A153

ASME B16.3

ASME **B1.20.1**

ANSI/ASME B1.20.1

ANSI/ASME B16.18

ASTM B88. ASTM B306. NSF-61

UL Listed

ISO 9001

C12200

IMPORTED BRONZE THREADED FITTINGS & FLANGES CLASS 125

Bronze Castings Bronze Fitting Dimensions NPT Pipe Fitting Threads Bronze Unions Bronze Flanges Overseas Manufacturing Facilities ASTM B62-93, ASTM B584, C83600 ASME B16.15, Fed Spec. WW-P-460C ASME B1.20.1 A-A-59617, Fed. Spec WW-U-516B ASME B16.24, B16.5, MSS-SP-106 ISO 9001:2000

ASME B16.39, Fed. Spec WW-U-516B

IMPORTED MALLEABLE IRON THREADED FITTINGS, CLASS 150 & 300

Malleable Castings Hot-Dipped Galvanized Fittings Malleable Fitting Dimensions Malleable Unions NPT Pipe Fitting Threads All Malleable Iron Fittings Overseas Manufacturing Facilities

COPPER (WROT) FITTINGS

Threaded Ends Solder Ends Cast Items Alloy

MERCHANT STEEL FITTINGS & COUPLINGS

Merchant Coupling (Dimensions & Material) Merchant Coupling Threads Merchant Steel Bushings, Caps & Plugs API Line Couplings

ASTM **A865** ASME **B1.20.1** ASME **B16.14 API-5L**



PVC PLASTIC PIPE NIPPLES Sch 80

PVC Plastic Pipe PVC Plastic Pipe Nipples

NPT Pipe Nipple Threads

ASTM **D-1784,** ASTM **D-1785** ASTM **A733** ASTM **F-1498,** ASME **B1.20.1**

NOTE: Molded PVC Pipe Nipples are made from similar but superior resins which offer equivalent strength, consistency, and durability.

This document contains information and specifications which may be confidential, protected and/or legally privileged. This information is intended only for use by: a) any organization to which it was distributed directly by Edmund A. Gray Company Inc. or b) current customer(s) having purchasing history directly with Edmund A. Gray Company, Inc during the last twelve (12) months. If you do not fit into one of these two groups, use of this document is strictly prohibited and under no circumstance is there to be any duplication, distribution or disclosure of the information contained herein to any other organization, person or third party, by any means, without written authorization from Edmund A. Gray Company.





SUBMITTAL AND DATA SHEET

SCHEDULE 40 AND SCHEDULE 80 CONDUIT NSF NRTL* ANSI/UL 651 AND NEMA TC-2

RIGID NON-METALLIC CONDUIT FOR USE IN BOTH ABOVE GROUND AND UNDERGROUND INSTALLATIONS

SCHEDULE 40 CONDUIT

Rated for 90°C Conductors

SIZE	AVERAGE O.D.	NOM. I.D.	MIN. T.	APPROX. WT/100 FT
1/2	0.840	0.622	0.109	18
3/4	1.050	0.824	0.113	24
1	1.315	1.049	0.133	33
1-1/4	1.660	1.380	0.140	45
1-1/2	1.900	1.610	0.145	56
2	2.375	2.067	0.154	76
2-1/2	2.875	2.469	0.203	126
3	3.500	3.068	0.216	163
3-1/2	4.000	3.548	0.226	197
4	4.500	4.026	0.237	234
5	5.563	5.047	0.258	319
6	6.625	6.065	0.280	411
8::	8.625	7.942	0.322	622

Schedule 40 is furnished in standard 10' lengths with one bell end. 20' lengths are available upon request.

:: Non-UL or -NSF listed

SCHEDULE 80 CONDUIT

Rated for 90°C Conductors

SIZE	AVERAGE O.D.	NOM. I.D.	MIN. T.	APPROX. WT/100 FT
1/2	0.840	0.546	0.147	22
3/4	1.050	0.742	0.154	30
1	1.315	0.957	0.179	42
1-1/4	1.660	1.278	0.191	60
1-1/2	1.900	1.500	0.200	72
2	2.375	1.939	0.218	98
2-1/2	2.875	2.323	0.276	160
3	3.500	2.900	0.300	213
3 1/2	4.000	3.364	0.318	256
4	4.500	3.826	0.337	310
5	5.563	4.813	0.375	430
6	6.625	5.761	0.432	590

Schedule 80 is furnished in standard 10' lengths with one bell end. 20' lengths are available upon request.

* NATIONAL RECOGNIZED TESTING LABORATORY (NRTL) BY OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (OHSA)



To Our Valued Customer:

We hereby certify that to the best of our knowledge and belief the S.A. brand lead free brass fittings manufactured by Siam Fittings Co. Bangkok, Thailand and distributed by Merit Brass Company comply with the following standards:

	SPECIFICATIONS
DIMENSION	ANSI/ASME B16.14,B15.15,B16.18
	MSS-SP-106(Flanges)
	A-A-59617(Union)
THREADS	ANSI/ASME B1.20.1
MATERIAL	ASTM 584-06a(C89833)LEAD FREE
	Cu= 87.0-91.0%
	Sn= 4.0-6.0%
	Pb= 0.10% (Max.)
	Zn= 2.0-4.0%
	Ni = 1.0% (Max.)
	P= 0.05% (Max.)
	Si= 0.005% (Max.)
	Al= 0.005% (Max.)
	S= 0.08% (Max.)
	Fe= 0.3% (Max.)
	Sb= 0.25% (Max.)
	Bi- 1.7-2.7%

Please consider this letter official notification that all Siam (SA) brand fittings marked LF-SA meet the requirements of California Health & Safety Code 116875 (AB1953), Vermont Act 193 and are certified by NSF to NSF/ANSI 61 Annex G.

Sincerely,

MERIT BRASS COMPANY

hlesinger Maic

Marc Schlessinger President







HD Fowler Company Submittal

Sec. 8: Ln 9: Sec. 8: Ln 10: Sec. 8: Ln 11: Sec. 8: Ln 20: Sec. 8: Ln 21 Vendor: 77590



To Our Valued Customer:

We hereby certify that to the best of our knowledge and belief all brass nipples manufactured by Merit Brass Company conform to specification ASTM B687-88.

Nipples are threaded with American Standard taper pipe threads (NPT) in accordance with screw-threaded standard for Federal Services Handbook H-28.

Brass nipples have a weighted average lead content of $\leq 0.25\%$ and are in compliance with California's Health & Safety Code Section 116875 (commonly known as AB1953) and Vermont Act 193. This product is Certified by NSF to NSF/ANSI 61 for use in drinking water supplies of pH 6.5 and above.

Sincerely,

MERIT BRASS COMPANY

sserger

Marc Schlessinger President



P.O. Box 43127 * One Merit Drive * Cleveland, OH 44143

ss.com Web Xpress

Phone: 216 261 9800 * Toll Free: 800 726 9800 * Fax: 800 726 9880 * www.meritbrass.com * www.mbwebXpress.com 🎢

HD Fowler Company Submittal

Sec. 16: Ln 58: Sec. 16: Ln 59: Sec. 16: Ln 60: Sec. 16: Ln 61 Vendor: 77670

Certificate of Compliance • Specification & Compliance Guide

Bronze Threaded Fittings

ASTM B62-93-93 (C83600) 85-5-5-5 ANSI/ASME B1.20.1 ANSI/ASME B16.5 ANSI B16.18, B16.3 Class 125 ISO 9001:2000 Fed Spec. WW-P460C MSS-SP-106 ASTM B584-93B Unions WW-U-516B UL/FM Listed & Approved - EX15226 NSF-61 Approved

Bronze Threaded Flanges

ASTM B62 ASME B16.24 ASME B1.20.1, Class 150 ISO 9001:2000

Malleable Iron Fittings

ASTM A197, ASTM A153 ASME 16.3, ASME B16.34 ASME B1.20.1, ASME B16.39 Coating ASTM A164 LS or ASTM A165 NS S1255 All fittings pressure tested to 300# Class UL/FM Listed & Approved - EX15174 Union WW-U-5116-B, EX9172 Others GS143, JIS H-0401 BS 21 DIN 2999 ISO 9001:2000 Galvanized Fittings meet NSF-61

Cast Iron Flanges

ASTM A126 ASTM A48, ASME 16.1 ASME B1.20.1 ISO 9001:2000

Cast Iron Fittings

ASTM A126 **ASTM B16.4** ASME B1.20.1 ISO 9001:2000

Copper Fittings

Threaded Ends ANSI/ASME B1 Solder Ends ASTM B88 ASTM A306 NSF-61 (Alloy C12200)

Forged Steel Fittings

ASME A105, ASTM 182 (F301, F304L, F316, F316L, F304H, F316H, F317L, F321, F11, F22, F91) ASME B16.11 ASME B1.230.1 MSS-SP-79/83/95/97 Normalized ISO 9001:2000 2000 lb., 3000 lb., and 6000 lb. Threaded and Socket Weld

Bronze Threaded Nipples

ASTM B43 ANSI B1.20.1, WW-N-351 ANSI/ASTM B687-96 Burst Pressure 6000 lb (41Mpa) Tensile Strength 460 N/mm sq. Rockwell Hardness (30T) 71 NSF-61 Approved

Merchant Steel Couplings

ASTM A865, ANSI B1.20.1 ISO 9001:2000 API Line API 5L FED Spec WW-P-404 XH AAR, Recessed and Non-recessed

Steel Welded Nipples Sch. 40 & 80 Galvanized Nipples - NSF Approved

ASTM A733, ASTM A53 ASME B1.20.1 ISO 9001:2000 ISO 14001:1996



CALIFORNIA TEXAS NEW YORK

5593 Fresca Dr., La Palma CA 90623 • Toll Free: 866-532-8306 • Fax: 866-532-8307 1150 Silber Rd., Houston TX 77055 • Toll Free: 800-935-5456 • Fax: 713-680-2999 PO Box 27, Rt. 22, Brewster NY 10509 • Toll Free: 800-431-2082 • Fax: 845-278-9056 WEB: www.matco-norca.com

EMAIL: mail@matco-norca.com

Effective May 1, 2010













Barton Combined Sewer Overflow Control Project

BACKFLOW PREVENTER



Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax



Top Access Double Check Valve Assembly

SPECIFICATION SUBMITTAL SHEET



FEATURES

Sizes: 🗆 3/4" 🗆 1"

□ 1 1/4" □ 1 1/2" □ 2"

175 PSI

350 PSI

ANSI B1.20.1

180°F

Maximum working water pressure Maximum working water temperature Hydrostatic test pressure End connections Threaded

OPTIONS

(Suffixes can be combined

- L less ball valves
- □ FT with "Fast Test" test cocks
- U with union ball valves
- S with bronze "Y" type strainer

ACCESSORIES

- Repair kit (rubber only)
- Thermal expansion tank (Model WXTP)
- Bronze wye strainer
- Stainless steel ball valve handles
- QT-SET Quick Test Fitting Set
- Test Cock Lock (Model TCL24)

APPLICATION

Designed for installation on potable water lines to protect against both backsiphonage and backpressure of polluted water into the potable water supply. A tethered test cock cap is provided to protect against fouling caused by insects, dirt and debris. Assembly shall provide protection where a potential non-health hazard exists.

STANDARDS COMPLIANCE

(Unless otherwise noted, applies to 3/4" thru 2" Horizontal)

- ASSE® Listed 1015 (Vertical flow-up:1 1/4" thru 2"
- IAPMO® Listed
- AWWA Compliant C510
- CSA® Certified (ertical flow-up:1 1/2" & 2"
- NYC MEA 426-89-M VOL 3
- Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California

MATERIALS

Main valve body Access covers Fasteners Elastomers

Test cock cover

Polymers

Springs

Cast Bronze ASTM B 584 Cast Bronze ASTM B 584 Stainless Steel, 300 Series Silicone (FDA approved) Buna Nitrile (FDA approved) NoryI[™], NSF Listed Stainless steel, 300 series Plastic





DIMENSIONS & WEIGHTS (do not include pkg.)

			DIMENSIONS (approximate)											WEI	GHT						
MOE	DEL			A UNI	ON	B LE	SS											LE	SS	W	TH
SIZ	ΖE	A		BAL	L.	BAL	L	C		D		E		F		G		B	ALL	BA	۹LL
				VALV	ES	VALV	ΈS											VAL	VES	VAL	VES
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg	lbs.	kg
3/4	20	13	330	14 5/16	364	8 3/4	222	2 3/8	60	2 5/16	59	3 5/16	84	3/4	19	17 5/8	448	4	1.8	6	2.7
1	25	14	356	15 3/4	400	8 3/4	222	2 1/2	64	2 5/16	59	3 5/16	84	3/4	19	19 3/4	502	8	3.6	12	5.4
1 1/4	32	19 5/8	499	21 5/8	549	13 3/4	349	4	102	3 5/8	92	4 3/8	111	1 5/16	33	24 3/4	629	16	7.3	22	10
1 1/2	40	20 5/16	516	22 5/16	567	13 3/4	349	5 3/8	137	3 5/8	92	4 3/8	111	1 5/16	33	25 15/16	659	16	7.3	22	10
2	50	21 3/8	543	23 1/4	591	13 3/4	349	5 13/16	148	3 5/8	92	4 3/8	111	1 5/16	33	28 5/16	719	17	7.7	29	13.2

DOCUMENT #: REVISION: BF-950XLT 1/09

Page 1 of 2

WILKINS a Zurn company, 1747 Commerce Way, Paso Robles, CA 93446 Phone:805/238-7100 Fax:805/238-5766 In Canada: ZURN INDUSTRIES LIMITED, 3544 Nashua Dr., Mississauga, Ontario L4V 1L2 Phone:905/405-8272 Fax:905/405-1292 Product Support Help Line: 1-877-BACKFLOW (1-877-222-5356) • Website: http://www.zurn.com

FLOW CHARACTERISTICS

MODEL 950XLT 3/4", 1", 1 1/4", 1 1/2" & 2" (STANDARD & METRIC)

FLOW RATES (I/s)



FLOW RATES (GPM)

Rated Flow (Established by approval agencies)

TYPICAL INSTALLATION

Local codes shall govern installation requirements. To be installed in accordance with the manufacturer's instructions and the latest edition of the Uniform Plumbing Code. Unless otherwise specified, the assembly shall be mounted at a minimum of 12" (305mm) and a maximum of 30" (762mm) above adequate drains with sufficient side clearance for testing and maintenance. If installed below grade, be certain adequate drainage is provided to prevent the device from being submerged.

Capacity thru Schedule 40 Pipe								
Pipe size	5 ft/sec	7.5 ft/sec	10 ft/sec	15 ft/sec				
1/8"	1	1	2	3				
1/4"	2	2	3	5				
3/8"	3	4	6	9				
1/2	5	7	9	14				
3/4"	8	12	17	25				
1"	13	20	27	40				
1 1/4"	23	35	47	70				
1 1/2"	32	48	63	95				
2"	52	78	105	167				



SPECIFICATIONS

The Double Check Type Backflow Preventer shall be ASSE Listed 1015, rated to 180°F and supplied with full port ball valves. The main body and access covers shall be bronze (ASTM B 584), the seat ring and all internal polymers shall be NSF® Listed Noryl[™] and the seat disc elastomers shall be SILICONE. The first and second check shall be located at a 45° angle and accessible for maintenance from the top of the device, without removing the device from the line. Each check shall have separate access covers and test cocks shall be accessible from the top of the device. Test cocks shall be protected from debris by a tethered cap. The Double Check Type Backflow Preventer shall be a WILKINS Model 950XLT.

WILKINS a Zurn company, 1747 Commerce Way, Paso Robles, CA 93446 Phone:805/238-7100 Fax:805/238-5766 IN CANADA: ZURN INDUSTRIES LIMITED, 3544 Nashua Dr., Mississauga, Ontario L4V 1L2 Phone:905/405-8272 Fax:905/405-1292 Product Support Help Line: 1-877-BACKFLOW (1-877-222-5356) • Website: http://www.zurn.com

Model 950XLT Double Check Valve Assembly (3/4", 1", 1 1/4", 1 1/2" & 2")



Installation I Testing I Maintenance Instructions

INSTALLATION INSTRUCTIONS

CAUTION: Installation of Backflow Preventers must be performed by qualified, licensed personnel. The installer should be sure the proper device has been selected for the particular installation. Faulty installation could result in an improperly functioning device.

WILKINS Model 950XLT Double Check Valve assemblies are for use on potable water lines where a health hazard does not exist in the event of a backflow situation

Damage to the device could result wherever water hammer and/or water thermal expansion could create excessive line pressure. Where this could occur, shock arresters, check valves and/or pressure relief valves should be installed downstream of the device.

If installation is in a pit or vault, the Backflow Preventer must never be submerged in water because this could cause a cross-connection. Make sure that the pit or vault always remains dry by providing ample drainage.

- Before installing a Model 950XLT Backflow Prevente, flush the line thoroughly to remove all debris, chips and other foreign matter. If required, a strainer should be placed upstream of the Backflow Prevente. CAUTION: Do not use a strainer in seldom used emergency waterlines such as fire lines
- 2. Provide adequate space around the installed unit so that the test cocks will be accessible for testing and servicing.
- 3. Install valve at least 12 inches above surrounding flood level
- 4. Always consult local codes for installation methods, approvals and guidance.

PLACING THE MODEL 950XLT IN SERVICE

1. Start with both shut-off valves closed. Slowly open the inlet shut-off valve until the backflow preventer is completely pressurized.

2. When the unit has been pressurized, vent any trapped air by slightly opening each of the four test cocks.

3. Slowly open the downstream shut-off valve. The Model 950XLT Double Check Valve assembly is now in service.

4. After the Model 950XLT has been properly installed, test the device (see "TEST PROCEDURES"). If the device fails the test, remove the first and second check valves and thoroughly flush the device. Clean rubber and seats of all debris and place unit back in service.



VERTICAL INSTALLATION

Vertical installation is acceptable in applications where inlet and outlet piping are flo ing vertically upwards. All the basic installation instructions apply to such installations. Consult factory for approval status.

INDOOR INSTALLATION

C DIRECTION OF FLOW

Indoor installation is preferred in areas that are subject to freezing conditions. All the basic installation instructions apply to such installations.





OUTDOOR INSTALLATION

The Model 950XLT Backflow Preventer may be installed outdoors only if the device is protected against freezing conditions. Exposure to freezing conditions will result in improper function or damage to the device. The installation location must be kept above 32°F. All the basic installation instructions apply.

<u>Proposition 65 Warning</u> This product contains chemicals known to the State of California to cause cancer or birth defects or other reproductive harm.



Testing Procedures

MODEL 950XLT DOUBLE CHECK VALVE ASSEMBLY

Equipment Required: Differential pressure gauge test kit.

TEST NO. 1 - TIGHTNESS OF #1 CHECK VALVE

REQUIREMENT:

The static pressure drop across check valve #1 shall be at least 1.0 psid. If test cock #3 is not at the highest point of the check valve body, then a vertical tube must be installed on test cock #3 so that it rises to the top of the check valve body.

PROCEDURE:

- 1. Slowly open all 4 test cocks to remove any foreign material and attach fittings
- 2. Attach hose from the high side of the test kit to the #2 test cock.
- 3. Open test cock #2 and bleed all air from the hose and gauge by opening the high side bleed needle valve. Close high side bleed needle valve. If a tube is attached to test cock #3, open test cock #3 to fill the tube. Close test cock #3. Close #2 shut-off valve then close the #1 shut-off valve.
- 4. Hold gauge at same level as test cock #3 or water level in tube. Slowly open test cock #3. Record the static pressure drop across check valve #1 after gauge reading stabilizes and water stops running out of test cock #3.
- 5. Close all test cocks, open shut-off valve #1 and remove test equipment.

TEST NO. 2 - TIGHTNESS OF #2 CHECK VALVE

REQUIREMENT:

The static pressure drop across check valve #2 shall be at least 1.0 psid. If test cock #4 is not at the highest point of the check valve body, then a vertical tube must be installed on test cock #4 so that it rises to the top of the check valve body.

PROCEDURE:

- 1. Attach hose from the high side of the test kit to the #3 test cock.
- Open test cock #3 and bleed all air from the hose and gauge by opening the high side bleed needle valve. Close high side bleed needle valve. If a tube is attached to test cock #4, open test cock #4 to fill the tube. Close test cock #4. Close #1 shut-off valve.
- 3. Hold gauge at same level as test cock #4 or water level in tube. Slowly open test cock #4. Record the static pressure drop across check valve #2 after gauge reading stabilizes and water stops running out of test cock #4.
- 4. Close all test cocks, slowly open shut-off valve #1 & #2 and remove test equipment.



WILKINS

WILKINS, a ZURN company

1747 Commerce Way, Paso Robles, CA 93446 Phone:805/238-7100 Fax:805/238-5766



All Model 950XLT Double Check Valve Backflow Preventers must be inspected and maintained by licensed personnel at least once a year or more frequently as specified by local codes. Replacement of worn or damaged parts must only be made with genuine "WILKINS" parts.

GENERAL MAINTENANCE

- 1. Clean all parts thoroughly with water after disassembly.
- 2. Carefully inspect rubber seal rings and o-rings for damage.
- 3. Test unit after reassembly for proper operation (refer to

"TESTINg PROCEDURES").

SERVICING CHECK VALVES

- 1. Close inlet and outlet shut-off valves.
- 2. Open No. 2, No. 3 and No. 4 test cocks to release pressure from valve.
- Unscrew check valve cover using appropriate sized wrench. CAUTION: COVER IS SPRINg LOADED. To avoid injury, hold cover down firmly with one hand while unscrewing
- 4. Remove cover, spring and poppet assembly.
- 5. Inspect the rubber seal ring for cuts or embedded debris.
- 6. To remove seal ring, remove screw and seal retainer.
- 7. If the reverse side of the seal ring is unused, it is possible to invert the seal ring. This would be considered a temporary solution to fixing a fouled check and should be replaced with a new seal ring as soon as possible.
- 8. Inspect the valve cavity and seating area. Remove any debris.
- 9. If necessary, unscrew seat from body and replace with new seat and lightly greased o-ring (For seat removal assistance, contact factory).
- 10. Reverse the above procedures to reinstall check valve assemblies and access cover, making sure the 3 test cocks remain open.



(Shown with optional union ball valves)

Troubleshooting

- PROBLEM
- 1. LEAKINg CHECK VALVES

2. LOW OR NO FLOW

POSSIBLE CAUSES

- Debris on seat or seal ring 1.
- Damaged seat 2.
- 3. Damaged seat o-ring
- 1. Device installed backwards
- Shut-off valves or valve upstream may 2. not be fully open
- 3. Low supply pressure

CORRECTIVE ACTION

- 1. Clean seat and seal ring area
- Replace seat 2.
- Replace seat o-ring 3.
- 1. Verify flow direction arro
- Turn handles counterclockwise 2.
- Attach pressure gauge to test cock 3. #1 and verify pressure



200 100 150 FLOW RATE (GPM)



Capacity thru Schedule 40 Pipe								
Pipe size	5 ft/sec	7.5 ft/sec	10 ft/sec	15 ft/sec				
1/8"	1	1	2	3				
1/4"	2	2	3	5				
3/8"	3	4	6	9				
1/2"	5	7	9	14				
3/4"	8	12	17	25				
1"	13	20	27	40				
1 1/4"	23	35	47	70				
1 1/2"	32	48	63	95				
2"	52	78	105	167				

50

SPECIFICATIONS

Maximum working water pressure: 175 PSI Maximum working water temperature: 180°F Hydrostatic test pressure: 350 PSI End connections: Threaded ANSI B1.20.1

Proper performance is dependent upon licensed, gualified personnel performing regular, periodic testing according to WILKINS' specifications and prevailing governmental & industry standards and codes and upon following these installation instructions. Failure to do so releases WILKINS of any liability that it might otherwise have with respect to that device. Such failure could also result in an improperly functioning device.

IS950XLT (REV. 7/10)

0

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WILKINS

WILKINS, a ZURN Company 1747 Commerce Way, Paso Robles, CA 93446 Phone:805/238-7100 Fax:805/238-5766

4

PRESSURE LOSS (kpa)

PRESSSURE LOSS (kpa)

138

103

69

34

0

250

103

69

34

MODEL 950XLT, 950XLTDA WILKINS Double Check

Backflow Preventers 3/4" to 2

ITEM NO.	DES	SCRIPTIO	N	3/4"	1"	1 1/4"	1 1/4" 1 1/2"		2" XLTDA(BF)	3/4" 350D (BY-PASS)	
1	CHE	ECK COVEI	R	952-3XL2-010F	952-3XL2-010F	954-3XL2-010F	954-3XL2-010F	954-3XL2-010F	954-3XL2-010F	N/A	
2	O-R	ING, COVE	R	136N	136N	153N	153N	153N	153N	N/A	
3	CHE	CK SPRIN	G	952-33	952-33	554-33	554-33	554-33	956-33DA	352DA-33	
4	POPPET			952-30-010F	952-30-010F	954-30-010F	30-010F 954-30-010F		954-30-010F	352-30	
5	S	EAL RING		952-12S	952-12S	954-12S	954-12S	954-12S	954-12S	N/A	
6	SEAL R	ING RETAI	NER	952-14	952-14	954-14	954-14	954-14	954-14	N/A	
7	RET/	AINING BO	LT	952-11	952-11	952-11	952-11	952-11	952-11	N/A	
8	CHE	CK SEAT #	ŧ1	952-18T	952-18T	954-18T	954-18T	954-18T	954-18T	352-18A	
	CHE	CK SEAT #	\$2	952-18T	952-18T	954-18T	954-18T	954-18T	954-18T	352-18B	
9	O-RING,	CHECK SE	EAT #1	WK-125N	WK-125N	136N	136N	136N	136N	WK-125N	
	O-RING,	CHECK SE	EAT #2	WK-125N	WK-125N	136N	136N	136N	136N	126N	
10	TE	EST COCK		18-860	18-860	14-860	14-860	14-860	14-860	18-860	
11	BALL V	ALVE, TAP	PED	34-850T	1-850T	114-850T	112-850T	2-850T	N/A	34-850T	
12	BA	ALL VALVE		34-850	1-850	114-850	112-850	2-850	N/A	34-850	
	GATE	VALVE (XLT	TDA)	N/A	N/A	N/A	N/A	N/A	2-48OSYCIT	N/A	
	BFLY VA	ALVE, TAPF	PED**	N/A	N/A	114-49BRT	112-49BRT	2-49BRT	2-49BRT	N/A	
	BF	LY VALVE**	٢	N/A	N/A	114-49BR	112-49BR	2-49BR	2-49BR	N/A	
13	POPPET ASSEMBLY #1		LY #1	952-300S	952-300S	954-300S	954-300S	954-300S	954-300S	352-300C	
	POPPET ASSEMBLY #2		LY #2	952-300S	952-300S	954-300S	954-300S	954-300S	954-300S	352-300D	
14	TEST COCK CAP PLUG		PLUG	2-7P	2-7P	2-7P	2-7P	2-7P	2-7P	2-7P	
*	ŀ	IOUSING		N/A	N/A	N/A	N/A	N/A	N/A	352-1A	
*	O-RING,	HOUSING	INLET	N/A	N/A	N/A	N/A	N/A	N/A	214N	
*	O-RING, H	IOUSING C	DUTLET	N/A	N/A	N/A	N/A	N/A	N/A	223N	
*	HOUS	ING SCRE	WS	N/A	N/A	N/A	N/A	N/A	N/A	352-11	
	HOUSI	NG ASSEM	IBLY	N/A	N/A	N/A	N/A	N/A	N/A	RK34-350DV	
15	WATE	R METER,	5/8"	N/A	N/A	N/A	N/A	N/A	557-54	N/A	
	CHEC	K SEAT TC	OL	972-SE/	ATTOOL		974-SE	ATTOOL		N/A	
* SEE	3/4" MODE	EL 350, INTI	EGRAL	SUPERVISORY	SWITCH OPTIO	N AVAILABLE					
					RE	PAIR KITS					
RK3	4-950XL		REPA MC	NR KIT, RUBB	ER & SPRING 3/4" & 1" Only	^{iS} RK114-9	50XL	REPAIR KI MODEL 950	T, RUBBER & XLT, 1 1/4", 1	SPRINGS 1/2", 2" Only	
PAF	RT NO.	QTY.		DESCRIF	PTION	PART N	O. QTY.	D	ESCRIPTIO	N	
95	2-12S	2		SEAL R	ING	954-12	S 2		SEAL RING		
1	36N	2		O-RING, C	OVER	153N	2	0-	-RING, COVE	R	
95	52-33	2		CHECK S	PRING	554-33	3 2	CI	HECK SPRIN	IG	
RK34	4-950XLI	R	MC	REPAIR KIT, DEL 950XLT,	RUBBER 3/4" & 1" Only	RK114	-950XLR	REPA MODEL 950	AIR KIT, RUE XLT, 1 1/4", 1	BER 1/2", 2" Only	
PAF	RT NO.	QTY.		DESCRIF	PTION	PART N	0. <u>QTY.</u>	D	ESCRIPTIO	N	
95	2-12S	2		SEAL R	ING	954-12	S 2		SEAL RING		
	36N	2		O-RING, C	OVER	153N	153N 2		O-RING, COVER		





MODEL 950XLTDA



MODEL 950XLTDABF

REPAIR KITS

RK34-950XL	950XLSK SEAT REPAIR KIT MODEL 950XLT, 3/4" & 1" Only				SEAT REPAIR KIT MODEL 950XLT, 1 1/4", 1 1/2", 2" Only					
PART NO.	QTY	. DESC	DESCRIPTION				ΓΥ.	DESCRIPTION		
952-18T	2	CHK SE/	AT, 3/4" XLT		954-18T	2	2	CHK SI	EAT, 1-1/4" - 2" 950XLT	
WK-125N	2	0-	RING		136N	2	2		O-RING	
RK34-350D	REPA M	IR KIT, COMPLETE	RK34-350DV	REP/ M	AIR KIT, VESS ODEL 350D 3/4"	EL	RK2-950X	LTDA	REPAIR KIT, SPRINGS MODEL 950XLTDA(BF) 2"	
PART NO.	QTY.	DESCRIPTION	PART NO.	QTY.	DESCRIPTI	ON	PART NO.	QTY.	DESCRIPTION	
352-300C	1	#1 CHECK ASSY	RK34-350DV	1	HOUSING AS	SSY	954-12S	2	SEAL RING	
352-300D	1	#2 CHECK ASSY					153N	2	O-RING, COVER	
214N	1	O-RING, HOUSING INLET					956-33DA	2	CHECK SPRING	
223N	1	O-RING, HOUSING OUTLET								



Barton Combined Sewer Overflow Control Project

PRESSURE REDUCING VALVE

H.D FOWLER COMPANY

Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax



Model 600XL

Water Pressure Reducing Valve with Integral By-pass Check Valve and Strainer

Application

Ideal for use where Lead-Free* valves are required. Designed for installation on potable water lines to reduce high inlet pressure to a lower outlet pressure. The integral strainer makes this device most suitable for residential and commercial water systems requiring frequent cleaning because of sediment and debris. The direct acting integral by-pass design prevents buildup of excessive system pressure caused by thermal expansion. The balanced piston design enables the regulator to react in a smooth and responsive manner to changes in system flow demand, while at the same time, providing protection from inlet pressure changes.

Standards Compliance

- ASSE® Listed 1003
- IAPMO® Listed
- CSA® Certified
- City of Los Angeles Approved
- NSF® Listed Standard 61, Annex G*
- Certified to NSF/ANSI 372* by IAPMO R&T
- *(0.25% MAX. WEIGHTED AVERAGE LEAD CONTENT)

Materials

Main valve body	Low Lead Cast Bronze ASTM B 584
Access covers	Low Lead Cast Bronze ASTM B 584
	Low Lead Brass
Fasteners	Stainless Steel, 300 Series
Stem & plunger	Low Lead Cast Bronze ASTM B 584
	Low Lead Brass
Elastomers	Buna Nitrile, (FDA Approved)
	EPDM, (FDA Approved)
Cap gaskets	Natural Vulcanized Fibre
	Acetal (Delrin™), NSF Listed
Strainer screen	Stainless Steel, 300 Series Strainer
Seat	Stainless Steel, 300 Series

Features

Sizes: 1/2", 3/4", 1", 11/4", 11/2", 2"	
Maximum working water pressure	300 psi
Maximum working water temperature	140°F
Reduced pressure range (standard)	25 psi to 75 psi
Factory preset	50 psi
Hydrostatic test pressure	300 psi
CPVC tailpiece: Max. hot water temp.	140°F @ 100 psi
Cold water rated temp.	73.4°F @ 400 psi

Dimensions & Weights (do not include pkg.)



Ор	o tions (Sut	ffixes can be combined)
	-	standard with 20 mesh strainer screen, SU, FNPT
	С-	copper sweat connection (3/4" thru 2")
	HR -	75 psi to 125 psi spring range, factory set at 85 psi
	HLR -	10 psi to 125 psi spring range, factory set at 50 psi
	HTSTSC -	180°F maximum temp, stainless steel trim,
		spring, sealed cage
	L -	less integral by-pass check valve
	LU -	less union assembly, female x female (3/4" & 1"
		only)
	LPV -	180°F maximum temp with 10 psi to 35 psi
		spring range, factory set at 20 psi
	LPC -	140°F maximum temp with 10 psi to 35 psi
		spring range, factory set at 20 psi (2" field
		set only)
	SC -	sealed cage bell housing and stainless steel
_		adjustment screw
	610XL -	400 psi inlet rating and 75 psi to 125 psi
_	_	spring range, factory set at 85 psi
	P -	tapped and plugged for gauge
Ц	CPVC -	CPVC tailpiece connection (1/2"-1")
	G -	Tapped with gauge
	CH -	Chrome stem & plunger



		U (1 07										
017E			DIMENSIONS (approximate)									WEICHT	
312	- L.	CONNECTIONS	A		В		С		D		WEIGHT		
in.	mm		in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg.	
1/2	15	SINGLE UNION	5 1/2	133	6 1/4	159	1 1/4	32	2 3/4	70	3	1.5	
1/2	15	LESS UNION	4 1/2	114	6 1/4	159	1 1/4	32	2 3/4	70	3	1.5	
3/4	20	SINGLE UNION	5 5/16	135	5 1/2	140	1 1/4	32	2 3/4	70	3	1.5	
3/4	20	LESS UNION	4 7/8	121	5 1/2	140	1 1/4	32	2 3/4	70	3	1.5	
1	25	SINGLE UNION	6 1/8	156	7 1/4	184	2	51	3 3/8	86	5	2.5	
1	25	LESS UNION	5 3/4	146	7 1/4	184	2	51	3 3/8	86	5	2.5	
1 1/4	32	SINGLE UNION	7 1/8	181	8	203	2	51	3 7/8	100	7	3.0	
1 1/2	40	SINGLE UNION	9 1/8	232	10	254	2 1/2	64	5	127	13	6.0	
2	50	SINGLE UNION	10 1/4	260	12	305	3	76	6 1/2	165	21	9.5	

Zurn Industries, LLC | Wilkins

1747 Commerce Way, Paso Robles, CA U.S.A. 93446 Ph. 855-663-9876, Fax 805-238-5766 In Canada | **Zurn Industries Limited** 3544 Nashua Drive, Mississauga, Ontario L4V 1L2 Ph. 905-405-8272, Fax 905-405-1292 Rev. C Date: 9/13 Document No. REG-600XL Product No. Model 600XL



Typical Installation

Local codes shall govern installation requirements. Unless otherwise specified, the assembly shall be mounted in accordance with the latest edition of the Uniform Plumbing Code. The Model 600XL may be installed in any position. If installed in a pit, vault or inside application, specify the "SC" sealed cage option. Multiple installations are recommend for wide demand variations or where the desired pressure reduction is more than 4 to 1 (i.e.: 200 psi inlet reduced to 50 psi outlet). <u>CAUTION:</u> Anytime a reducing valve is adjusted, a pressure gauge must be used downstream to verify correct pressure setting. Do not bottom adjustment bolt on bell housing.



Specifications

The Pressure Reducing Valve shall be certified to NSF/ANSI 372, consist of a low lead bronze body and bronze bell housing, shall have separate access covers for the plunger and strainer screen and shall have a bolt to adjust the downstream pressure. The Pressure Reducing Valve shall be of the balanced piston design and shall reduce pressure in both flow and no-flow conditions. The bronze bell housing and access caps shall be threaded to the body and shall not require the use of ferrous screws. The Pressure Reducing Valve shall be a ZURN WILKINS Model 600XL.

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 Wilkins

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Barton Combined Sewer Overflow Control Project

CONTROLLER

H.D FOWLER COMPANY

Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax



DDCWP Series



Controllers

Looking for a rugged waterproof controller ideal for remote or isolated installations? Toro's DDCWP Series controller provides all that and more. Using the new potted DC latching solenoid popular on Toro EZFIO® Plus, TPV, P-220 and 220 Brass Series valves, the DDCWP is battery-operated using two 9V batteries. Toro's exclusive digital dial technology provides the simplicity of a mechanical dial without any moving parts. The digital dial guides users through simple programming functions without the potential for mechanical failure common to traditional dials. Available in 2-, 4-, 6-, and 8-station models, the DDCWP is a controller for those who demand a step above the rest.



Features & Benefits

Fully Waterproof and Submersible Submersible up to 6.5' per IP-68 standards, allowing contractors to mount up to an 8-station controller in a valve box.

Operates DC Latching Solenoids

Controller is compatible with most manufacturers' DC Latching solenoids.

Exclusive "Digital Dial" Technology

Simple programming functions.

Unique Power Feature

Verifies sufficient voltage level for turning stations off before turning any stations on.

Monthly Watering Schedule

Monthly preset option – ideal for automatic runtime adjustments. Delay with Pump-enabled Option.

DDCWP Series



EZ-Flo® and P-220 valves shown with the DCLS-P Latching solenoid which provide cost and labor savings.

Specifications

Model	Description
• DDCWP-2-9V	2-station
 DDCWP-4-9V DDCWP-6-9V 	4-station 6-station
• DDCWP-8-9V	8-station

Dimensions

- 5 ³⁄₄" W x 5" H x 1 ¹⁵⁄₁₆" D
- Weight: 23.3 oz. (without 9V battery)

Operating Specifications

- Operating temperature: 0° 60° C
- Operates using two x 9V alkaline batteries (not supplied)
- Operates one latching solenoid per station and one latching solenoid-equipped master valve
- Controller is compatible with all Toro valves accepting latching solenoids (model DCLS-P or equivalent) and competitive valve models/latching solenoids
- Accepts Toro TRS RainSensor™ and other normally closed sensors
- Low-battery indicator visible on LCD screen
- Three independent programs and three start times per program
- Three scheduling choices by program:
 - -Seven-day calendar
 - –1 to 7-day interval
 - -Odd/even with 365-day calendar and 31st day exclusion
- Station run times from one minute to four hours in one-minute increments
- Seasonal adjust by month from 0-200% in 10% increments
- Manual operation by station or program
- Self-diagnostic circuit breaker skips shorted stations
- Five-year program retention with on-board coin battery saves time of day and all programming features

Warranty

• Two years

www.toro.com • The Toro Company • Irrigation Division 5825 Jasmine St. • Riverside, CA • 92504 • 877-345-8676



Specifications subject to change without notice. For more information, contact your local Toro distributor. P/N 10-1090-IRC ©2010 The Toro Company. All rights reserved.

Battery Cap



Easy installation of two 9V batteries with the simple screw on/off lid. The battery cap provides a dependable leak- proof seal allowing submersion up to 6.5' per IP-68.



Monthly % Adjust

DDCWP adjusts annual irrigation run time the first time the controller is set up. Options include from 0-200% and January to December scheduling. With easy adjusting for seasonal watering, water savings is enhanced for all-around intelligent programming.

1 = The first month, January



10 = 100%. 140% would be designated as 14.

Wire Run Lengths for DDCWP

With battery voltage at 9 VDC, maximum recommended wire runs for an 8-station DDCWP are:

Multi-strand	Distance				
Wire	Feet				
18 AWG	197				
16 AWG	305				
14 AWG	493				
12 AWG	820				

Specifying Information

DDCWP- <u>X</u> -9V									
Description	Stat	tions	Voltage						
DDCWP	<u>X</u>	<u>XX</u>							
DDCWP—Digital Dial	2-2 Stations	6—6 Stations	9V—9 Volt						
Waterproof	4—4 Stations	8—8 Stations							
Controller									
Example: An 8 station DDCWP controller would be specified as:									
	DDCWP-8-9V								



		CUS	STO 3 Pr	M V ogr	WATERING am Contre	G Pl oller	AN				
Date:			_		Program A	A F	Progr	am B	Pro	gran	n C
Station		Descript	ion		Duratior	ן ו	Dura	ation	Dι	irati	on
1											
2											
3											
4											
5											
6											
7											
8											
		Progra	m A		Progra	m B		Pr	ogra	m C	
Irrig. Day	'S S	Su Mo Tu We ⊺	Th Fr S	ia Su	Su Mo Tu We	Th Fr S	Sa Su	Su Mo T	u We	Th Fr S	ia Su
Days Cyc	e		Odd	Even		Odd	Even			Odd	Even
Start 1											
Start 2											
Start 3											

TORO. Count on it.

Waterproof Battery Controller



Electromagnetic Compatibility

This controller complies with European, United States and Australian electromagnetic compatibility standards.

CE

TORO. Ask for	r Customer Service	The Toro Company www.toro.com
TORO AUSTRALIA T: 1300 130898 F: 1300 788144	TORO AMERICAS T: 1-800-664-4740 F: 1-951-785-3511	TORO EUROPE T: +00 32-14-562960 F: +00 32-14-581911
010107	- 12 -	1.100 52 11 501711

INSTALLATION AND OPERATING INSTRUCTIONS



TORO_® **Count on it**

Thank you for choosing the Toro DDCWP Waterproof Battery Controller. The DDCWP incorporates the latest programming technology in an easy-to-use, "digital dial" display.

The following instructions will help you get started. As you follow the simple steps, please pay attention to the important NOTES, which will give you helpful hints and programming advice to maximize the feature capability of the DDCWP.

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Programming Lock Out Feature

The DDCWP can be locked so that unauthorized programming can not occur. In the AUTO RUN position, press both +/ON and -/OFF buttons and hold for 5 seconds. The DDCWP will be "locked" in the AUTO RUN position. Repeat this sequence to "unlock" the DIAL button.

Automatic Voltage Detection

The DDCWP has an automatic voltage detection circuit. Before an irrigation start is initiated, this circuit checks battery voltage to insure that there is sufficient voltage remaining to shut the solenoids off. If there is not sufficient voltage, the program is cancelled and the low battery icon is turned on in the LCD display.

About the DDCWP memory

This controller is equipped with "on board" back up battery that will keep the program memory for a few months in case power is not available. The 9 volt battery will turn on both displays and programming is possible. Do not remove batteries for winter months as program loss can occur.

Maximum Wire Runs for DDCWP Controller

With battery voltage at 9V DC and 7 Bars (105 PSI) of pressure at the valve, these are the maximum wire runs for an 8 station DDCWP. AWG # 18 (1.0mm²) multi-strand wire – 60m (197') AWG # 16 (1.5mm²) multi-strand wire – 100m (305') AWG # 14 (2.5mm²) multi-strand wire – 150m (493') AWG # 12 (4.0mm²) multi-strand wire – 250m (820')

The Toro Promise — Limited Two-Year Warranty The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreementbetween them, jointly warrants, to the owner, each new piece of equipment (featured in the current catalog at date of installation) against defects in material and workmanshipfor a period described below, provided they are used for irrigation purposes under manufacturer's recommended specifications. Product failures due to acts of God (i.e., lightning, flooding, etc.) are not covered by this warranty. Neither Toro nor Toro Warranty Company is liable for failure of products not manufactured by them even though such products may be sold or used in conjunction with Toro products. During such warranty period, we will repair or replace, at our option, any part found to be defective. Your remedy is limited solely to the replacement or repair of defective parts. Return the defective part to your local Toro distributor, who may be listed in your telephone directory Yellow Pages under "Irrigation Supplies" or "Sprinkler Systems," or contact The Toro Warranty Company P.O. Box 489, Riverside, California, 92502. Phone (800) 664-4740 for the location of your nearest Toro distributor or outside the U.S., call (951) 688-9221. This warranty does not apply where equipment is used, or installation is performed, in any manner contrary to Toro's specifications and instructions, nor where equipment is altered or modified. Neither Toro nor Toro Warranty Company is liable for indirect, incidental or consequential damages in connection with the use of equipment, including but not limited to: vegetation loss, the cost of substitute equipment or services required during periods of malfunction or resulting non-use, property damage or personal injury resulting from installer's actions, whether negligent or otherwise. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. All implied warranties, including those of merchantability and fitness for use, are limited to the duration of this express warranty. Some states do not allow limitations of how long an implied warranty lasts, so the above limitation may not apply toyou. This warranty gives you specific legal rights and you may have other rights which vary from state to state. The DDCWP controller is covered by this warranty for a period of two years from the date of installation.

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Press NEXT to set next function OR Press DIAL to move to AUTO-RUN PROGRAM ERASE – You can erase all program information for a selected program. This can be done for any selected program. PE Press NEXT to select the program to erase. Press +/ON to erase. pr will flash 5 times. **Dial position: AUTO-RUN** The AUTO-RUN position is used to provide information regarding the controller's operation as well as for reviewing all data stored in the irrigation programs. The following is a list of information you can observe on the display: • Current Time & Day • A program(s) in OFF position • Information regarding the operating station: program, station and start times • Active Rain Delay • If irrigation is suspended due to SENSOR input • Low battery state To turn OFF the working cycle, press DIAL to MANUAL PROGRAMS and press -/OFF. If you wish to review what data you have in each program: Program Review: Press NEXT to PROGRAM REVIEW. Press PROG to select the program. Press +/ON to start the review. **Status:** If you wish to have a complete status report on the operating station: Press NEXT to STATUS. Remaining station RUN TIME will be displayed as well as the operating program.

Press NEXT to return to AUTO-RUN position.

Note: During programming, the dial will return to the AUTO-RUN position automatically after 3 minutes of inactivity.

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Controller Specifications:

The DDCWP will run one master valve and one station valve simultaneously. The DDCWP is a DC controller. This means it ONLY runs DC latching solenoids. It will not run AC solenoids. It has been fully tested using Toro DC Latching Solenoids. If you intend to use other brands, test them before making an installation.

As DC latching solenoids are more susceptible to debris than AC solenoids, Toro recommends that a filter be installed in the system upstream of the valves.

The DDCWP is tested to be operational under 2 meters of water and is marked IP68. It is important to completely dry the controller before opening the battery compartment. It is also important to make waterproof connections for the longevity of the system components. The DDCWP is supplied with 3M waterproof connectors for this purpose. If more connectors are required, Toro recommends 3M[®] DBY type connectors as these are readily available in most markets.

Connect all field wiring before applying battery power to the controller. This will insure that all connected DC solenoids are properly calibrated for operation.

Installation Instructions: DDCWP Controller

Level and mount controller mounting bracket to a solid surface. If mounting in a valve box, it is suggested to mount the bracket under the lid and leave sufficient wire so the lid can be removed to access the controller.

Next connect the solenoid wires to the controller. The controller drives Toro latching solenoids. It is essential for proper operation that the wire colors between the solenoid and the controller be matched. The red controller station wire is connected to the red solenoid wire and the black controller common wire is attached to the black solenoid wire. It is also essential that a waterproof wire connection be made. The DDCWP is shipped with waterproof connectors for this purpose. These can be used for wire sizes 19 to 26 AWG. (0.9 metric is the largest size wire these accept)

(continued on next page)

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After the station wires are connected, remove the battery compartment waterproof cap and take out the two 9VDC connectors.

Attach two 9VDC alkaline batteries (not supplied) to the battery connectors, insert them into the battery compartment, replace the battery compartment cap and turn it clockwise to its locked position. It is important to add or change batteries with the controller in a dry condition. If moisture gets into the battery compartment, it can lead to deterioration of the batteries.

Note: When the controller powers up, it sends an "Off" pulse to all the solenoids so they are calibrated for proper operation. This is why the solenoids should be connected prior to attaching the batteries. If it is desired to program the controller prior to installation, attach two 9VDC alkaline batteries, program the controller and remove the batteries before field installation. Then follow the steps above.

- 4 -

Dial Position: MANUAL PROGRAMS

The MANUAL PROGRAMS mode allows the immediate start of an entire program (A, B or C). When using the MANUAL PROGRAMS feature, the DDCWP will essentially override the normal start time and begin immediately. Using MANUAL PROGRAMS does not affect the previously scheduled run times. They will begin as programmed once the MANUAL PROGRAMS feature has completed its cycle.

Press PROG to select the program you wish to operate.

The display will show all the stations programmed in the selected program Press NEXT if you wish to select a different station as the 1st station. Press +/ON to turn ON the sequence.

Press NEXT to skip from a station that is currently irrigating to the next one in the sequence.

The display will show the remaining RUN TIME of each operating station. Press -/OFF to turn OFF the sequence (before it is completed). Press DIAL to advance to SYSTEM OFF.



3 main functions can be performed in this dial position.

OFF

ALL PROGRAMS OFF - Irrigation is suspended for all programs. It will remain suspended as long as the DIAL stays in this position.

Press NEXT to set next function OR Press DIAL to advance to AUTO-RUN RAIN DELAY: Irrigation is delayed for the selected number of days, one to seven. DLY T Press +/ON or -/OFF to select the number of days.

The display will show the umbrella, DLY=DELAY and the day the irrigation will resume (Flashing). -9-



Dial position: SEASON ADJUST

In this dial position you can increase or decrease the RUN TIME of all stations in that program by percentage

scaling from 0% to 200% in 10% increments.

Season Adjust is set by month with the default setting being 100% of set runtimes. This water management feature allows you to stop irrigation for the months not requiring irrigation and ramp up the irrigation times as the irrigation season advances.

Press PROG to select the program you wish to percentage adjust. The display will show 1:10%. This is January, month one, and it is set at 100%.

Press "+/on" to increase watering percentage or "-/off" to decrease watering percentage.

Press NEXT to advance to the next month. Repeat steps above to increase or decrease watering percentage for the month displayed.

To set a program to "OFF"

If you wish to stop irrigation of a program, set percentage adjustment to 0%.

The display will show that program is OFF.

To resume normal operation of that program, set dial to "SEASON ADJUST" and increase the percentage to your desired value. Increasing to 100% will set RUN TIME to its original value.

Press PROG to select the program.

Press DIAL to advance to MANUAL.

Dial position: MANUAL

The MANUAL mode allows immediate customized

irrigation on one or more zones. You can set an

individual RUN TIME for each of the stations you wish

to start manually. The controller has a "programmable manual" function, so if you manually program more than one station, they will open in sequence.

Press +/ON or -/OFF to set the station RUN TIME.

Press NEXT to advance to next station.

To turn ON the 1st station in the sequence:

Press DIAL to AUTO-RUN position.

Press -/OFF (in AUTO-RUN position) to turn OFF the sequence.

All stations with a manually programmed RUN TIME will be displayed. Operating stations will flash and the display will show the remaining RUN TIME of the station (count down).

Press DIAL to advance to MANUAL PROGRAMS.

- 8 -

Sensor Connection and Operation:



The DDCWP will respond to a Toro, TRS wired RainSensor[™]. Cut the yellow looped wire from the controller, and using waterproof connectors, connect the two wires from the rain sensor to either ends of the yellow controller wires.

The controller will respond to any normally closed (N.C.) wired RainSensor[™]. Follow the manufacturers installation instructions.

Activation of the RainSensor[™] cancels irrigation programs until the RainSensor[™] returns to a closed status.

NOTE: When irrigation is suspended due to the RainSensor^M, the display shows: $\bigcap F = F$ and the rain icon \frown is displayed.



PROGRAMMING:

It is recommended to press the RESET button to clear the memory and verify that all LCD segments are active. Press DIAL to advance to SET TIME/DAY

Dial Position: SET TIME/DAY

Set the current YEAR, MONTH, DAY & TIME. Set the YEAR with +/ON or -/OFF

Press NEXT

Set the MONTH with +/ON or -/OFF

Press NEXT

Set the DAY with +/ON or -/OFF

Press NEXT

Select 24 hour mode (default) or AM/PM with +/ON or -/OFF Press NEXT

Set the TIME with +/ON or -/OFF

Press NEXT if you wish to go back to YEAR setting.

NOTE: If you press and hold either +/ON or -/OFF continuously, the digits will advance more quickly.

Press DIAL to advance to RUN TIME

Dial Position: RUN TIME

The DDCWP has 3 independent programs: A, B & C.

Program A has a default program with each station set for a 5 minute run time, every day watering and a 0400 (AM) start time. This initial program can be erased by following the "Program Erase" function described on page 10 or it can be modified by following these programming steps.

Press PROG to select the program to be set.

Press +/ON or -/OFF to set the desired RUN TIME for the first station. Run time is in one minute increments from 1 minute to 240 minutes.

Press NEXT to advance to next station.

Continue to assign stations to a program by entering RUN TIMES for those stations. Unselected stations in a program will remain OFF. Enabling / Disabling MASTER VALVE: After the last station is the MASTER VALVE position. The display will show "ON". To disable the master valve / pump start for this program, press -/OFF. Press +/ON to resume master valve / pump start operation.

NOTE: To turn off a station which has previously been programmed, press both +/ON and -/OFF buttons and hold them for a few seconds. Use this option if you have a station with RUN TIME and you want this station to be OFF or if you have a start time and you want to cancel it (set it to OFF).

- 6 -





There are 4 choices for your days selection: CAL - Select days of the week. (All days are ON as the default) Int - Select days interval, 1-7 days, and the 1st day to start the interval Odd - Irrigation on Odd days (31st day is skipped) **En** - Irrigation on Even days.

In CAL position: Press +/ON for operating day or -/OFF to skip the day. Press NEXT for Interval selection or DIAL for next programming step.

In "Int" position: Press +/ON or -/OFF to select the watering day interval of one to seven days.

Press NEXT to select the 1st day to start the watering (using the +/ON or -/OFF buttons). Press NEXT for odd day selection or DIAL for next programming step.

selection.Press NEXT to select Even days or DIAL. Press DIAL to advance to START TIME.

In Odd position: The 31st day is automatically skipped in the ODD day In Even position: Press NEXT if you wish to go back to CALENDAR.

Dial position: START TIMES

3 start times per day are available for each program. (A, B or C)

Press +/ON or -/OFF to set the first start time.

Press NEXT for start 2 and use +/ON or -/OFF to set the time.

After setting start times, you can Press PROG to start entering data for another program. The Dial position will automatically move back to the RUN TIME position for that program.

- Note: Start times are stacked to avoid operating more than 2 solenoids at a time.
- Note: To reset the START TIME back to OFF press +/ON and -/OFF buttons until display shows OFF.

Press DIAL to advance to the "SEASON ADJUST" position. - 7 -







Barton Combined Sewer Overflow Control Project

AUTOMATIC VALVE



Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax



TECH SPECS

GB, EFB-CP, and EFB-CP-R Series Valves Classic Hardware. Classic Performance.

Electric remote control valves don't come any better than GB and EFB-CP Series red brass valves. Looking for heavy duty performance in clean water applications? Choose the GB! Need a contamination-proof, self-flushing screen that cleans itself and resists debris build-up in dirty water? The EFB-CP's the one! Also available in a reclaimed water valve configuration, the EFB-CP-R, is designed to handle chlorine and other harsh chemicals found in reclaimed water systems. All Rain Bird brass valves offer long life and superior performance in high pressure applications.

Features

- Red brass body and bonnet for longer life and more rugged performance at 200 psi (13,80 bar).
- Reverse flow feature ensures valve will fail in the closed position if a tear or rip in the diaphragm occurs. Prevents flooding, water waste and landscape damage.
- Fluid resistor slows flow through the solenoid, reducing closing speed and preventing water hammer and system damage.
- One-piece solenoid design with captured plunger and spring prevents loss of parts.
- Low power requirement allows for longer wire runs without increased wire gauge size.
- Manual internal and external bleed.
- Adjustable flow control.
- EFB-CP and EFB-CP-R Valves: Contamination-proof self-flushing filter screen resists debris build-up. Water flow continuously flushes the screen, dislodging particles and debris before they can accumulate and clog the filter.

Options (order separately)

- Accommodates optional, field installed PRS-D pressure regulating module.
- Optional purple flow control handle for easy identification of non-potable water system. (EFB-GB-NP-HAN)
- Accepts latching solenoid for use with Rain Bird battery-operated controllers up to 150 psi (10,35 bar).

Operating Range

- Pressure: 15 to 200 psi (1,04 to 13,80 bar)
- Flow with/without PRS-D: 5 to 200 gpm
- (1,14 to 45,40 m³/h; 19,2 to 757 l/m)
- Temperature: up to 150° F (66° C)

Electrical Specifications

- Power: 24 VAC 50/60 Hz (cycles/sec) solenoid
- Inrush current: 0.41 A (9.84 VA) at 60 Hz
- Holding current: 0.28 A (6.72 VA) at 60 Hz

Models

- 100GB: 1"(26/34)
- 125GB: 1¼"(33/42)
- 150GB: 1½" (40/49)
- 200GB: 2" (50/60)
- 100EFB-CP-R: 1" (26/34)
- 100EFB-CP-R: 1 (20/34)
 150EFB-CP-R: 1½" (40/49)
- 150EFB-CP-R: 1/2 (40/45)
 200EFB-CP-R: 2" (50/60)

200EFD-CF-n.2 (30/00

*BSP threads available; specify when ordering.

Bra	Brass Valves Pressure Loss (psi)										
Flow gpm	100	125	GB 150	200	100	EF 125	B-CP 150	200	E 100	F B-CP - 150	R 200
5	0.4				0.2				0.2		
10	0.8				0.7				0.6		
15	1.2				1.2				1.2		
20	2.1	1.4	2.3	0.6	2.1	1.4	2.3	0.5	2.2	0.6	0.4
30	5	2.3	2.9	0.7	5	2.3	2.9	0.6	4.9	1.3	0.5
40	8.2	4.1	2	0.9	8.2	4.1	2	0.8	8.6	2.2	0.7
50	13	6.8	3.3	1.1	13	6.8	3.3	1.1	13.4	3.4	1
60	-	9.8	4.6	1.7	-	9.8	4.6	1.8	-	4.9	1.5
80	-	16.5	7.5	2.6	-	16.5	7.5	2.4	-	8.5	2.5
100	-	-	11.8	3.9	-	-	11.8	3.8	-	13.2	3.9
120	-	-	16.6	5.9	-	-	16.6	5.9	-	18.6	5.8
140	-	-	-	7.8	-	-	-	7.8	-	-	7.3
160	-	-	-	10	-	-	-	10	-	-	9.2
180	-	-	-	12.4	-	-	-	12.5	-	-	11.8
200	-	-	-	15.1	-	-	-	15.8	-	-	14.5

Flow	Flow		G	в			EFE	3-CP		E	FB-CP	-R
m³/h	l/m	100	125	150	200	100	125	150	200	100	150	200
1	19	0,03				0,01				0,15		
3	50	0,07				0,07				0,99		
6	100	0,27	0,14	0,19	0,05	0,27	0,14	0,19	0,04	3,93	1,05	0,46
9	150	0,56	0,28	0,14	0,06	0,56	0,28	0,14	0,05	8,46	2,17	0,69
12	200	-	0,53	0,25	0,09	-	0,53	0,25	0,09	-	3,83	1,14
15	250	-	0,82	0,38	0,14	-	0,82	0,38	0,14	-	5,99	1,80
18	300	-	1,12	0,51	0,18	-	1,12	0,51	0,16	-	8,37	2,46
21	350	-	-	0,70	0,24	-	-	0,70	0,23	-	11,43	3,37
24	400	-	-	0,91	0,31	-	-	0,91	0,30	-	14,73	4,44
27	450	-	-	1,13	0,40	-	-	1,13	0,40	-	18,30	5,69
30	500	-	-	-	0,49	-	-	-	0,49	-	-	6,71
33	550	-	-	-	0,58	-	-	-	0,58	-	-	7,80
36	600	-	-	-	0,68	-	-	-	0,68	-	-	9,06
39	650	-	-	-	0,79	-	-	-	0,79	-	-	10,72
42	700	-	-	-	0,90	-	-	-	0,92	-	-	12,46
45	757	-	-	-	1,04	-	-	-	1,09	-	-	14,25

Notes

1) Loss values are with flow control fully open.

 2) GB: PRS-D module recommended for use in shaded areas only.
 2) EFB-CP and EFB-CP-R: PRS-D module recommended for all flow ranges Recommendations

1) Rain Bird recommends flow rates in the supply line not to exceed 7.5 ft./ sec. (2,29 m/s) in order to reduce the effects of water hammer.

2) For flows below 5 gpm (1,14 m³h; 19,2 l/m), Rain Bird recommends use of upstream filtration to prevent debris from collecting below the diaphragm. 3) For flows below 10 gpm (2,27 m³h; 37,8 l/m) Rain Bird recommends the flow control stem be turned down two full turns from the fully open position





Dimensions

Size	Height	Length	Width
100GB	6" (15,2 cm)	4½" (11,4 cm)	2¼" (5,7 cm)
125GB	5¾" (14,6 cm)	5" (12,7 cm)	3″ (7,6 cm)
150GB	6½" (16,5 cm)	5½" (14 cm)	4" (10, 2 cm)
200GB	7" (17,8 cm)	6¾″ (17,1 cm)	5¼″ (13,3 cm)
100EFB-CP	6" (15,2 cm)	4½" (11,4 cm)	3¼" (8,3 cm)
125EFB-CP	5¾" (14,6 cm)	5" (12,7 cm)	3¼" (8,3 cm)
150EFB-CP	6½" (16,5 cm)	5½" (14 cm)	4½" (11,4 cm)
200EFB-CP	7″ (17,8 cm)	6¾" (17,1 cm)	5¾" (14,6 cm)
100EFB-CP-R	6" (15,2 cm)	4½" (11,4 cm)	3¼″ (8,3 cm)
150EFB-CP-R	6½" (16,5 cm)	5½" (14 cm)	4½" (11,4 cm)
200EFB-CP-R	7″ (17,8 cm)	6¾" (17,1 cm)	5¾" (14,6 cm)
Noto: The DDC D	ontion adds 2" (E 1 cm) to value beight	

te: The PRS-D option adds 2" (5,1 cm) to valve heigh

How to Specify/Order

<u>Size</u>	Model	Optional Feature
100: 1″	GB	PRS-D: pressure
125: 1¼″	EFB-CP	regulating
150: 1½″	EFB-CP-R	module
200: 2″		

Note: Valve and PRS-D module must be ordered separately.





Specifications

The electric remote control valve shall be a normally closed 24 VAC 50/60 Hz (cycles/sec) solenoid actuated globe pattern with a balanced pressure diaphragm design. The valve pressure rating shall not be less than 200 psi (13,80 bar). The valve shall have the following characteristics (circle one):

Flow rate: _____ gpm m³/h l/m Pressure loss not to exceed: _____ psi bar

The valve body and bonnet shall be constructed of heavy cast red brass; diaphragm shall be of nylon reinforced nitrile rubber (GB & EFB-CP) or nylon reinforced EPDM rubber (EFB-CP-R). All other internal parts shall be made of bronze, brass, and stainless steel to ensure corrosion resistance.

The valve shall have both internal and external manual open/close control (internal and external bleed) for manually opening and closing the valve without electrically energizing the solenoid. The valve shall have internal manual bleed to prevent flooding of the valve box.

The valve shall house a fully-encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing and a leverage handle for easy turning. This 24 VAC 50/60 Hz solenoid shall open with 19.6 VAC minimum at 200 psi (13,80 bar). At 24 VAC, average inrush current shall not exceed 0.41 amps. Average holding current shall not exceed 0.28 amps.

The valve shall have a stainless steel flow control stem with cross handle for regulating or shutting off the flow of water. The valve must open or close in less than one minute at 200 psi (13,80 bar), and less than 30 seconds at 20 psi (1,38 bar).

The valve construction shall be such as to provide for all internal parts to be removable

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Specification Hotline

(800) 458-3005 (U.S. and Canada only)

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from the top of the valve without disturbing the valve installation.

GB only: The valve shall have a control port filter screen to filter out grit and prevent clogging of hydraulic control ports.

EFB-CP only: The valve shall have a contamination proof (CP) self-flushing nylon screen located at the valve inlet to filter out grit and prevent clogging of hydraulic control ports and assure reliable operation.

EFB-CP-R only: The valve shall have a contamination proof (CP) self-flushing stainless steel screen located at the valve inlet to filter out grit and prevent clogging of hydraulic control ports and assure reliable operation. The valve shall also have a purple flow control handle and chlorine resistant diaphragm.

Optional Feature Specification

When so indicated on the design, the 1", 1½", 1¼", and 2" electric remote control valves shall have a pressure regulating module (PRS-D) capable of regulating outlet pressure between 15 and 100 psi (\pm 3 psi) (1,04 and 6,90 bar (\pm 0,21 bar)).

The PRS-D module shall have an adjusting knob for setting pressure and Schrader valve connection for monitoring pressure. Pressure shall be adjustable from the PRS-D when the valve is internally manually bled or electrically activated.

Non-Potable Flow Control Handle EFB-GB-NP-HAN

When so indicated on the design, the valve shall have a purple flow control handle to indicate to the user that non-potable water is being used. There shall be no difference between the brass and purple handles except for the color.





The valve shall be as manufactured by Rain Bird Corporation, Glendora, California.

RAIN BIRD.

Catalog Number 630

125 / 150 / 200 EF-CP AND 100 / 125 / 150 / 200EFA-CP SERIES



Ref.	Part Description	125EF-CP	150EF-CP	200EF-CP	100EFA-CP	125EFA-CP	150EFA-CP	200EFA-CP
BON	BONNET ASSEMBLY							
1	Screw	202502	202502	202502	202502	202502	202502	202502
2	Handle, flow control	209356	209356	209356	209356	209356	209356	209356
-	NP Handle (sold separately)	231238	231238	231238	231238	231238	231238	231238
3	O-ring, flow control	202515	202515	202515	202515	202515	202515	202515
4	Stem, flow control	202667	202667	202667	202600	202667	202667	202667
5	Bolts (A)	202507	202507	202507	202507	202507	202507	202507
б	Bleed screw assembly	202669	202669	202669	202669	202669	202669	202669
7	O-ring, bleed screw	202668	202668	202668	202668	202668	202668	202668
8	Bonnet	-	-	-	(202558)	-	-	-
-	Bonnet, B style	-	209814-03	209814-04	-	209814-02	209814-03	209814-04
-	Bonnet assembly, B style	-	209369-03	209369-04	209369-01	209369-02	209369-03	209369-04
_	Solenoid, EZ Bleed (B style)	-	209532-02	209532-02	-	209532-02	209532-02	209532-02
9	SOLENOID ASSEMBLY	206920-01	206920-01	206920-01	206920-01	206920-01	206920-01	206920-01
10	Rubber retainer	627167	627167	627167	627167	627167	627167	627167
11	Coil	602118	602118	602118	602118	602118	602118	602118
12	U-Frame	210914	210914	210914	210914	210914	210914	210914
13	Nut, base (brass)	602142	602142	602142	602142	602142	602142	602142
-	Nut, base (plastic)	-	-	-	602606	602606	602606	602606
14	Tube, welded	630028	630028	630028	630028	630028	630028	630028
15	Plunger/spring assembly	629453	629453	629453	629453	629453	629453	629453
16	Fluid resistor assembly	207400	207401	207401	207399	207400	207401	207401
17	O-ring	203316	203316	203316	203316	203316	203316	203316
LOWER ASSEMBLY								
18	Elbow	202581	202581	202581	202581	202581	202581	202581
19	Diaphragm spring	(202516)	202542	202542	202528	(202516)	202542	202542
20	Diaphragm	202511	202520	203500	202868	203604	202614	202615
21	Body, NPT	-	-	-	(205854)	202565	202606	202609
22	Nylon tube	202598	202598	202598	202598	202598	202598	202598
23	Filter assembly	202579	202579	202579	202579	202579	202579	202579
24	Filter	206092-02	206092-02	206092-02	206092-02	206092-02	206092-02	206092-02

(A) 200 series requires 6 bolts, all others require 4 bolts.-

Note: Part numbers enclosed in brackets () are not available individually, but may be sold in assemblies or kits.

TO BUY GENUINE RAIN BIRD PARTS, CONTACT YOUR LOCAL DISTRIBUTOR OR VISIT OUR ONLINE STORE AT WWW.RAINBIRD.COM



TECH SPECS

PRS-Dial Pressure Regulating Module

The PRS-Dial is an excellent means of regulating outlet pressure at the valve regardless of incoming pressure fluctuations. The visible scale makes installation quick and easy. The regulator fits all Rain Bird PGA, PEB, PESB, PESB-R, GB, EFB-CP, EFB-CP-R, BPE and BPES series valves. The dial cartridge retrofits easily into existing PRS-B units.

Features

- Regulates and maintains constant outlet pressure between 15 and 100 psi (1,04 to 6,90 bar) within ±3 psi (±0,21 bar)
- Adjustment knob with detents permits finetune setting in 1/3 psi (0,02 bar) increments
 Improved spike reduction capabilities
- Improved spike reduction capabilities reduce water hammer
- Ergonomic design with snap-tight cover to prevent vandalism
- Waterproof dial cartridge eliminates fogging and binding
- Dial cartridge retrofits into all existing PRS-B units
- Schrader valve connects pressure hose gauge
- Easy field installation. PRS-Dial threads underneath the solenoid and adapter
- Corrosion-resistant glass-filled nylon for rugged performance

Operating Range

Pressure:up to 100 psi (6,90 bar)*Regulation:15 to 100 psi (1,04 to 6,90 bar)Accuracy: ± 3 psi ($\pm 0,21$ bar)Flow:refer to chartTemperature:up to 150°F (66°C)

* While the PRS-Dial unit can withstand pressure up to 200 psi (13,80 bar), accurate pressure regulation can be maintained only up to 100 psi (6,90 bar).

Application Information

- Proper operation requires inlet pressure to be a minimum of 15 psi (1,04 bar) higher than desired outlet pressure.
- For areas with very high pressure or uneven terrain, install sprinklers with PRS pressure regulating stems and/or SAM check valves.
- When inlet pressure exceeds 100 psi (6,90 bar), a pressure regulating master valve or inline pressure regulator is required.
- Rain Bird does not recommend using the pressure regulating module for applications outside the recommended flow ranges.
- To reduce the effects of water hammer, Rain Bird recommends flow rates in the supply line not to exceed 7.5 ft/sec (2,29 m/s).
- For flows below 10 gpm (2,27 m³/h; 37,8 l/m), Rain Bird recommends the flow control stem be turned down two full turns from the fully open position.
- For flows below 5 gpm (1,14 m³/h; 19,21 l/m), Rain Bird recommends the use of upstream filtration to prevent debris from collecting below the valve diaphragm.

Recommended Flow Ranges*

Model	gpm	m³/h	l/m
100-PGA	5-40	1,14-9,08	19,2-151
150-PGA	30-100	6,81-22,70	113-378
200-PGA	40-150	9,08-34,05	151-568
100-PEB	5-50	1,14-11,35	19,2-189
150-PEB	20-150	4,54-34,05	76-568
200-PEB	75-200	17,03-45,40	284-757
100-PESB/PESB-R	5-50	1,14-11,35	19,2-189
150-PESB/PESB-R	20-150	4,54-34,05	76-568
200-PESB/PESB-R	75-200	17,03-45,40	284-757
100-GB	5-50	1,14-11,35	19,2-189
125-GB	20-80	4,54-18,16	76-302
150-GB	20-120	4,54-31,78	76-529
200-GB	20-200	4,54-45,40	76-757
100-EFB-CP	5-50	1,14-11,35	19,2-189
125-EFB-CP	20-80	4,54-18,16	76-302
150-EFB-CP	20-120	4,54-31,78	76-529
200-EFB-CP	20-200	4,54-45,40	76-757
300-BPE	60-300	13,62-68,10	227-1136
300-BPES	60-300	13,62-68,10	227-1136





* These are the valve flow ranges. The PRS-Dial regulates only up to 100 psi (6,90 bar

Note: Valve and PRS-D must be ordered separately







Specifications

The pressure regulating module shall be a two-piece device consisting of a glass-filled, UV resistant nylon housing and dial cartridge.

When so indicated on the design, the plastic or brass valve shall have a pressure regulating module (PRS-Dial) which shall have the following characteristics (circle one):

Operating pressure: psi				bar	
Outlet pressure regulation:					
between	and	ps	si	bar	

The regulator shall be installed between the plastic or brass valve bonnet and electric solenoid. The electric solenoid shall be 24 VAC 50/60 Hz (cycles/second) solenoid and shall open with 19.6 volts minimum at 200 psi (13,80 bar). Average inrush current shall not exceed 0.41 A (9.4VA) and holding current shall not exceed 0.28A (6.72VA).

The regulator shall have a visible pressure indication scale ranging from 0-100 psi (0,0 to 6,90 bar) and an adjustment knob with detents that provide fine-tune adjustments in 1/3 psi (0,02 bar) increments. The protective cover shall snap tight to deter vandalism.

A schrader valve shall be installed to accommodate a pressure hose gauge for monitoring pressure.

The regulator shall be waterproof to prevent fogging the clear window and to prevent grit from binding internal components. The pressure shall be adjustable when the valve is manually internal bled or electronically activated. The regulator construction shall be such as to provide replacing the dial cartridge without removing the regulator housing or disturbing the valve installation.

The pressure regulating module shall be manufactured by Rain Bird Corporation, Glendora, California.



Rain Bird Corporation

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Barton Combined Sewer Overflow Control Project

HEADS



Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax



Tech Spec

RD1800[™] Series Spray Heads

Built to Endure Any Installation

RD1800[™] Series Spray Heads build on the reputation of the 1800[®] Series that have provided unmatched durability, reliability and performance for over 30 years.

The RD1800 Series has been built to withstand harsh operating conditions such as chemically treated recycled water (reclaimed / nonpotable), dirty water containing grit, debris, and other particulates, and high operating pressures common in commercial irrigation systems.

Features

The RD1800 Series features an exclusive comolded, pressure activated Triple-Blade Wiper Seal to assure a positive seal without excess "flow-by", which enables more heads to be installed on the same valve. The Triple-Blade Wiper Seal precisely balances flushing, flow-by and debris protection to optimize performance and durability at pop-up and retraction. Precision-controlled flushing at pop-up and retraction clears debris, assuring positive stem retraction in all soil types. Debris pockets in the base of the spray body prevent recirculation of harmful debris during operation to reduce wear on the wiper seal and stem.

- Designed for use with all Rain Bird nozzles Rotary Nozzles, U-Series, MPR, VAN, HE-VAN, and SQ Series.
- Parts developed to be resistant to corrosion in treated recycled water containing chlorine and other chemicals.
- Strong stainless steel spring provides reliable stem retraction and withstands corrosion.
- Reinforced ratchet mechanism allows easy nozzle pattern alignment without tools, withstands chemicals in recycled water and prevents pattern misalignment over time.
- Pre-installed 1800 Pop-Top[™] flush plug blocks debris from entering after flushing and allows for easy nozzle installation.
- Constructed of time-proven ultravioletresistant plastic and corrosion-resistant stainless steel parts, assuring long product life.
- All sprinkler components are removable from the top without special tools, providing for quick and easy flushing and maintenance of the sprinkler.
- Side inlets featured on all models except SAM Models.
- Five-year trade warranty.

Operating Range

- Spacing: 2.5 to 24 feet (0.8 to 7.3 m)
- Pressure: 15 to 100 psi (1.0 to 6.9 bar)

Specifications

- Flow-by:
 - SAM Models: 0 at 15 psi (1.0 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise
 - All Other Models: 0 at 10 psi (0.7 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise

Dimensions / Models

- 1/2" (15/21) NPT female threaded inlet
- Models and height:
 - **RD-04:** 6" (15.2 cm) body height; 4" pop-up height (10.2 cm)
 - **RD-06:** 9 ³/⁸" (23.8 cm) body height; 6" pop-up height (15.2 cm)

RD-12: 16" (40.6 cm) body height;
 12" pop-up height (30.5 cm)
 Exposed surface diameter: 2 ¼" (5.7 cm)



Model

RD-04: 4" (10 cm) pop-up height **RD-06**: 6" (15 cm) pop-up height **RD-12**: 12" (40 cm) pop-up height

Notes:

SAM feature included with P45 models. Flow-Shield™ Technology available in P30 and P45 models only.

Specify sprinkler bodies and nozzles separately.





Standard Cover

Non-Potable Cover

RD1800 Series Sprays Models

4″ Models	
RD-04-NP	RD-04-S-P30-F
RD-04-S	RD-04-S-P30-F-N
RD-04-S-NP	RD-04-S-P45-F
RD-04-S-P30	RD-04-S-P45-F-N
6" Models	
RD-06	RD-06-S-P30-F
RD-06-NP	RD-06-S-P30-F-N
RD-06-S	RD-06-S-P45-F
RD-06-S-NP	RD-06-S-P45-F-N
RD-06-S-P30	RD06NPNSI*
12" Models	
RD-12	RD-12-S-P30-F
RD-12-NP	RD-12-S-P30-F-N
RD-12-S	RD-12-S-P45-F
RD-12-S-NP	RD-12-S-P45-F-N
RD-12-S-P30	

* For Florida and Southeast Regions Only
Exclusive Flow-Shield[™] Technology

Exclusive Flow-Shield[™] Technology provides up to 90% reduction in water loss when a nozzle is removed, preventing potentially costly and unacceptable run-off.



Patented Pressure Regulator

The RD1800's patented pressure regulator increases nozzle efficiency by up to 50% in high pressure applications.





Reinforced Ratchet Mechanism

The RD1800's ratchet mechanism was designed to improve ease of use and consistency, hold its setting over time, withstand years of chlorine exposure and provide greater debris resistance.

Seal-A-Matic[™] (SAM) Check Valve

Exclusive to Rain Bird, the SAM Check Valve holds back up to 14 feet of head and helps eliminate low head drainage, erosion, run-off and water hammer at start-up.

Service Indication Stream

Exclusive Flow-Shield Technology delivers a low-flow service indication stream when a nozzle is removed. As a result, system performance is maintained, water is saved and you don't have to wait until you have brown grass or dead plants to notice something's wrong.

, Patented Triple-Blade Wiper Seal

The RD1800[™] Series features a patented Triple-Blade Wiper Seal. The top seal flushes during pop-up and wipes the stem clean during retraction, preventing external debris

from entering. During operation, the primary seal combines with the stem's surface to eliminate flow-by. The exclusive Third Blade provides another line of



defense, in case the primary seal is damaged.

Reclaimed Water Resistant

The RD1800 Series is designed with reclaim water resistant materials such as EPDM and Polyester. These materials resist degradation caused by chlorine in reclaimed water, ensuring a longer life.

/ Unique Debris Pockets

With each system start-up, the RD1800's unique debris pockets hold grit in place—removing it from circulation and preventing long-term damage.



RD1800 Series

Designed for use in dirty water applications and systems with high operating pressures.

- Exclusive co-molded Triple-Blade Wiper Seal to assure a positive seal without excess "flow-by" which enables more heads to be installed on the same valve.
- Debris pockets in the base of the spray body prevent recirculation of harmful debris during operation to reduce wear on the wiper seal and stem.
- Spray body is rating from 15 to 100 psi providing extra durability in high pressure systems.

Operating Range

- Spacing: 2.5 to 24 feet (0.8 to 7.3 m)
- Pressure: 15 to 100 psi (1.0 to 6.9 bar)

Specifications

• Flow-by: 0 at 15 psi (1.0 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise

Dimensions / Models

- 1/2" (15/21) NPT female threaded inlet
- Models and height:
 - **RD-04:** 6" (15.2 cm) body height; 4" pop-up height (10.2 cm)
 - **RD-06:** 9 ³/8" (23.8 cm) body height; 6" pop-up height (15.2 cm)
 - **RD-12:** 16" (40.6 cm) body height; 12" pop-up height (30.5 cm)
 - Exposed surface diameter: 2 1/4" (5.7 cm)

RD1800 SAM Series

Ideal for use in areas with changing elevations, the RD1800 SAM Series has all RD1800 Series features plus:

- Built-in Seal-A-Matic[™] (SAM) check valve. Eliminates the need for under-the-head check valves. No parts to be installed at the site.
- Stronger retract spring to accommodate elevation changes up to 14' (4.2 m). One of the strongest springs in the industry.
- Prevents drainage from spray heads at lower elevations. Stops water waste. Ends landscape damage due to flooding and erosion.
- Retains water in lateral pipes which reduces wear on system components by minimizing water hammer during start-up.
- "SAM" printed on the cap for easy identification and maintenance.

Operating Range

- Spacing: 2.5 to 24 feet (0.8 to 7.3 m)
- Pressure: 15 to 100 psi (1.0 to 6.9 bar)

Specifications

- SAM capability: Holds up to 14 feet (4.2 m) of head; 6 psi (0.3 bar)
- Flow-by: 0 at 15 psi (1.0 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise
- No side inlet

Dimensions / Models

- ¹/₂"(15/21) NPT female threaded inlet
- Models and height:
 - **RD-04-S:** 6" (15.2 cm) body height; 4" pop-up height (10.2 cm)
 - RD-06-S: 9 3/8" (23.8 cm) body height;
 6" pop-up height (15.2 cm)
 - **RD-12-S:** 16" (40.6 cm) body height; 12" pop-up height (30.5 cm)
 - Exposed surface diameter: 2 ¼" (5.7 cm)

RD1800 SAM PRS Series

Meets the needs of all spray areas, regardless of changing elevation or water pressure. Incorporates all RD1800 Series SAM and PRS features. "SAM-PRS" printed on the cap for easy identification and maintenance. Five year trade warranty.

Operating Range

- Spacing: 2.5 to 24 feet (0.8 to 7.3 m)
- Pressure: 15 to 100 psi (1.0 to 6.9 bar)

Specifications

- SAM capability: Holds up to 14 feet (4.2 m) of head; 6 psi (0.3 bar)
- Flow-by: 0 at 15 psi (1.0 bar) or greater;
 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise
- Regulates nozzle pressure to an average 30 psi (2.1 bar) with inlet pressures of up to 100 psi (6.9 bar)
- No side inlet

Dimensions / Models

- 1/2" (15/21) NPT female threaded inlet
- Models and height:
 - RD-04-S-P30: 6" (15.2 cm) body height;
 - 4" pop-up height (10.2 cm)
 - **RD-06-S-P30:** 9 ³/⁸" (23.8 cm) body height; 6" pop-up height (15.2 cm)
 - RD-12-S-P30: 16" (40.6 cm) body height; 12" pop-up height (30.5 cm)
 - Exposed surface diameter: 2 1/4" (5.7 cm)

Designed to save water and preserve system hydraulics to maintain proper operation throughout the irrigation zone. Provides protection against plant material loss and reduces likelihood of incurring costly fines as a result of excessive run-off when a nozzle has been removed. The RD1800 Flow-Shield[™] Series offers all RD1800 SAM, PRS, and PRS-45 features plus:

- Exclusive Flow-Shield Technology built into the stem. No parts to be installed at the site. Saves water, plant material, time, and money.
- Restricts water loss by up to 90% if nozzle is removed from a non-PRS spray head.
- Restricts water loss by up to 50% if nozzle is removed from a PRS spray head.
- Reduces possibility of accidents and property damage. Recommended for high pressure and vandal-prone areas.
- Provides low flow vertical water jet visible from +200' line of sight when a nozzle has been removed. Height and low flow of vertical water jet causes water to dissipate during descent, reducing puddles and run-off.
- Low flow vertical water jet does not exceed 2 gpm (0.45 m³/h; 0.13 l/s), even with varying inlet pressure.
- Low flow vertical water jet decreases likelihood of nozzle removal going unnoticed, prompting nozzle replacement to decrease probability of stressed turf and plant material losses.
- "F" printed on cap for easy identification and maintenance.

Operating Range

- Spacing: 2.5 to 24 feet (0.8 to 7.3 m)
- Pressure: 15 to 100 psi (1.0 to 6.9 bar)

Specifications

- SAM capability: Holds up to 14 feet (4.2 m) of head; 6 psi (0.3 bar)
- Flow-by:
 - **SAM Models:** 0 at 15 psi (1.0 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise
 - All Other Models: 0 at 10 psi (0.7 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise

Dimensions / Models

- 1/2" (15/21) NPT female threaded inlet
- Models and height:
 - RD-04-S-P30-F, RD-04-S-P45-F:
 6" (15.2 cm) body height;
 4" pop-up height (10.2 cm)
 - RD-06-S-P30-F, RD-06-S-P45-F:
 9³/s" (23.8 cm) body height;
 6" pop-up height (15.2 cm)
 - RD-12-S-P30-F, RD-12-S-P45-F:
 16" (40.6 cm) body height;
 12" pop-up height (30.5 cm)
- Exposed surface diameter: 2 ¹/₄" (5.7 cm)

RD1800 Non-Potable Water Series

All RD1800[™] Series Spray Heads (standard, SAM Series, SAM PRS Series, and Flow-Shield[™] Series) are built with materials specifically selected for their ability to withstand the corrosive impact of chemically treated recycled water. The RD1800 Non-Potable Water Series provides an alternative to clip-on caps and molded purple covers to identify non-potable water use. The RD1800 Non-Potable Water Series offers all RD1800 SAM, SAM PRS, SAM PRS-45, and Flow-Shield Series features plus:

 Exclusive, non-potable water use indication on cover featuring purple Triple-Blade
 Wiper Seal, easy-to-read English "DO NOT DRINK", Spanish "NO BEBA" warnings, and international do not drink symbol illustrated below:



- Does not require the use of purple clip caps that can be removed by a vandal.
- Does not require use of eye-catching purple molded covers that give away sprinkler location.

Operating Range

- Spacing: 2.5 to 24 feet (0.8 to 7.3 m)
- Pressure: 15 to 100 psi (1.0 to 6.9 bar)

Specifications

- SAM capability: Holds up to 14 feet (4.2 m) of head; 6 psi (0.3 bar)
- Flow by:
 - SAM Models: 0 at 15 psi (1.0 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise
 - All Other Models: 0 at 10 psi (0.7 bar) or greater; 0.5 gpm (0.1 m³/h; 0.03 l/s) otherwise

Dimensions / Models

- 1/2" (15/21) NPT female threaded inlet
- Models and height:
 - RD-04-S-NP, RD-04-S-P30-F-N, RD-04-S-P45-F-N: 6" (15.2 cm) body height; 4" pop-up height (10.2 cm)
 - RD-06-NP, RD-06-S-NP,
 RD-06-S-P30-F-N, RD-06-S-P45-F-N:
 93/8" (23.8 cm) body height; 6" pop-up height (15.2 cm)
 - RD-12-NP, RD-12-S-NP,
 RD-12-S-P30-F-N, RD-12-S-P45-F-N:
 16" (40.6 cm) body height; 12" pop-up height (30.5 cm)
- Exposed surface diameter: 2 1/4" (5.7 cm)

Specifications

RD-06, and RD-12 Pop-up Full or Part Circle Spray Sprinkler

The sprinkler body, stem, nozzle, and screen shall be constructed of heavy-duty and ultra-violet resistant plastic. All components shall be designed to withstand chlorine and other harsh chemicals found in reclaimed and recycled water systems. It shall have a heavyduty stainless steel retract spring for positive pop-down and a ratcheting system for easy alignment of the nozzle pattern and retention of pattern edges. The sprinkler shall have an elastomer pressure-activated co-molded Triple-Blade Wiper Seal for cleaning debris from the pop-up stem as it retracts into the case and to prevent stem stick ups. The Triple-Blade Wiper Seal shall also minimize flow-by and allow adequate flushing of debris to prevent wear. The Triple-Blade Wiper Seal shall contain a biocide to resist biological degradation in water sourced from chemically treated waste water.

The sprinkler shall have a matched precipitation rate (MPR) plastic nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing protective, non-clogging filter screens of pressure compensating screens (PCS) under the nozzle. The screen shall also be used in conjunction with the adjusting screw for regulating. The 6" (15.2 cm) and 12" (30.5 cm) models shall have both a side and a bottom ¹/2" (15/21) FNPT inlet for ease of installation.

The sprinkler shall have a Pop-Top[™] Flush Plug pre-installed. The plug shall prevent debris from clogging the sprinkler during installation and allow for the system to be flushed before nozzling. The plug shall be bright orange in color and constructed of polypropylene material.

RD-04-S, RD-06-S, and RD-12-S Full or Part Circle Seal-A-Matic[™] Pop-up Spray Sprinkler

Optional Feature Specifications:

When so indicated on the design, the 4", 6", or 12" high pop-up spray sprinklers shall also include a Seal-A-Matic (SAM) check valve to prevent low head drainage of up to 14 feet of head. These units shall be identifiable from the top with "SAM" marking printed on the cover. The sealing device shall be an integral part of the pop-up stem, removable through the top of the sprinkler, and shall seal against the bottom case inlet. It shall create no more than 1 psi pressure drop at the maximum rated flow. The SAM seal washer shall be made of EPDM rubber material which is chlorine and chemical resistant.

RD-04-S-P30, RD-06-S-P30, and RD-12-S-P30 Full or Part Circle Seal-A-Matic[™] Pop-up Spray Sprinkler

Optional Feature Specifications:

When so indicated on the design, the 4", 6", and 12" high pop-up spray sprinkler shall also include Seal-A-Matic[™] (SAM) check valve and a 30 psi pressure regulating device. These units shall be identifiable from the top with "SAM-PRS" marking printed on the cover.

The check valve shall prevent low head drainage of up to 14 feet of head. The 30 psi pressure regulating device shall prevent high pressure operation of the nozzle that causes water waste and undesirable performance by regulating the nozzle operating pressure to 30 psi for inlet pressures from 35 psi to 100 psi. Below 35 psi the pressure loss shall not exceed 6 psi.

RD-04-S-P30-F, RD-04-S-P45-F, RD-06-S-P30-F, RD-06-S-P45-F, RD-12-S-P30-F, RD-12-S-P45-F Full or Part Circle Pop-up Spray Sprinklers with Flow-Shield™ Technology

Optional Feature Specifications:

When so indicated on the design, the 4", 6", and 12" high pop-up spray sprinkler shall also include Flow-Shield[™] Techonolgy (F) to save water, preserve system hydraulics to maintain proper operation throughout the irrigation zone, provide protection against plant material loss, and reduce likelihood of incurring costly fines as a result of excessive run-off when a nozzle has been removed. Flow-Shield™ Technology shall provide a 2 gpm maximum, vertical water jet visible from +200' line of sight when a nozzle has been removed. Height and low flow of vertical water iet shall cause water to dissipate during descent reducing puddles and run-off. Flow-Shield[™] Technology shall be an integral part of the pop-up stem.

Flow-Shield Technology shall be made available in all RD1800 model featuring 30 psi or 45 psi in-stem pressure regulation.

The 30 psi pressure regulating device shall prevent high pressure operation of the nozzle that causes water waste and undesirable performance by regulating the nozzle operating pressure to 30 psi for inlet pressures from 35 psi to 100 psi. Below 35 psi the pressure loss shall not exceed 6 psi.

The 45 psi pressure regulating device shall prevent high pressure operation of the nozzle that causes water waste and undesirable performance by regulating the nozzle operating pressure to 45 psi for inlet pressures from 50 psi to 100 psi. Below 50 psi the pressure loss shall not exceed 6 psi.

The check valve shall prevent low head drainage of up to 14 feet of head.

During normal operation, the Flow-Shield Technology device shall be held in-stem by the nozzle filter. In the event the nozzle is removed, in-stem flow shall cause the Flow-Shield[™] to travel upstream and seal against the base of the nozzle threads limiting water loss and geysers of excessive flow.

Pressure loss across the Flow-Shield shall not exceed 1 psi across operating range.



Specifications

RD-04-NP, RD-04-S-NP, RD-04-S-P30-F-N, RD-04-S-P45-F-N, RD-06-NP, RD-06-S-NP, RD-06-S-P30-F-N, RD-06-S-P45-F-N, RD-12-NP, RD-12-S-NP, RD-12-S-P30-F-N, RD-12-S-P45-F-N Full or Part Circle Non-Potable Pop-up Spray Sprinkler

Optional Feature Specifications:

When so indicated on the design, the 4", 6", and 12" high pop-up spray sprinkler shall also include a purple Triple-Blade Wiper Seal and non-potable water use identification on the cover with English "DO NOT DRINK", Spanish "NO BEBA", and the international do not drink symbol illustrated below:



The purple text and Triple-Blade Wiper Seal shall be made of materials and colorants that resist fading due to exposure to chlorine and other chemicals found in reclaimed and recycled water systems and ultra-violet light.

All other RD1800 Series Spray features shall be available in the non-potable versions including; Seal-A-Matic[™] (SAM) check valves, in-stem 30 psi pressure regulation (PRS), in-stem 45 psi pressure regulation (PRS-45), and Flow-Shield[™] (F).

RD1800 Series Non-Potable sprays may include a Flow-Shield Technology device to save water, preserve system hydraulics to maintain proper operation throughout the irrigation zone, provide protection against plant material loss, and reduce likelihood of incurring costly fines as a result of excessive run-off when a nozzle has been removed. Flow-Shield Technology shall provide a 2 gpm maximum, vertical water jet visible from +200' line of sight when a nozzle has been removed. Height and low flow of vertical water jet shall cause water to dissipate during descent reducing puddles and run-off. Flow-Shield Technology shall be an integral part of the pop-up stem.

The 30 psi pressure regulating device shall prevent high pressure operation of the nozzle that causes water waste and undesirable performance by regulating the nozzle operating pressure to 30 psi for inlet pressures from 35 psi to 100 psi. Below 35 psi the pressure loss shall not exceed 6 psi.

The 45 psi pressure regulating device shall prevent high pressure operation of the nozzle that causes water waste and undesirable performance by regulating the nozzle operating pressure to 45 psi for inlet pressures from 50 psi to 100 psi. Below 50 psi the pressure loss shall not exceed 6 psi.

The check valve shall prevent low head drainage of up to 14 feet of head.

During normal operation, the Flow-Shield shall be held in-stem by the nozzle filter. In the event the nozzle is removed, in-stem flow shall cause the Flow-Shield[™] to travel upstream and seal against the base of the nozzle threads limiting water loss and geysers of excessive flow.

Pressure loss across the Flow-Shield shall not exceed 1 psi across operating range.

Rain Bird Corporation

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Rain Bird Technical Services

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RAIN BIRD. Spray Heads



<u>Ref.</u>	Part Description	1802	1803	1804	1806	1812
STAN	IDARD MODELS					
1	Non-Potable snap cover	A46610	A46610	A46610	A46610	A46610
2	Cover	116901	116901	116901	116901	116901
_	Cover. vandal resistant	A46400	A46400	A46400	A46400	A46400
3	Adjustment auide, ratchetina	(113363)	(113363)	(113363)	(113363)	(113363)
4	Stem assembly, ratchetina	-	-	(112175)	(112174)	(112173)
6	Body	_	_	-	-	(115880)
7	Plug	_	-	-	107355	107355
SAM	MODELS					
1	Non-Potable snap cover	-	-	A46610	A46610	A46610
2	Cover	-	-	116901	116901	116901
-	Cover, vandal resistant	-	-	A46400	A46400	A46400
3	Adjustment guide, ratcheting	-	-	(113363)	(113363)	(113363)
4	Stem assembly, ratcheting	-	-	(109250)	(113119)	113121
5	Seal, SAM	-	-	112528	112528	112528
б	Body	-	-	-	-	(115880)
7	Plug	-	-	-	107355	107355
PRS I	MODELS					
1	Non-Potable snap cover	-	-	A46610	A46610	A46610
2	Cover	-	-	116901	116901	116901
-	Cover, vandal resistant	-	-	A46400	A46400	A46400
3	Adjustment guide, ratcheting	-	-	(113363)	(113363)	(113363)
4	Stem assembly, ratching	-	-	(111587)	(111588)	(111589)
6	Body	-	-	-	-	(115880)
7	Plug	-	-	-	107355	107355
SAM	-PRS MODELS					
1	Non-Potable snap cover	-	-	A46610	A46610	A46610
2	Cover	-	-	116901	116901	116901
-	Cover, vandal resistant	-	-	A46400	A46400	A46400
3	Adjustment guide, ratcheting	-	-	(113363)	(113363)	(113363)
4	Stem assembly, ratching	-	-	(111590)	(111591)	(111592)
5	Seal, SAM	-	-	112528	112528	112528
б	Body	-	-	-	-	(115880)
7	Plug	_	-	-	107355	107355
SAM	-P45 MODELS					
1	Non-Potable snap cover	-	-	A46610	A46610	A46610
2	Cover	-	-	116901	116901	116901
_	Cover, vandal resistant	-	_	A46400	A46400	A46400
3	Adjustment guide, ratcheting	-	-	(113363)	(113363)	(113363)
4	Stem assembly, ratching	-	-	(178043)	(178044)	(178045)
5	Seal, SAM	-	-	112528	112528	112528
6	Body		_	_	_	(115880)
-	White Filter Screen	A21511	A21511	A21511	A21511	A21511
-	Blue Filter Screen	A21550	A21550	A21550	A21550	A21550

Note: Part numbers enclosed in brackets () are not available individually, but may be sold in assemblies or kits.



Tech Spec

High-Efficiency Variable Arc Spray Nozzles (HE-VAN)

Features

- Easy arc adjustment from 0° to 360° with a simple twist of the center collar to increase or decrease arc setting.
- ExactEdge[™] takes the guesswork out of arc adjustment. As you turn the nozzle to the desired arc setting, you'll feel it lock into place for a clean, consistent edge every time.
- Patent pending Flow Control Technology provides superior close-in watering and uniform coverage across the entire pattern.
- Thicker streams and large water droplets for greater wind resistance.
- Matched precipitation rates with Rain Bird[®] MPR and U-Series Nozzles.
- A strong top deflector to minimize nozzle damage due to normal wear and tear.
- No special tools required.
- Stainless steel adjustment screw to adjust flow and radius, up to a 25% reduction in radius.
- Shipped with appropriate filter screens to maintain precise radius adjustment and prevent clogging.
- Fits on all Rain Bird[®] 1800[®] Series Spray Heads, UNI-Spray[™] Series Spray Heads and Rain Bird Shrub Adapters.

Models

- HE-VAN-08
- HE-VAN-10
- HE-VAN-12
- HE-VAN-15

*These ranges are based on proper pressure at nozzle.

Operating Range

- Radius*
 - HE-VAN-08:
 - 6 to 8 feet (1.8 to 2.4 m)
 - HE-VAN-10:
 - 8 to 10 feet (2.4 to 3.0 m)
 - HE-VAN-12:
 - 10 to 12 feet (3.0 to 3.7 m)
 - HE-VAN-15:
 - 12 to 15 feet (3.7 to 4.6 m)

Rain Bird[®] HE-VAN Efficiency Ratings

- Rain Bird[®] HE-VAN Nozzles deliver an average DU_{LQ} of 70%, more than a 40% improvement over typical variable arc spray nozzles.
- Rain Bird[®] HE-VAN Nozzles deliver a SC ≤ 1.6, which is 35% lower than the typical variable arc spray nozzle.

Definitions

- **Distribution Uniformity (DU**LQ): DU in irrigation is a measure of how uniformly water is applied to the area being watered.
 - DU_{LQ} is calculated by taking the volume in the lowest quarter of catch can measurements and dividing it by the average volume of all catch can measurements.
- Scheduling Coefficient (SC): SC is a measure of how long a zone must be run in order to provide adequate water to the driest spot.







How To Specify



8 Series HE-V/	AN				
24° Trajectory					
Nozzle	Pressure psi	Radius ft.	Flow gpm	Precip In/h	Precip In/h
360° Arc	15	5	0.83	3.19	3.68
	20	б	0.96	2.56	2.95
(•)	25	7	1.07	2.10	2.42
	30	8	1.17	1.76	2.03
270° Arc	15	5	0.62	3.19	3.68
	20	6	0.72	2.56	2.95
	25	7	0.80	2.10	2.42
	30	8	0.88	1.76	2.03
180° Arc	15	5	0.41	3.19	3.68
	20	б	0.48	2.56	2.95
	25	7	0.53	2.10	2.42
	30	8	0.59	1.76	2.03
90° Arc	15	5	0.21	3.19	3.68
	20	6	0.24	2.56	2.95
	25	7	0.27	2.10	2.42
l i	30	8	0.29	1.76	2.03

8 Series HE-V	/AN				M	IETRIC
24° Trajectory Nozzle	Pressure bar	Radius m	Flow m³⁄h	Flow I/m	Precip mm/h	Precip mm/h
360° Arc	1.03	1.52	0.19	3.14	82	95
	1.38	1.83	0.22	3.62	66	76
(•)	1.72	2.13	0.25	4.05	54	62
	2.07	2.44	0.27	4.43	45	52
270° Arc	1.03	1.52	0.14	2.35	82	95
	1.38	1.83	0.16	2.72	66	76
<u> </u>	1.72	2.13	0.18	3.04	54	62
	2.07	2.44	0.20	3.33	45	52
180° Arc	1.03	1.52	0.10	1.57	82	95
	1.38	1.83	0.11	1.81	66	76
	1.72	2.13	0.12	2.02	54	62
• -	2.07	2.44	0.13	2.22	45	52
90° Arc	1.03	1.52	0.05	0.78	82	95
-	1.38	1.83	0.05	0.91	66	76
	1.72	2.13	0.06	1.01	54	62
—	2.07	2.44	0.07	1.11	45	52

10 Series HE-	VAN				M	ETRIC
27° Trajectory						
Nozzle	Pressure bar	Radius m	Flow m³⁄h	Flow l/m	Precip mm/h	Precip mm/h
360° Arc	1.03	2.13	0.29	4.78	64	74
	1.38	2.44	0.34	5.52	56	65
(0)	1.72	2.74	0.37	6.17	50	57
	2.07	3.05	0.41	6.76	44	51
270° Arc	1.03	2.13	0.22	3.59	64	74
	1.38	2.44	0.25	4.14	56	65
<u> </u>	1.72	2.74	0.28	4.63	50	57
	2.07	3.05	0.31	5.07	44	51
180° Arc	1.03	2.13	0.15	2.39	64	74
	1.38	2.44	0.17	2.76	56	65
	1.72	2.74	0.19	3.09	50	57
	2.07	3.05	0.21	3.38	44	51
90° Arc	1.03	2.13	0.07	1.20	64	74
	1.38	2.44	0.08	1.38	56	65
	1.72	2.74	0.09	1.54	50	57
	2.07	3.05	0.10	1.69	44	51

10 Series HE-V	AN				
27° Trajectory					
Nozzle	Pressure psi	Radius ft.	Flow gpm	Precip In/h	Precip In/h
360° Arc	15	7	1.26	2.48	2.86
	20	8	1.46	2.19	2.53
(°)	25	9	1.63	1.94	2.24
	30	10	1.78	1.72	1.98
270° Arc	15	7	0.95	2.48	2.86
	20	8	1.09	2.19	2.53
	25	9	1.22	1.94	2.24
	30	10	1.34	1.72	1.98
180° Arc	15	7	0.63	2.48	2.86
	20	8	0.73	2.19	2.53
	25	9	0.81	1.94	2.24
	30	10	0.89	1.72	1.98
90° Arc	15	7	0.32	2.48	2.86
	20	8	0.36	2.19	2.53
	25	9	0.41	1.94	2.24
	30	10	0.45	1.72	1.98

Note: Turning the radius reduction screw may be required to achieve catalog radius and flow when the arc is set at less than maximum arc

Square spacing based on 50% diameter of throw

▲ Triangular spacing based on 50% diameter of throw

Performance data taken in zero wind conditions

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12 Series HE-\	/AN				
23° Trajectory					
Nozzle	Pressure psi	Radius ft.	Flow gpm	Precip In/h	Precip In/h
360° Arc	15	9	1.67	1.99	2.30
	20	10	1.93	1.86	2.15
•	25	11	2.16	1.72	1.99
	30	12	2.37	1.58	1.83
270° Arc	15	9	1.25	1.99	2.30
	20	10	1.45	1.86	2.15
	25	11	1.62	1.72	1.99
	30	12	1.77	1.58	1.83
180° Arc	15	9	0.84	1.99	2.30
	20	10	0.97	1.86	2.15
	25	11	1.08	1.72	1.99
	30	12	1.18	1.58	1.83
90° Arc	15	9	0.42	1.99	2.30
	20	10	0.48	1.86	2.15
	25	11	0.54	1.72	1.99
-	30	12	0.59	1.58	1.83

15 Series HE-V	AN				
25° Trajectory					
Nozzle	Pressure	Radius	Flow	Precip	Precip
	psi	ft.	gpm	In/h	In/h
360° Arc	15	11	2.62	2.08	2.40
	20	12	3.02	2.02	2.33
	25	14	3.38	1.66	1.92
	30	15	3.70	1.58	1.83
270° Arc	15	11	1.96	2.08	2.40
	20	12	2.27	2.02	2.33
	25	14	2.53	1.66	1.92
	30	15	2.78	1.58	1.83
180° Arc	15	11	1.31	2.08	2.40
	20	12	1.51	2.02	2.33
	25	14	1.69	1.66	1.92
	30	15	1.85	1.58	1.83
90° Arc	15	11	0.65	2.08	2.40
	20	12	0.76	2.02	2.33
	25	14	0.84	1.66	1.92
	30	15	0.93	1.58	1.83

Note: Turning the radius reduction screw may be required to achieve catalog radius and flow when the arc is set at less than maximum arc

Square spacing based on 50% diameter of throw

▲ Triangular spacing based on 50% diameter of throw

Performance data taken in zero wind conditions

12 Series HE-	VAN				N	IETRIC
23° Trajectory						
Nozzle	Pressure bar	Radius m	Flow m³⁄h	Flow I/m	Precip mm/h	Precip mm/h
360° Arc	1.0	2.7	0.38	6.33	50.5	58.3
	1.4	3.0	0.44	7.31	47.3	54.6
•	1.7	3.4	0.49	8.18	43.7	50.4
	2.1	3.7	0.54	8.96	40.2	46.4
270° Arc	1.0	2.7	0.28	4.75	50.5	58.3
	1.4	3.0	0.33	5.48	47.3	54.6
	1.7	3.4	0.37	6.16	43.7	50.4
	2.1	3.7	0.40	6.72	40.2	46.4
180° Arc	1.0	2.7	0.19	3.17	50.5	58.3
	1.4	3.0	0.22	3.66	47.3	54.6
	1.7	3.4	0.25	4.09	43.7	50.4
	2.1	3.7	0.27	4.48	40.2	46.4
90° Arc	1.0	2.7	0.09	1.58	50.5	58.3
	1.4	3.0	0.11	1.83	47.3	54.6
	1.7	3.4	0.12	2.04	43.7	50.4
	2.1	3.7	0.13	2.24	40.2	46.4

15 Series HE-	VAN				N	IETRIC
25° Trajectory						
Nozzle	Pressure bar	Radius m	Flow m³⁄h	Flow l/m	Precip mm/h	Precip mm/h
360° Arc	1.0	3.4	0.59	9.91	52.9	61.1
	1.4	3.7	0.69	11.44	51.3	59.3
(•)	1.7	4.3	0.77	12.79	42.2	48.7
	2.1	4.6	0.84	14.01	40.2	46.5
270° Arc	1.0	3.4	0.45	7.43	52.9	61.1
	1.4	3.7	0.51	8.58	51.3	59.3
	1.7	4.3	0.58	9.59	42.2	48.7
	2.1	4.6	0.63	10.51	40.2	46.5
180° Arc	1.0	3.4	0.30	4.95	52.9	61.1
	1.4	3.7	0.34	5.72	51.3	59.3
	1.7	4.3	0.38	6.39	42.2	48.7
Ŭ	2.1	4.6	0.42	7.00	40.2	46.5
90° Arc	1.0	3.4	0.15	2.48	52.9	61.1
	1.4	3.7	0.17	2.86	51.3	59.3
	1.7	4.3	0.19	3.20	42.2	48.7
Ĵ	2.1	4.6	0.21	3.50	40.2	46.5



Specifications

- The plastic HE-VAN Nozzle deflectors shall be constructed of UV-resistant plastic.
- The radius adjustment screw shall be constructed of stainless steel.
- The HE-VAN Nozzles shall be designed with patent pending Flow Control Technology to deliver an average DU_{LQ} of 70% and a SC of \leq 1.6.
- The HE-VAN-10 and HE-VAN-12 nozzles shall accept the Rain Bird green filter screen, and the HE-VAN-12 and HE-VAN-15 nozzles shall accept the Rain Bird blue filter screen to allow for radius adjustment.
- The plastic HE-VAN Nozzle shall be manufactured by Rain Bird Corporation, Azusa, California.



Rain Bird Corporation

6991 E. Southpoint Road Tucson, AZ 85756 Phone: (520) 741-6100 Fax: (520) 741-6522

Rain Bird Technical Services

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Rain Bird Corporation

970 West Sierra Madre Avenue Azusa, CA 91702 Phone: (626) 812-3400 Fax: (626) 812-3411

Specification Hotline

800-458-3005 (U.S. and Canada)

Rain Bird International, Inc.

1000 West Sierra Madre Ave. Azusa, CA 91702 Phone: (626) 963-9311 Fax: (626) 852-7343

The Intelligent Use of Water[™] www.rainbird.com



SA Series – Swing Assemblies

Primary Applications

Connects heads to lateral pipes. This low-cost, reliable, and flexible connection prevents heads or pipes from breaking when run over by equipment and allows easy adjustment of the heads to grade.

Features and Benefits

- Preassembled units save the contractor time and reduce installation costs
- Swing arm lengths allow quick adjustment of spray heads to grade preventing damage from lawn equipment
- Quad Swing Assembly is the most adaptable product, making installation of spray heads on inclines fast and easy

Specifications

The operating range of the swing assemblies matches or exceeds the operating range for most 1/2''(1,3 cm) sprays and 3/4''(1,9 cm) rotors.

- Operating pressure up to 80 psi (5,5 bar)
- Surge pressure up to 240 psi (16,6 bar)
- Temperature up to 110° F (43° C)
- Maximum flow is 8 gpm (0.5 l/sec)
- Pressure loss at 6 gpm (0.38 l/sec) is 2.0 psi (0.14 bar)

Unique Rain Bird system offering: Swing Assemblies, Saddle Tees, and Spray Heads

How to Specify/Order



SA Series Swing Assemblies Specifications								
Model Number	Part Number		Length		Inlet		Outlet	Notes
		US	METRIC	US	METRIC	US	METRIC	
SA-6050-P	A48030P	6″	15,2 cm	1/2″	1,3 cm	1/2″	1,3 cm	PALLET PACK
SA-6050	A48030	6″	15,2 cm	1/2″	1,3 cm	1/2″	1,3 cm	-
SA-65050Q	A48070	6″	15,2 cm	1/2″	1,3 cm	1/2″	1,3 cm	QUAD
SA-65075	A48055	6″	15,2 cm	1/2″	1,3 cm	3/4″	1,9 cm	-
SA-125050	A48035	12″	30,5 cm	1/2″	1,3 cm	1/2″	1,3 cm	-
SA-125050Q	A48075	12″	30,5 cm	1/2″	1,3 cm	1/2″	1,3 cm	QUAD
SA-125075	A48045	12″	30,5 cm	1/2″	1,3 cm	3/4″	1,9 cm	-
SA-127575	A48050	12″	30,5 cm	3/4″	1,9 cm	3/4″	1,9 cm	_
SA-185050	A48065	18″	45,7 cm	1/2″	1,3 cm	1/2″	1,3 cm	_

Specifications

SA Series – Swing Assemblies

The Swing Assemblies shall be used as a flexible swing joint assembly for 1/2''(1,3 cm) and 3/4''(1,9 cm) inlet sprinklers.

The pipe shall be flexible black tubing constructed of linear low density polyethylene material. The tubing shall have a wall thickness of 0.090". It shall have an inside diameter of 0.490". The fittings shall be constructed of UV-resistant, thermoplastic material. The model and logo shall be along the length of the tubing.

The Swing Assembly shall have an operating pressure rating of 80 psi at 110° F (5,5 bar at 43° C). The Swing Assembly shall be manufactured by Rain Bird Corporation, Glendora, California.







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www.rainbird.com

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1800[®] NP Cover

Non-Potable 1800 Spray Head Cover

Features

- Designed for excellent retention on 1800 Series Spray Body covers
- Purple plastic cover for easy identification of non-potable water system
- Marked with "Do Not Drink!" warning in both English and Spanish.
- Snaps onto all 1800[®] Series Spray Body covers

Model





1800-NPCAP

PA-8S

Plastic Shrub Adapter

Features

- Adapts Rain Bird Nozzles for use with 1/2" (15/21) MPT threaded risers
- Accepts protective, non-clogging 1800 Series filter screen (shipped with nozzle) and PCS Series screens
- Durable, non-corrosive plastic construction

Specifications

- 1/2" (15/21) female inlet threads
- · Fine top threads accept all Rain Bird nozzles

Model

• PA-8S



PA-8S

1800[®]-EXT

Plastic Extension

Features

- UV-resistant thermoplastic construction for long life
- Fits all Rain Bird Spray Bodies and Nozzles. Exception: Cannot be used with bubblers
- Easily installed without any tools
- Can be reinstalled without damaging the threads if accidentally knocked off the riser or spray head
- Maximum recommended number: two extensions per spray body

Model

• 1800-EXT



PA-80 Plastic Adapter

Features

- Adapts Rain Bird Spray Bodies for use with any 1/2" (15/21) FPT bubbler or spray nozzle
- Rugged, UV-resistant thermoplastic construction
- Easy to install; no tools required

Dimensions

• Height: 1¹/₂" (3.8 cm); 0.8" (2.0 cm) above 1800 cap

Model • PA-80



PA-8S-NP

1800-EXT

Non-Potable Plastic Shrub Adapter

Features

- Purple plastic shrub adapter for easy identification of non-potable water system
- Adapts Rain Bird Nozzles for use with ¹/₂" (15/21) MPT threaded risers
- Accepts protective, non-clogging 1800 Series filter screen (shipped w/ nozzle) and PCS Series screens
- · Durable, non-corrosive plastic construction

Specifications

- 1/2" (15/21) female inlet thread
- Fine top threads accept all Rain Bird Nozzles

Model

• PA-8S-NP



PA-8S-NP

Spray Bodie:



TECH SPECS

Bubbler Heads

Adjustable Full-Circle Bubbler 1300A-F

Designed for tree, shrub and flower areas.

Operating Range

- Flow: 1.0 to 2.3 gpm (0,23 to 0,52 m³/h; 0,06 to 0,14 l/s)
- Spacing: 1 to 3 feet (0,3 to 0,9 m)
- Pressure: 10 to 60 psi (0,7 to 4,0 bar)

Dimensions

- ½ inch (15/21) female threaded inlet
- Height: 1 inch (2,5 cm)
- Top diameter: 1 inch (2,5 cm)

Pressure Compensating Full-Circle Bubblers

1400 Series

Designed for irrigating tree, shrub and flower areas where pressure compensation is required.

Operating Range

- Flow: 0.25 to 2.0 gpm (0,06 to 0,46 m³/h; 0,02 to 0,13 l/s)
- Spacing: 1 to 3 feet (0,3 to 0,9 m)
- Pressure: 20 to 90 psi (1,5 to 6,0 bar)

Dimensions

• Same as 1300A-F

Models and Specifications

- 1401: 0.25 gpm (0,06 m³/h; 0,02 l/s); full circle, trickle pattern
- 1402: 0.5 gpm (0,11 m³/h; 0,03 l/s); full circle, trickle pattern
- 1404: 1.0 gpm (0,23 m³/h; 0,06 l/s) full circle, umbrella pattern
- 1408: 2.0 gpm (0,46 m³/h; 0,12 l/s); full circle, umbrella pattern







Specifications 1300A-F

Adjustable Flood Bubbler

The bubbler body shall be constructed of durable UV-resistant plastic. It shall have a plastic inlet filter screen to protect the nozzle against clogging, and a stainless steel adjusting screw, capable of shutting off the bubbler and regulating the flow.

The bubbler shall have a ½ inch (15,21) female threaded inlet for connecting to the piping system riser.

The bubbler shall be as manufactured by Rain Bird Corporation, Glendora, California.

1401, 1402, 1404, 1408 Pressure Compensating Flood Bubbler

The bubbler shall have a "trickle" pattern (1401 & 1402 models) or an "umbrella" pattern (1406 & 1408 models) discharge.

The bubbler assembly shall have a plastic inlet filter screen to protect the nozzle against clogging.

The pressure compensating bubbler shall be of a permanently assembled design constructed of durable, UV-resistant plastic with an integral rubber flow washer for regulating the flow rate at an operating pressure range of 20 to 90 psi (1,5 to 6,0 bar).

The pressure compensating bubbler shall have a $\frac{1}{2}$ inch (15,21) female threaded inlet for connection to the piping system riser.

The pressure compensating bubbler shall be as manufactured by Rain Bird Corporation, Glendora, California.



Rain Bird Corporation

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Specification Hotline

(800) 458-3005 (U.S. and Canada only)

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Barton Combined Sewer Overflow Control Project

MISC. ACCESSORIES



Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax





Quick-Coupling Valve Cutaway





Quick-Coupling Valves

- Industrial-strength brass quick-coupling valves for convenient water access in potable and non-potable systems
- Rugged, red brass construction for long life and reliable performance
- Reliable operation with strong corrosion-resistant stainless steel spring

Features

- Optional locking cover on models 33-DLRC, 44-LRC, 5-LRC, 33-DNP, 44-NP and 5-NP (use 2049 key to unlock). Metal cover on model 7 only
- One-piece body design (models 3-RC, 5-RC, and 7).
- Two-piece body design for easy servicing (models 33-DRC, 44-LRC, 44-RC, 33-DNP, and 44-NP).
- Strong corrosion-resistant stainless steel spring prevents leakage
- Thermoplastic cover for durability
- 33-DNP, 44-NP and 5-NP covers marked with "Do Not Drink!" warnings in English and Spanish

Operating Range

- Pressure: 5 to 125 psi (0.35 to 8.63 bar)
- Flow: 10 to 125 gpm (2.27 to 28.38 m³/h; 37.8 to 473 l/m)
- 33-DNP, 44-NP and 5-NP flow: 10 to 70 gpm (2.27 to 15.89 m³/h; 37.8 to 265 l/m)

Dimensions

• 3-RC:	Height: 4¼"	(10.8 cm)
• 33-DRC:	Height: 4 ³ / ₈ "	(11.1 cm)
• 33-DLRC:	Height: 4 ⁵ ⁄8"	(11.7 cm)
• 44-RC:	Height: 6"	(15.2 cm)
• 44-LRC:	Height: 6"	(15.2 cm)
• 5-RC:	Height: 5½"	(14.0 cm)
• 5-LRC:	Height: 5½"	(14.0 cm)
• 7:	Height: 5¾"	(14.6 cm)
• 33-DNP:	Height: 4 ³ / ₈ "	(11.1 cm)
• 44-NP:	Height: 6"	(15.2 cm)
• 5-NP:	Height: 5½"	(14.0 cm)



33-DNP

Models

• 3-RC:	³ / ₄ " (20/27) Rubber Cover, 1-Piece Body	
• 33-DRC:	³ ⁄4" (20/27) Double Track Key Lug, Rubber Cover, 2-Piece Body	
• 33-DLRC:	³ /4" (20/27) Double Track Key Lug, Locking Rubber Cover, 2-Piece Body	
• 44-RC:	1" (26/34) Rubber Cover, 2-Piece Body	
• 44-LRC:	1" (26/34) Locking Rubber Cover, 2-Piece Body	
• 5-RC:	1" (26/34) Rubber Cover, 1-Piece Body	•
• 5-LRC:	1" (26/34) Locking Rubber Cover, 1-Piece Body	1
• 7:	1½" (40/49) Metal Cover, 1-Piece Body	(
• 5-RC-BSP:	1" (26/34) Rubber Cover, 1-Piece Body, BSP threaded	•
• 5-LRC-BSP:	1" (26/34) Locking Rubber Cover, 1-Piece Body, BSP threaded	-
• 33-DNP:	³ / ₄ " (20/27) Non-potable, Purple Locking Rubber Cover, 2-Piece Body	
• 44-NP:	1" (26/34) Non-potable, Purple Locking Rubber Cover, 2-Piece Body	
• 5-NP:	1" (26/34) Non-potable, Purple Locking Rubber Cover, 1-Piece Body	
Note: For non-	US applications, it is necessary to specify NPT or BSP thread type	

Quick-	Quick-Coupling Valves Pressure Loss (psi)							
Flow	3-RC	33-DRC 33-DLRC 33-DNP	44-RC 44-LRC 44-NP	5-RC 5-LRC 5-NP	7			
gpm	3⁄4"	3⁄4"	1"	1"	1 ½"			
10	1.8	2	-	-	-			
15	4.7	4.3	2.2	-	-			
20	7.2	7.6	4.4	-	-			
30	-	-	11.5	4.1	-			
40	-	-	-	7.3	-			
50	-	-	-	11	1.7			
60	-	-	-	15.7	2.5			
70	-	-	-	21.5	3.6			
80	-	-	-	-	4.9			
100	-	-	-	-	8.4			
125	-	-	-	-	14			

Quick-Coupling Valves Pressure Loss (bar)						
Flow 3-RC 33-DRC 44-RC 5-RC 33-DLRC 44-LRC 5-LRC 33-DNP 44-NP 5-NP	7					
m³h l/m 1.9 cm 1.9 cm 2.5 cm 2.5 cm	3.8 cm					
2.3 38 0.12 0.12	-					
4 67 0.41 0.42 0.23 -	-					
5 83 0.57 0.62 0.40 -	-					
6 100 0.62 -	-					
7 117 0.83 0.30	-					
8 133 0.40	-					
9 150 0.50	-					
10 167 0.61	-					
12 200 0.85	0.13					
14 233 1.15	0.18					
16 267 1.50	0.25					
22 367	0.54					
28 473	0.97					



Quick Coupling Valves



Valves



Valve Keys Quick-Coupling Keys

Features

• Key threads into top of quick-coupling valve to provide water access

Models

- 33-DK: ³/₄" (20/27) • 44-K: 1" (26/34)
- 55-K-1: 1" (26/34)*
- 7-K: 1¹/2" (40/49)*
- * Available with BSP threads; specify when ordering



Top Pipe Threads Female Valve Key Male 3-RC 33-DK 3⁄4" 1/2" 33-DRC/33-NP 3⁄4" 1/2" 33-DK 1" 3⁄4" 44-RC/44-NP 44-K 5-RC/5-NP 55-K-1 1" 7-K 1½" 1¹/4"

Correspondi	ng Valve Keys		METRIC
Valve	Kov	Top Pipe Threads	Fomalo
3-RC	33-DK	20/27	15/21
33-DRC/33-NP	33-DK	20/27	15/21
44-RC/44-NP	44-K	26/34	20/27
5-RC/5-NP	55-K-1	26/34	-
7	7-K	40/49	33/42

Valves

SH Series

Hose Swivel

Features

- Attaches water hose to quick-coupling valve key
- Swivels up to 360°
- Allows hose to be pulled in any direction
- Prevents hose damage

Specifications

- SH-1: 1" (26/34) female pipe thread x $\frac{3}{4}$ " (20/27) male hose thread
- SH-2: 1" (26/34) female pipe thread x 1" (26/34) male hose thread
- SH-3: $1^1\!\!/_2$ (40/49) female pipe thread x 1" (26/34) male hose thread

Models

• SH-0 • SH-1 • SH-2* • SH-3 *Available with BSP threads



Locking Cover Key

Corresponding Valve Keys

Features

- Locks and unlocks the optional locking cover on quickcoupling valves
- Operates the valve marker compression lock
- Compatible with models
 33-DLRC, 33-DNP, 44-LRC,
 44-NP, 5-LRC,
 and 5-NP

Model

• 2049 Cover Key



2049

SPLICE-1

Wire Splice

Features

- Fast, reliable splicing
- UV resistant black housing is pre-filled with non-toxic lithium grease

Specifications

- Splices low voltage electrical control wires: 30 V max
- Fits wires up to
- 5 #18, #20, or #22 AWG
- -4 #16 AWG
- -2 #14 AWG

Model





the tee head.

MUELLER[®] MARK II ORISEAL[®] CURB VALVES

The MUELLER® MARK II ORISEAL® Curb Valve has a sturdy one-piece, closed-bottom body that differs from other designs by reducing the number of potential leakage points. The closed bottom design minimizes exposed moving parts. The large tee head and plug are integrally cast as one strong piece to resist twisting and breaking. In addition, the O-ring

sealed design allows the plug to turn easily in the body, with a minimum of torque. The top and port O-rings are fully supported in machined grooves to provide positive sealing. All of these features combine in the MUELLER MARK II ORISEAL Curb Valve to provide reliable performance and long-term reliability.

Mueller

Pack Joint and F.I.P. thread.

All service brass will comply with AWWA C-800. Components in contact with potable water will also comply with latest requirements of the Federal Safe Drinking Water Act.



MUELLER MARK II ORISEAL Curb Valve

7.14 Mueller Co.

Rev. 8-13 Shaded area indicates change

MUELLER[®] MARK II ORISEAL[®] CURB VALVES WITH F.I.P. CONNECTION



NOTE: 3/4" and 1" sizes are bi-directional and can be installed with flow from either direction. Sizes larger than 1" are one way flow and must be installed with flow as indicated by arrow and in/out lettering cast on valve body.



ORISEAL Curb Valve F.I.P. thread - **both ends** Quarter turn check and Minneapolis top thread

3/4"	1"	1-1/4"	1-1/2"	2"

NOTE: 3/4" and 1" sizes are bi-directional and can be installed with flow from either direction. Sizes larger than 1" are one way flow and must be installed with flow as indicated by arrow and in/out lettering cast on valve body.



MUELLER MARK II ORISEAL Curb Valve F.I.P. thread - **both ends** Quarter turn check, drain and Minneapolis top thread

1					
	3/4"	1"	1-1/4"	1-1/2"	2"

[†] Requires minimum ordering quantity. Contact MUELLER[.] Customer Service Center for minimum ordering requirements and availability. NOTE: Sizes shown above represent nominal size of valve.

MUELLER Curb Valves are manufactured and tested in accordance with ANSI/AWWA C800. Components in contact with potable water will also comply with latest requirements of the Federal Safe Drinking Water Act.



PRODUCT SPECIFICATIONS



DETECTABLE MARKING TAPE

PRODUCT TYPE: Detectable Marking Tape

DESCRIPTION: Christy's[™] Detectable Marking Tape provides for easy buried pipeline detection and below ground identification and warning. The tape can be located below ground with a non-ferrous metal detector, when buried at the proper depths. We recommend bury depths of:

TAPE WIDTH	2"	3"	6"	12" or wider
TAPE BURY DEPTH	6" - 18"	6" - 28"	6" - 36"	6" - 36"

<u>SPECIFICATIONS & INDUSTRY LISTINGS</u>: Christy's[™] Detectable Tape Must Be Buried Flat For Maximum Detectability and Line Protection.

Christy's[™] DETECTABLE marking tape shall consist of a minimum 5.0 mil (0.0050") overall thickness; five-ply composition; ultra-high molecular weight; 100% virgin polyethylene; acid, alkaline and corrosion resistant.

Elongation properties shall be in accordance with ASTM D882-80A and shall be: 80% MD and 135%TD.

The tape shall have a minimum 20 gauge (0.0020") solid aluminum foil core, adhered to a 2.55 mil (0.00255") polyethylene backing.

Tape color and legend combination shall be in accordance with A.P.W.A. or local requirements. The color shall be ______. The legend shall read_

The tape printing shall be buried beneath the top protective layer.

The tape tensile strength shall be in accordance with ASTM D882-80A and be not less than 7,800 PSI.

The tape shall remain flexible as measured by ASTM D671-76 pliable hand value.

Tape width shall be _____. (For best results we recommend a tape width at least 3/4 of the diameter of the pipeline being protected. A 4" diameter line would use 3" or wider tape for optimum protection). Standard widths are 2'', 3'', 6'', 12'' and 24''.

The tape shall be manufactured by T. Christy Enterprises, Inc. (800-258-4583). The model number shall be ______ (TA-DT-XX-XXX). (See model number designations on the following page).

Special and Custom Legends: Christy's[™] also offers a full range of non-standard legend/color combinations in addition to the combinations listed below, including specialty applications such as Telemetry, Irrigation and additional water line wording. All standard combinations listed are available in at least one color/width combination. We also offer specific agency legends, designations or color combinations. Custom legends can also include the use of specific wording, insignias and phone numbers. Call our product specialists with your unique requirements.

Standard Color/Ledend Combinations

Color	Legend	Suffix
Blue	Caution Irrigation Line Buried Below	BI
Blue	Caution Non-Potable Water Line Buried Below	BNP
Blue	Caution Potable Water Line Buried Below	BPW
Blue	Caution Water Line Buried Below	BW
Brown	Caution Force Main Buried Below	BFM
Brown	Caution Sludge Line Buried Below	BSL
Green	Caution Force Main Buried Below	GFM
Green	Caution Irrigation Line Buried Below	GI
Green	Caution Non-Potable Line Buried Below	GNP
Green	Caution Potable Line Buried Below	GPW
Green	Caution Raw Water Line Buried Below	GRAW
Green	Caution Sewer Line Buried Below	GS
Green	Caution Storm Drain Buried Below	GSTDR
Orange	Caution Fiber Optic Line Buried Below	OFO
Orange	Caution Telephone Line Buried Below	ОТ
Purple	Caution Recycled/Reclaimed Water Line Buried Below	PRW
Purple	Caution Bilingual Reclaimed Water Line Buried Below	PBI
Red	Caution Electric Line Buried Below	RE
Red	Caution Fire Line Buried Below	RF
Red	Danger Do Not Enter (above or below ground)	DNG
Yellow	Caution Caution Caution(above or below ground)	CTN
Yellow	Caution Gas Line Buried Below	YG

<u>NOTE:</u> Not All Widths Are Available As Standard For The Above Stock Color/Legend Combinations In Detectable tape. Consult T. Christy for Stock Availability Of Specific Products. *Non-Stock Combinations Will Be Considered Special Orders And Subject To Minimum Requirements.*







- PRODUCT INFORMATION & SPECIFICATIONS -

IRRIGATION ID TAGS Standard and Maxi

DESCRIPTION

Standard and Maxi ID Tags are for high-visibility point-of-use identif cation to correctly identify valve, hose bibb and valve box installations. The tags are commonly used to identify specifi valve sequences (A1, A2 . . . A99) and specifi applications (I.E. Recycled / Reclaimed Water). They are available in two sizes and a variety of colors that conform to both locally developed standards, as well as APWA and AWWA national standards. The tags are designed and tested to last for years while withstanding ultra-violet degradation and general weathering.



Standard Yellow ID Tags

SPECIFICATIONS

- Manufactured from polyurethane Behr Desopan.
- Attached neck and reinforced hole are capable of withstanding 180 lbs. pull of resistance.
- The hole is designed to pass a 16 gauge or smaller solenoid pigtail wire or nylon tie for attachment.
- Can be attached to a valve box lid with a bolt (not included).
- Standard size measures 2.25" x 2.75" and Maxi tags are 3" x 4". Both are .0625 thick.
- Letters are 1.125" high.
- Lettering is hot-stamped in black. They can be seen from a distance of up to 50'.
- All lettering is capable of withstanding outdoor usage.
- Standard tags accommodate up to three characters per side.
- · Maxi tags can accommodate up to four characters per side.
- Standard sequences rang from A1 . . . A36 through Z1 . . . Z36 and practically any special alpha numeric numbering requirement. (I.E. A1A, A1B,A1C . . . A1Z) (AAA,AAB,AAC . . . AAZ).
- Colors available are yellow, purple, blue, green, red and white.
- Tags can be stamped single or double sided.



- PRODUCT INFORMATION & SPECIFICATIONS -



Subject to change without notice.

July 2010



Tree Stake Specifications

2" x 6' and 8' Round Net Dimension: 2 1/4 "

Net Dimension: 2 1/4 " Manufacture: dowelled with pencil point Species: Douglas Fir Treatment: none. Manufactured in Oregon.

2 x 2 x 6' and 8' Net Dimension: 1 9/16 x 1 ¹/₂ Manufacture: 2 ¹/₂ "V" Point Species: mixed softwood

Treatment: none

Gene Cloud Account Manager UFP #388/ D Stake Mill 503-434-5525



Product Configurations

- Item 1101 ProLock[®] ¹/₂" Poly Chain Lock Tree Tie
- Item 1102 ProLock[®] 1" Poly Chain Lock Tree Tie

Product & Packaging Specifications (1/2")

- Material: High density polyethylene with UV inhibitor
- Weight: 3.0 lbs. per 250' roll (nominal)
- Width: 0.45 in. (nominal)
- Thickness: 0.08 in. (nominal)
- Packaged: 12 250' cartons per master case.

Product & Packaging Specifications (1")

- Material: High density polyethylene with UV inhibitor
- Weight: 3.5 lbs. per 100' roll (nominal)
- Width: 1.000 in. (nominal)
- Thickness: 0.125 in. (nominal)

Packaged: 10 – 100' cartons per master case.

Physical Property Testing

ProLock® Poly Chain Lock Tree Tie products pass the following:

Ultraviolet and Weathering Tests per Federal Std. 191 A Method 5804. Low Temperature Flexibility & Cracking Test per Federal Std. 501 Method 6511 at -1° C.



Dimex Limited Lifetime Warranty

ProLock® Poly Chain Lock Tree Tie products are guaranteed to be free from manufacturing defects and will not to crack, rot, or deteriorate due to UV exposure or severe weather conditions.

28305 State Route 7 Marietta, OH 45750 www.edgepro.com Phone: 740-374-3100 Toll Free: 800-334-3776 Fax: 740-374-5420





ROOT BARRIER PANELS

EP Series Root Barrier Panels are injection molded High mpact Polypropylene (H PP) modular root barrier panels, with a unique factory installed joiner strip that eases installation. EP Series Panels include a "T" top edge to prevent root overgrowth and an external flange at the base to lock panels in the ground.

Suitable for all planting installations, EP Series Root Barrier Panels are available in 12", 18", 24" and 36" depths.



Interlocking Joiner Strips



Reinforcing Ribs



A - Finished Grade B - 3"-4" of ³/4" Gravel

C - Amended Soil D - EP Panel

Specifications: Material shall be EP Series Root Barrier Panels by NDS. Panels must have factory installed independent joiner strips. Barriers must be a minimum of .090 inches thick and be made of up to 50% post consumer High mpact Polypropylene (H PP). Material must contain U.V. inhibitors to ensure longevity. Barriers must have 1/2" raised vertical ribs running perpendicular to the panel and be 6" on center. Panels shall have a ³/₈" wide "T" top edge and an external ground anchoring base flange 1/₈" in width.

	Part No.	Description	Color	Pkg. Qty.	(lbs.)	Class	
	EP-1250	12" x 24" Root Barrier Panel	Black	25	1.80	50EP	_
36"	EP-1850	18" x 24" Root Barrier Panel	Black	25	1.56	50EP	
	EP-2450	24" x 24" Root Barrier Panel	Black	25	2.12	50EP	
	EP-3650	36" x 24" Root Barrier Panel	Black	25	3.20	50EP	
24"	ncludes 1 Jo	biner Strip per panel					



AST	IM SPECI	FICATIONS	EP Series	Root Barrier	Panels
Properties	Tensile Stress	Yield Elongation	Flexural Modulus	Notched Izod Impact	Rockwell Hardness
ASTM Test (Units)	D638 (psi)	D638 (psi)	D790A (psi)	D256 (psi)	D785
Values	3,600-4,200	12%	150,000	3.0 @ 73° F	R70

RECOMMENDED INSTALLATIONS

Surround Application:

Panels placed around root ball, at a sufficient distance to allow proper backfill of materials.

Linear/Root Pruning Application:

Panels placed directly adjacent to the hardscape being protected.



Note: All dimensions are nominal. All weights are for shipping purposes only. Availability is subject to change.



Barton Combined Sewer Overflow Control Project

VALVE BOXES



Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax

NDS PRO SERIES VALVE BOXES

COMMERCIAL GRADE

NDS Pro Series 10" Round Valve Boxes

Specifications: The NDS PRO SERIES 10° round valve boxes and covers are injection molded of structural foam polyethylene material with a melt index between 10-12. Coloring and UV stabilizers are added, along with processing lubricants when needed.

The 10" round body shall be tapered and have a minimum wall thickness of .250". The cover seat area shall have 8 structural support ribs on the underside of the seat, each with a minimum thickness of .250". The bottom of the body shall have a .500" flange. The 10" round cover shall have an average thickness of .300". The valve box shall have a 3/8" 304 SS nut for the bolt-down as a standard feature.

	Part Number	Description - Marking	Color (Box/Cover)	Pallet Qty	Weight Ea	Product Class
	Box & Cover 212BC 212BCB	10" Round Box, Round Overlapping Cover - ICV 10" Round Box, Round Overlapping Bolt-Down Cover - ICV	Green/Green Green/Green	120 120	4.50 4.60	20PR 20PR
	211BCBLK 211PBCR	10" Round Box, Round Overlapping Cover - ICV 10" Round Box, Round Overlapping Cover - Reclaimed Water	Black/Black Purple/Purple	120 120	4.50 4.50	20PR 20PR
9 - 1/8" 9 - 3/4"	212BCW 212BCBW	10" Round Box, Round Overlapping Cover - Water 10" Round Box, Round Overlapping Bolt-Down Cover - Water	Green/Green Green/Green	120 120	4.50 4.60	20PR 20PR
C IN	212BCS 212BCBS	10" Round Box, Round Overlapping Cover - Sewer 10" Round Box, Round Overlapping Bolt-Down Cover - Sewer	Green/Green Green/Green	120 120	4.50 4.60	20PR 20PR
	212BC ELEC 212BCB ELEC	10" Round Box, Round Overlapping Cover - Electrical 10" Round Box, Round Overlapping Bolt-Down Cover - Electrical	Gray/Gray Gray/Gray	120 120	4.50 4.60	20PR 20PR
	Cover Only					
	2110	10" Round Overlapping Cover - ICV	Green	200	1.50	20PR
11 - 5/8"	211CR	10" Round Overlapping Cover - Reclaimed Water	Purple	200	1.50	20PR
13"		10" Round Overlapping Cover - ICV	Black	200	1.50	20PR 20PR
	2110 DER		Black	200	1.50	20PR
2 - 1/2" x 3 - 1/2"	211CS	10" Round Overlapping Cover - Sewer	Green	200	1.50	20PR
Pipe Slot	211C ELEC	10" Round Overlapping Cover - Electrical	Gray	200	1.50	20PR
	Box Only					
	212B	10" Round Box	Green	120	3.00	20PR
	212PB	10" Round Box	Purple	120	3.00	20PR
	212B BLK	10" Kound Box	Black	120	3.00	20PR
	2128 GKAY 11388	10 ROUIIU BOX 2-1/2" x 3/8" SS Bolt	GIAY	78	3.00 0.10	20PR 20NM
	11000		01001	10	0.10	2014141

Please Note: All Boxes will be Black



Note: All dimensions are nominal. All weights are for shipping purposes only. Availability is subject to change.

NDS PRO SERIES VALVE BOXES

COMMERCIAL GRADE

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NDS Pro Series 14" X 19" Rectangular Valve Boxes

Specifications: The NDS PRO SERIES 14"x19" valve boxes and covers are injection molded of structural foam polyethylene material with a melt index between 10-12.

Coloring and UV stabilizers are added, along with processing lubricants when needed. The 14"x19" body shall be tapered and have a minimum wall thickness of .200". The body shall have a double wall at the top cover seat area with a minimum thickness of .250". The cover seat area shall have 16 structural support ribs on the underside of the seat, each with a minimum thickness of .250". The bottom of the body shall have a .500" flange. The 14"x19" cover shall have an average thickness of .300". The valve box shall have a 3/8" 304 SS nut for the bolt-down as a standard feature.

	Part Number	Description - Marking	Color (Box/Cover)	Pallet Qty	Weight Ea	Product Class
	Box & Cover					
	214BC	14"x19" Box. Overlapping Cover - ICV	Green/Green	78	9.00	20PR
314 9 7- 2"	213BCBLK	14"x19" Box, Overlapping Cover - ICV	Black/Black	78	9.00	20PR
No La	216	14"X19"X6" Extension, Overlapping Cover - ICV	Green/Green	49	9.00	20PR
	216BCB	14"x19"x6" Extension, Overlapping Bolt-Down Cover - ICV	Green/Green	49	9.10	20PR
	213PBCR	14"x19" Box, Overlapping Cover - Reclaimed water	Purple/Purple	78	9.00	20PR
	214BCW	14"x19" Box, Overlapping Cover - Water	Green/Green	78	10.30	20PR
in the second second	214BCS	14"x19" Box, Overlapping Cover - Sewer	Green/Green	78	9.00	20PR
10 55.	214BCB ELEC	14"x19" Box, Overlapping Bolt-Down Cover - Electrical	Gray/Gray	78	9.10	20PR
1 - 3/4"	214BC ELEC	14"x19" Box, Overlapping Cover - Electrical	Gray/Gray	78	10.78	20PR
	214BCDB	14"x19" Box, Drop-In Bolt Down Cover-ICV	Green/Green	78	9.30	20PR
	Cover Only 213C 213CB	14"x19" Overlapping Cover - ICV 14"x19" Overlapping Cover - ICV	Green Black	300 300	2.50 2.50	20PR 20PR
1/2"	213CW	14"x19" Overlapping Cover - Water	Green	300	2.50	20PR
10. 15.	213CS	14"x19" Overlapping Cover - Sewer	Green	300	2.50	20PR
$\gamma_{4^{\prime\prime}} \neq \prec$	213C ELEC	14"x19" Overlapping Cover - Electrical	Gray	300	2.50	20PR
11.394	Box Only 214B	14"x19" Box	Green	78	6.00	20PR
	214-6	14"x19"x6" Extension	Green	49	4.00	20PR
	214B CAL	14"x19" Box w/ No Holes	Green	/8	6.00	20PR
6-3/4	214B GRAY	14"x19" Box	Gray	/8	6.00	20PR
	I I 3BB	2-1/2 x 3/8 55 BOIT	51661	/δ	0.10	201011/1



3x4" Pipe Slot

Please note: All Boxes will be Black



NDS PRO SERIES METER BOXES

PREMIUM COMMERCIAL GRADE

NDS 17"x30" Meter Boxes

Specifications: The NDS 17"x30" meter boxes and covers are injection molded of structural foam polyolefin material with a melt index between 10-12. Coloring and UV stabilizers are added, along with processing lubricants when needed. The 17"x30" body shall be tapered and have a minimum wall thickness of .32". The body shall have a double wall at the top cover seat area with a minimum thickness of .32". The cover seat area shall have 20 structural support ribs on the underside of the seat, each with a minimum thickness of .25". The body shall have a 1" flange. The 17"x30" cover shall have an average thickness of .35". The Meter box shall have a 3/8" 304 SS nut for the bolt-down as a standard feature.

	Part Number	Description - Marking	Color (Box/Cover)	Pallet Qty	Weight (Ea)	Product Class
	Drop In Box & Cover			_		
	124BCDWB	17"x30"x15" Box, Bolt-Down Drop-in Solid Plastic	Black/Black	12	34.79	20NM
19. 2 - 1/4		Cover - Water Meter		10	00 77	0000
	120BCDWB	Cover - Water Meter	BIACK/BIACK	10	36.77	2011111
	124BCDMB	17"x30"x15" Box, Bolt-Down Drop-in Plastic w/ Plastic Reader Cover - Water Meter	Black/Black	12	28.00	20NM
0-114	126BCDMB	17"x30"x18" Box, Bolt-Down Drop-in Plastic w/ Plastic Reader Cover - Water Meter	Black/Black	10	37.00	20NM
~ 30	124BCDMCIFB	17"x30"x15" Box, Bolt-Down Drop-in Plastic w/ Cast Iron Reader Cover - Water Meter	Black/Black	12	36.52	20NM
2 "	126BCDMCIFB	17"x30"x18" Box, Bolt-Down Drop-in Plastic w/ Cast Iron Reader Cover - Water Meter	Black/Black	10	38.50	20NM
	226BCDB ELEC	17"x30"x18" Box, Bolt-Down Drop-in Solid Plastic Cover - Electric**	Gray/Gray	10	36.90	20PR
00-114	Drop In Cover Only	17"v20" Drop in Plactic w/ Cast Irop Dooder Cover	Plack	75	10.16	2000
> .5.	1230DIMOIF	Water Meter	DIACK	75	12.10	2011111
2 - 1/4"	Overlapping Cover Only					
······································	223CR	17"x30" Overlapping Solid Plastic Cover - Reclaimed Water	Purple	75	11.00	20ND
	Box Only					
1 St	124B	17"x30"x15" Box	Black	12	24.26	20NM
30-114	126B 126PB	1/"X3U"X18" B0X 17"x30"x18" Box	Black	10 10	26.24	20NM 20ND
2"			i uipio	10	20.04	2010

**Note - Installer responsible for ensuring product meets local building/electrical code requirements.

Please Note: All Boxes will be Black







Barton Combined Sewer Overflow Control Project

WIRE



Bellevue Branch 13440 SE 30th St Bellevue, WA 98005 (425) 746-8400 (800) 487-5290 (425) 649-4692 Fax





800-876-3020 / 573-472-2990 / FAX 573-471-3134

UF/TWU Irrigation Wire

Description:

Regency's single conductor UF/TWU Irrigation Wire is manufactured for the purpose of direct burial power wire applications in accordance with Article 339 of the National Electric Code NFPA-70.

Conductor construction is soft drawn bare copper meeting the requirements of ASTM Specification B-3 and B-8. Gauge sizes 18 thru 8 are solid conductors. Sizes 6 thru 4/0 are stranded conductors.

The insulation is a high quality polyvinylchloride (PVC) for systems applications of up to 600 volts and conductor temperatures up to 60 C.

The UF/TWU Irrigation Wire is constructed in accordance with Underwriters Laboratories, Inc. standard 493 and 83, as well as CSA 22.2 No. 75.

Application:

Suitable for use as power and control wire for irrigation systems.

Construction:Conductor:Soft drawn bare copper (ASTM Spec. B-3 and B-8).Solid (18 awg to 8 awg)Stranded (6 awg to 4/0 awg)Insulation:Polyvinylchloride (PVC)Temperature:60 CVoltage:600 volts

Conductor Size	Insulation Thickness	Colors
14	.060	1-12
12	.060	1-12
10	.060	1-9, 11
8	.080	1-8
6	.080	1-5
4	.080	1, 2, 3, 5
2	.080	1, 2, 3, 5
1/0	.095	1, 2, 3, 5
2/0	.095	1, 2, 3, 5

Available Colors: 1-Black 2-White 3-Red, 4-Blue, 5-Green, 6-Yellow, 8-Orange 9-Gray, 10-Pink, 11-Purple, 12-Tan.

Material must be able to pass the following tests without showing signs of degradation: Cold Bend – The insulation shall not show any cracks when sample is bent around a 3X mandrel after being subjected to –25 C for four (4) hours.

Electrical - AC test voltage, 60 seconds at 5000 volts.

Sunlight Resistance Test - Samples conditioned for 300 hours of carbon-arc or xenon-arc exposure.

HD Fowler Company Submittal Sec. 18: Ln 68 Vendor: 80420



1.0 SCOPE: 1.1

The 3M[™] Direct Bury Splice Kit DBR/Y is used to electrically connect two or more pre-stripped copper wires and moisture seal the connection for direct burial. It includes the 3M R/Y+ Electrical Spring Connector and a high impact, UV-resistant polypropylene tube prefilled with moisture-resistant gel. It is ideal for splicing wires and cables in irrigation and Low Voltage Lighting systems. For residential, commercial, golf, and other green industry applications.

2.0 PACKAGING DETAILS:

Paige Par	t Number	270670	270671	
3M Part N	Number	DBR/Y Bulk	DBR/Y Kit	
Description		Bulk pack of 100 each gel-filled tubes and twist-on connectors.	25 Kits in a plastic bag. 2 gel-filled tubes and 2 twist-on connectors per bag.	
Case Data Weight		5.1 lbs 2,3 Kg	3.5 lbs 1,6 Kg	
Dimensio	Dimensions	14.25 x 7.625 x 7.5 inches 36 x 19 x 19 cm	13 x 7.6 x 6 inches 33 x 19 x 15 cm	
Pallet Quu Data We Din	Quantities	75 cases 7,500 tubes	133 cases 6,650 tubes (3,325 kits-of-	
	Weights	402 lbs 183 Kg	485 lbs 221 Kg	
	Dimensions	48 x 42 x 43 inches 122 x 107 x 109 cm	48 x 42 x 47.5 inches 122 x 107 x 121 cm	
	Volume	50.2 ft ³ 1,42 m ³	55.4 ft ³ 1,57 m ³	

3.0 FEATURES:

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Reduces inventory and SKUs: Designed to replaces the following 3M connectors: DBY, DBR, DBY-6, DBR-6, DBY-Kit, DBR-Kit, DBY-6-Kit, DBR-6-Kit. Reduces the SKUs from 8 to 2 (DBR/Y and DBR/Y Kit.)

3.2 Rated for 600 volts: One connector for most connections required in irrigation (conventional and decoder types) and landscape lighting systems.

- **3.3 Bulk or Kits-of-two connectors:** Each waterproof connector includes the R/Y+ twist-on connector (wire nut*), and a gel-filled tube
 - Water Resistant & Rain Tight: The DBR/Y may be installed above or below ground, inside a "valve box" or buried next to a valve-in-head sprinkler or light fixture.

Sunlight resistant: Connector can be used above or below ground level.

Strain relief:

The gel-filled tube includes a lid that compresses the wire insulation when closed. This applies a pressure, known as "strain relief" that keeps the connection inside the tube when the wires are pulled-upon. The connector tube includes channels for three sets of wires.

Operating temperature: -40°F to 221°F (-40°C to 105°C)

Made in the USA by the 3M Company: Unquestioned quality by a name you can trust!
3.9 The R/Y+ connector has an aggressive quick-bite:

It makes a fast and reliable mechanical connection over a wide temperature range. The R/Y+ connector locks in place when inserted into the gel-filled tube. It accepts a multitude of direct burial copper wire combinations, as listed in the Table below. Listed for USA and IEC Publications. Certified for Canada. CE passport to European Union countries.



Example: 2 #10 solid plus 1 #12 stranded





Cross section capacity	2,0 mm ² through 16,0 mm ²			
Conductor combinations	Quantity	Size	Туре	
	5 - 7	0,5 mm ²	sol/str.	
	3 - 7	0,75 mm ²	sol/str.	
	2 - 8	1,0 mm ²	sol/str.	
	2 - 7	1,5 mm ²	sol/str.	
	2 - 5	2,5 mm ²	sol/str.	
	2 - 4	4,0 mm ²	sol/str.	
	2	6,0 mm ²	sol/str.	



* "Wire nut" is a registered trade mark of Ideal Industries, Inc.

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APPENDIX E

DRAFT KING COUNTY INTEGRATED PEST MANAGEMENT DOCUMENT



Draft King County Integrated Pest Management Document

February 2012



Department of Natural Resources and Parks Water and Land Resources Division **Stormwater Services Section** King Street Center, KSC-NR-0600 201 South Jackson Street, Suite 600 Seattle, WA 98104 206-296-6519 TTY Relay: 711 www.kingcounty.gov/stormwater

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Section I. Purpose

This document outlines King County's Integrated Pest Management (IPM) Guidelines. These contain general implementation steps as well as specific standards and IPM strategies. These guidelines offer general information about the IPM approach and specific practices appropriate to certain activities and land uses. These include: waterways, buffer zones, road rights-of-way, developed landscapes, lawns and turf, natural open spaces, and electrical facilities and also information about noxious weeds and pesticide handling. It is the intent of these guidelines to serve as the minimum standard for each King County Departments' IPM program. These guidelines may be periodically revised based on new research and implementation experience. If revised, new editions of these guidelines will be distributed to participating departments and divisions.

Section II. IPM Approach

A. Definition of IPM

- 1. The following definition of IPM is based on Washington State law 17.15.010 RCW: Integrated pest management is a coordinated decision-making and action process that uses the most appropriate pest control methods and strategies in an environmentally and economically sound manner to meet agency programmatic pest management objectives. The elements of integrated pest management include:
 - a) Preventing pest problems.
 - b) Monitoring for the presence of pests and pest damage.
 - c) Establishing the density of the pest population, that may be set at zero, that can be tolerated or correlated with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic, or aesthetic thresholds.
 - d) Treating pest problems to reduce populations below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical, and chemical control methods and that must consider human health, ecological impact, feasibility, and cost-effectiveness.
 - e) Evaluating the effects and efficacy of pest treatments.
- 2. The following lists the keys of an IPM approach to pest and vegetation management:
 - a) Integrating IPM policies into the planning for and design of the soils, vegetation and landscaping of a facility or vegetated area, as well as into maintenance practices and specific pest control tactics.
 - b) Using a preventive approach that emphasizes using field experience, research and training about managing vegetation ecosystem and their corresponding pests to proactively develop maintenance practices to promote appropriate and healthy vegetation growth.

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- c) Placing an emphasis on knowledge about the pest and regular monitoring of pest levels as well as evaluation of control methods applied.
- d) Retaining native soil and using soil amendments such as compost, as a means to improve soil structure and provide organic matter, supply slow-release nutrients to plants, suppress soil-borne diseases and plant pathogens. In addition soil preservation helps to store moisture and reduce erosion while immobilizing and degrading some pollutants.
- e) Using "management" and "control" approaches in preference to elimination or eradication except in cases of certain noxious weeds and specific situations where the tolerance threshold may be zero. In general, IPM establishes an approach to manage pest problems within tolerable limits.

The IPM approach encourages planning, design and maintenance of landscapes, rights-of-way and facilities that meet their intended purposes while promoting healthy plants (where appropriate) and minimizing pest problems. The IPM approach follows a process that begins with careful planning, design and construction decisions, followed by appropriate maintenance and management of public lands, facilities and water bodies by employees with up-to-date training, while adhering to all legal requirements.

The IPM approach emphasizes a thorough knowledge of the pest or vegetation problem, predetermined tolerance thresholds, regular monitoring to determine when those levels are met, and treatment of the pest or vegetation problem with appropriate tools. Tolerance thresholds are set at levels that keep pest numbers or vegetation problems low enough to prevent unacceptable damage, annoyance or public safety hazards while remaining economically and environmentally feasible.

IPM encompasses the use of chemical controls specifically in situations where they may be the most environmentally responsible or safest way to deal with a problem, or where other control tactics have proven ineffective at meeting tolerance levels. When chemical controls are necessary, decisions on their use will consider any possible effects on aquatic life (toxicity) and any tendencies for the chemical to move in the environment (mobility). Decisions on chemical use are made in conjunction with other control methods that are effective and practical.

B. Components of an IPM Approach

1. Planning and Design.

It is important to take into account efforts that will enhance intended uses of the land and minimize pest problems during the planning and design of a landscape, facility or road right-of-way. Design shall take into account such factors as types of uses, soils, grading and slope, water table, drainage, proximity to sensitive areas, selection of vegetation, and vector control issues.

2. Soil Structure

Soils play a critical role in the natural environment. Healthy soils keep disease-causing organisms in check, recycle and store nutrients, and provide an important medium for air and water to pass through. The properties of a healthy soil are similar to those of a sponge, faucet and filter. They naturally regulate the flow of water, bind and degrade pollutants. The presence

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of millions of macro and microorganisms in soil creates an environment where organic material is consumed and air and water are retained. Nutrients are made available to plants to allow healthy root growth and oxygen generation.

Soil disturbing human activities typically degrade soil's natural functions by reducing organic matter and pore space. Plant growth in these soils is hindered by lack of nutrients from organic matter thus requiring the use of chemical fertilizers and pesticides. With the loss of pore space the water holding capacity of soil is reduced and erosion and surface water runoff are greatly increased which negatively impacts waterways. Additionally, soil disturbing activities often create opportunities for the introduction of invasive weeds whether by directly introducing the weeds or through creating degraded soils in which noxious weeds can propagate. Attention to soil as an IPM strategy minimizes the need for traditional pest management practices.

3. Maintenance and Landscape Health

Choices of vegetation as well as maintenance practices serve to keep areas as healthy as possible and thus minimize pest problems. Appropriate selection and retention of plants, irrigation, application of compost, mulch or fertilizer, mowing, and many other practices all serve to maintain healthy landscapes that withstand pest pressures and support natural predators for pests. A well-selected and maintained landscape reduces, often dramatically, the need for pest control.

4. Knowing the Pest

Identification of pests and knowledge of their life cycles are crucial to proper management. Potential pests should be documented and actual pests carefully identified in order to clearly focus IPM strategies. Field staff shall be trained in pest identification and allotted the time to conduct regular pest assessments. Additionally field staff should be encouraged to collect samples of unidentified species for later identification by a qualified expert.

5. Determining Tolerance Thresholds

Tolerance thresholds are levels of acceptable pest presence or activity that when exceeded will enact specific control actions. Tolerance thresholds must be established as part of a successful IPM program. They may vary by pest, specific location or type of land use. Weed threshold levels, for example, will be different for rural utility rights-of-way, urban ball fields, golf course greens and road shoulders. They will also differ depending on what class of noxious weed is present. Insect or plant disease tolerances will likewise be different depending on uses and/or specific locations.

The three distinct levels that may be identified as subsets of threshold determination are:

- a) Injury thresholds, the level at which some injury begins to occur or is noticeable.
- b) Action thresholds, the level at which action must be taken to prevent a pest population at a specific site from causing aesthetic, functional or economic harm.
- c) Damage thresholds, the level where unacceptable damage begins to occur.

In most environments certain levels of pest presence or injury can be accepted. IPM managers shall keep track of pests after the injury threshold is crossed so the pests do not get to the point where they can cause enough damage to impact the purpose of the landscape or facility being

maintained. When the predetermined action threshold is crossed, interventions are implemented so as to avoid reaching the damage threshold. There are situations where the threshold level for pests may be set near or at zero. Laws and regulations set the population threshold level at zero for certain noxious weed species due to potential for economic injury, public health or environmental impact. Road shoulders immediately adjacent to the pavement are areas where weed tolerance is low due to public safety requirements and potential for significant economic losses should the paved roadway surface be compromised. Safety and infrastructure protection also factor into the determination of very low or zero thresholds for weeds in areas such as electrical substations and propane tank storage yards.

6. Monitoring for Pests

Regular monitoring to assess pest level, extent, locations and stage in life cycle is an obvious but essential part of IPM. Monitoring provides an IPM manager with critical information about pest locations, type, and prevalence as well as effectiveness of control efforts current and historical. Analysis of gathered monitoring data against established tolerances is necessary to determine when action against a pest needs to be taken. Field staff will need training in pest identification and monitoring techniques, and management will need to allow time for appropriate monitoring to take place.

7. Developing the IPM Plan

The following elements should be considered when selecting appropriate strategies:

- a) Preservation of natural systems and long-term health of the area.
- b) Damage to the general environment.
- c) Disruption of those natural controls which are present.
- d) Hazards to human health.
- e) Toxicity to aquatic life, including all aspects of salmonid life cycle and salmonid foods.
- f) Mobility and persistence in the environment.
- g) Impact to non-target organisms.
- h) Timing relative to vulnerable periods in the pest's life cycle with the least impact on natural enemies.
- i) Ability to produce long-term reduction in the pest.
- j) Ability to be carried out effectively.
- k) Cost effectiveness in short and long term.
- 1) Ability to be measured and evaluated.

8. Implementing the IPM Plan

Field staff play a crucial role in fully implementing the selected IPM strategies. However, management plays a more important role as field staff will be unable to implement IPM unless management provides that staff with the required resources. These resources will include specific training, equipment, time and a shared commitment to implementing IPM. Field staff

will also need time allocated for appropriate monitoring and record keeping as IPM efforts are enacted.

9. Monitoring and Evaluation

With the implementation of an IPM program, staff shall begin an ongoing effort to record relevant details of the IPM program. By keeping comprehensive records of IPM information, evaluation of the effectiveness of the IPM methods can be undertaken to assess how well IPM is working to bring about the desired pest reductions.

Evaluation of monitoring data can also help to clarify areas where staff may need additional training and promote discussion in the evaluation processes. While some IPM data requires detailed record keeping (such as pesticide usage), not all has to be elaborate or time-consuming and can be as simple as keeping a field notebook or logbook.

10. Learning and Revision

The results of the evaluation of the application of specific IPM strategies will provide insights into successes and failures of the IPM program as it is enacted. By reviewing these lessons IPM program managers can learn how to improve the IPM program to operate more effectively or efficiently.

C. Management Methods

Management methods to be incorporated in an IPM approach include:

1. Cultural

These are management activities that prevent pests from developing. This can be due to enhancement of desirable vegetation which is able to out-compete or otherwise resist the pests. Other efforts can be made to enhance the resistance of desirable vegetation such as, but not limited to irrigation, seeding, fertilizing, mulching, pruning and thinning.

2. Physical or Mechanical

Management activities performed using physical methods and/or mechanical equipment such as hand removal, baits, traps, barriers, mowers, brush-cutters, flame or hot water weeders, blades, hoes, string trimmers, or other physical means to control pests (including undesirable vegetation).

3. Biological

Management activities performed using insects, animals, birds, diseases or competing vegetation to control pests (including undesirable vegetation). Appropriate permits should be obtained from WSDA, USDA, EPA or applicable agency before release of any predator. Local noxious weed control boards should be notified of any biological control releases for noxious weed control. Research into the appropriate species for controlling the pest is needed in order for these efforts to be successful.

4. Chemical

Management activities performed using chemical agents registered as pesticides by the Washington State Department of Agriculture.

D. Record Keeping

1. Examples of records that may be maintained as part of an IPM program are:

- a) The agency specific written IPM program kept in accessible location(s).
- b) Site- or pest-specific IPM management plans.
- c) Pest identification and assessment records of documented pests, including date, specific location, name, reference used for identification and/or corroborating expert (if appropriate), stage of life cycle, extent of pest presence and other pertinent information.
- d) Maintenance methods performed to minimize pest populations and enhance healthy plant growth.
- e) Control methods employed per the IPM strategy selected, including dates, location and other pertinent information.
- f) Pesticide application records as required by the WSDA, including but not limited to licensed applicator's name, application target or site, chemical name, brand name, area of application, concentrations used, amount and rate of application, coverage rate, equipment used, weather conditions including temperature and wind, and date and time intervals of application.
- g) Monitoring records documenting site or pest-specific observations that may include results of IPM methods used. Monitoring records are key tools for evaluating management strategies to allow assessment and revision as needed. Revisions should be documented. It should be emphasized that record keeping need not be burdensome. Simple field notebooks or logs can easily cover the majority of records kept, so that follow-up evaluation of what worked or didn't work and what to do differently in the future can be accomplished.

E. Training

The training of permanent and seasonal employees on the basics of the IPM policy, the IPM program and specific maintenance standards and IPM strategies will help ensure that they are understood and consistently followed. Implementing the IPM approach from design through daily maintenance will eliminate unnecessary applications of chemicals that could damage sensitive species including salmonid fishes or their habitat. In addition, full implementation of a well-understood IPM approach will help the County to reduce use of pesticides, save time and money and increase worker safety. Guidelines for developing a training plan are:

1. All staff associated with the planning, design, construction, and maintenance of parklands, roads, rights-of-way, park and ride lots, electrical substations, golf courses, other landscaped buildings and facilities and other areas where vegetation is managed and

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where pests may need to be controlled shall receive an orientation to the IPM policy, the department and/or division specific IPM program and these general guidelines.

- 2. Staff responsible for managing vegetation, including gardeners and laborers, shall receive training on:
 - a) An overview of IPM including identification and life cycles of typical Northwest pests, weeds, and beneficial insects; determining threshold levels for different types of landscapes; and monitoring techniques.
 - b) Noxious weed identification, control and regulations.
 - c) Pesticide laws and safety.
 - d) Working with organic amendments to reduce water, fertilizer and pesticide use.
 - e) How to apply specific IPM Best Management Practices as appropriate.
 - f) Who to contact for help identifying pests
- 3. Staff responsible for maintaining and scheduling irrigation system use shall receive training on:
 - a) Irrigation system maintenance and repair.
 - b) How to schedule irrigation based on vegetation physiology and habitat characteristics (evapotranspiration rates and seasonal fluctuations).
 - c) Backflow prevention.
- 4. To the extent practicable, IPM training can be shared across agencies within King County.

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Section III. Specific Guidelines

A. Waterways and Buffer Zones

King County recognizes the special sensitivity of Puget Sound and the freshwater rivers, streams, lakes, ponds, drainage systems and water quality facilities that fall under their stewardship. Pesticide use guidelines have been developed in an effort to minimize the potential for pesticides to enter waterways and impact these sensitive habitats, including threatened or endangered species.

This subsection establishes guidelines and limitations regarding maintenance methods and materials for use on or near waterways and the lands adjacent to them. It is the intent of these guidelines to complement the special management zones and buffer zones that were established as part of the King County ESA response. Management of existing, developed landscapes adjacent to water bodies is considered maintenance, not precluded by the ESA management and buffer zones. Pesticide use (or restrictions thereof) within ESA management and buffer zones should be consistent with the intent of the zones. Critical or sensitive areas ordinances of local jurisdictions should be consulted as well; the most restrictive rules or guidelines should be the ones followed.

1. Definitions

- a) BIOSWALE is a vegetated drainage ditch or other open water course designed to filter runoff by the direct contact between surface water and the vegetation growing in the channel. A bioswale is an engineered drainage course, part of the surface water management system.
- b) BUFFER ZONE is a corridor of land that is 25 feet in width on the sides of a stream or other body of water. Measurement of this buffer zone begins at the top of the stream bank. Anticipated seasonal or weather related changes affecting water level will be included in the decision making process when dealing with buffer zones. Measurement of the buffer zone in areas adjacent to tidal waters starts at the mean high tide line. Buffer zones may vary depending on the 4(d) rule, the outcome of council decisions, revisions to sensitive area and site alteration ordinances, etc.
- c) WATERWAY refers to an open waterbody such as Puget Sound, a river, stream, lake or pond, and includes a biofilter, pollution reduction facility, roadside ditch or bioswale when water is present.

2. Record Keeping

Records will be kept of all pesticide applications as required by Washington state law (RCW 17.21.100 and WAC 16-228-1320). Additionally, when pesticide application occurs within a buffer zone, this will be clearly noted on the application record to facilitate tracking. The division IPM coordinator will conduct an annual review of pesticide applications to buffer zones and waterways to evaluate the potential for further reducing pesticide use in these areas.

3. General Guidelines for Buffer Zones

When pesticides are applied within a buffer zone, great care will be exercised. The following general guidelines apply to all pesticide applications in buffer zones:

- a) Pesticide selection should consider persistence, mobility, and aquatic toxicity.
- b) Pesticides selection will be carefully reviewed before application in buffer zones of waterways with known populations of federal- or state-listed threatened or endangered species during periods when early life stages are present. Pesticide use in these areas is allowed for the control of State/County listed noxious weed control.
- c) Pesticides should not be applied when weather conditions increase the possibility of runoff or drift (e.g., when wind speed is > 8 mph).
- d) Equipment, including nozzle size, pressure regulation, droplet size, and height of spray wand, should be selected to limit drift.

4. Specific Guidelines for Buffer Zones

Pesticide applications in buffer zones should be consistent with the following specific guidelines based on four classifications (A, B, C, D) that describe their current features, as well as define the differing objectives and maintenance rationales of their care. The matrix following the buffer zone classifications provides pesticides use guidelines for each classification depending on whether they are being used for routine maintenance, noxious weed control or for restoration and construction projects. Each department is encouraged to group individual landscapes or grounds within these Buffer Zone Classification categories.

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Drait King County Integrated Pes	Management Document		
A. Highly Managed Areas	Butter Zone CI B. Intermediate Managed Areas	assifications C. Impacted Natural Areas	D. Intact Natural Areas
Features:	Features:	Features:	Features:
Ornamental landscape	Stream banks have some buffering with predominately native plants	Very limited impact to these areas	Very limited visitor impact
Public access and activity	Some impacts from use and park development apparent	Stream banks have buffering with predominately native plants	Native plant communities exist
High public use	Managed landscapes may be nearby	Limited impacts from use and park development apparent	No nearby developed park areas
May have mowed turf sometimes to edge of waterway	Stream bank erosion may be occurring due to use	Managed landscapes are not nearby	
May have facilities adjacent to water			
May have highly modified stream banks		24	
Often limited plantings in buffer			
Electrical substations			
Vegetation managed for safety and protection of assets			
Objectives:	Objectives:	Objectives:	Objectives:
Healthy plants and turf	Maintain healthy plant buffers	Maintain healthy plant buffers	Maintain healthy plant buffers
Maintain ability to handle high use	Minimize need for chemical intervention	Minimize need for chemical intervention	Low tolerance of invasive plants, non- natives
Minimize need for chemical intervention	Control invasive plants where feasible	Low tolerance of invasive plants	Maximize existing healthy ecosystem functions
Control invasive plants	Minimize impact on buffer	Minimize any impacts on buffer	Minimize any impacts from activities
Safe access	No bare soil areas	No bare soil areas	Control/eradicate noxious weeds
No bare soil areas except where required for protection of assets	Tolerance for natural appearance and weeds	Control/eradicate noxious weeds	
Low tolerance for weeds	Control/eradicate noxious weeds		-
May have high expectation for aesthetics in general			
Control/eradicate noxious weeds			

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Herbicide Use	Activity	D. Intact Natural Areas	C. Impacted Natural Areas	B. Intermediate Managed Areas	A. Highly Managed Areas
Pre-emergent pose safety hazard.	Routine Maintenance	No	No	No	Use only when weeds pose safety hazard.
Herbicide use possible?	During Construction/ Restoration	No	No	No	Use only when weeds pose safety hazard.
Post-emergent herbicide use possible?	Routine Maintenance	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.
	During Construction/ Restoration	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.	Spot spray. Broadcast spray for invasive species only. Cut and treat stems of woody species.	Spot spray and broadcast spray if necessary. Cut and treat stems of woody species.

Use of Herbicides within Buffer Zones of Waterways

5. Pesticide Use within Waterways

The use of pesticides in or on water shall comply with Washington State Department of Agriculture and Department of Ecology regulations. Each department and division should contact the local noxious weed program when managing noxious weeds in aquatic habitats (see Section III.F).

The following describes specific practices that may be used within the actual bodies of water. Pesticides should be carefully considered before being applied in waterways with known populations of federal-listed threatened or endangered species during periods when early life stages are present. This issue was recently addressed in a law suit (EPA Vs. Toxics Coalition) which determined that several pesticides needed additional testing to see if they impacted salmonids. If these pesticides were shown to have an impact, then buffers on pesticide application are legally required

(http://agr.wa.gov/PestFert/natresources/docs/WTCVEPA/(224)%20Order%20Granting%20Inter im%20Injunctive%20Relief.pdf)

- a) Within Streams. In the rare need for control of noxious weeds or invasive weeds or nonnative plants within a stream itself, mechanical and biological means will be utilized where feasible. When these methods are not feasible, emergent weeds may be controlled with a herbicide approved for aquatic use after obtaining appropriate permits from the Washington State Department of Ecology.
- b) Within Pond and Lake Areas. Within a pond or lake, herbicides will be used only for the control of noxious or invasive weeds and non-natives that threaten the health of the habitat. When chemical methods are necessary within a pond or lake, only herbicides approved for aquatic application should be employed and only after obtaining appropriate permits from the Washington State Department of Ecology.

- c) Within stormwater drainage treatment facilities. The facilities intercept stormwater runoff from land surfaces in order to improve the quality of the drainage discharge to natural waterways. For post emergent applications, the buffers of these facilities should be treated as class B streamside buffers.
- d) Within Bioswales. If the bioswale has an outlet to surface water, its treatment will follow the same restrictions as a streamside buffer. If a bioswale does not discharge to surface water, the buffer is not covered under this waterways section of the policy; however, standard IPM guidelines apply.

6. Special Exception Areas

Special exceptions to these waterways and buffer zone guidelines address municipal golf courses:

- a) Waterways and Buffer Zones at Municipal Golf Courses.
 - i) The nature of the current layout of many golf courses places golf greens near to waterways in some limited instances. In the Tri County IPM Guidelines, these specific areas have buffers that are variable in width, and may be smaller than 25 feet. In limited areas, buffers may be reduced to as little as 10 feet due to proximity of golf greens to existing waterways. Special golf course buffer widths should never be less than 10 feet. Locations of these variances should be mapped and recorded. These variance areas are few in number and amount to a very small percentage of overall water.
 - ii) In new construction or renovation and design of golf courses, placement of greens to allow establishment of standard width buffers is recommended. Incorporation of intercepting buffers is also encouraged where feasible. These intercepting buffers can be situated so that any possible runoff flowing towards open water is diverted into planted drainage systems and biofilters.
 - iii) Routine Golf Buffer Maintenance Practices. There should be no application of broadleaf herbicides to turf in buffer areas.
- b) Road Rights-of-Way

Roadside vegetation management within King County varies from urban to rural settings. It is the intention of road and street maintenance divisions under this policy to approach vegetation management from an IPM standpoint that encourages protection of water quality and fish habitat. These specific road right-of-way guidelines apply generally to undeveloped roadways without curbs and sidewalks, and do not apply to such developed street areas as landscaped medians, islands and planter strips; the latter areas are covered under the developed landscapes guidelines in Section III.C. Roadside vegetation maintenance activities are subdivided into the four basic control or management methods that cover the scope of integrated pest and vegetation management. These four areas of control are cultural, physical/mechanical, biological, and chemical, as described in Section II.C. Specific actions within each area are considered BMPs for road right-of-ways.

All four of these integrated options, when used alone or in conjunction with each other, provide positive outcomes to essential functions of the roadway and the safety of the traveling public. Some of these benefits are as follows:

- Reduced icing
- Reduced fire hazard
- Promotion of non-motorized use
- Reduction in the spread, or eradication of noxious weeds and undesirable vegetation
- Limited erosion
- Increased bio-filtration
- Improved visibility of signs and structures
- Facilitation of the inspection and maintenance of other features and structures
- Improved visibility of shoulder for emergencies and obstacles
- Increased sight distance
- When used in conjunction with each other, lower herbicide use.
- i) Cultural Control Methods:
 - Hydroseeding products should not enter flowing water, wetlands, ponds, or lakes.
 - Woody debris resulting from pruning or thinning should be removed from sensitive areas as required, except in the case of large woody debris specifically required to be left in a stream or other waterway as part of fish habitat enhancement plans.
 - Any cuttings of invasive knotweed shall be removed and properly disposed of to prevent the spread of knotweed from fragments.
- ii) Physical/Mechanical Control Methods:
 - Avoid cutting material on the backslope over running water.
 - Pick up litter and woody debris from water, ditches, and slopes in sensitive areas.
 - Recycle wood products when feasible.
 - Mow grass and brush at heights that avoid "scalping" of soil.
 - Any cuttings of invasive knotweed will be removed from and disposed of properly
 - Mow native vegetation at heights that promote its growth.
 - Carry spill kit appropriate for equipment used.
 - Amend soils with compost on a regular basis
- iii) Biological Control Methods:

- Incorporate biological controls, such as use of beneficial predators, into road IPM practices wherever appropriate.
- Obtain appropriate permits.
- iv) Chemical Control Methods:
 - Use only as part of an integrated approach to pest and vegetation management.
 - Follow all Washington State Department of Agriculture regulations pertaining to pesticide application (see Section III.H).
 - Follow the Waterways guidelines in Section III.A when within 25 feet of any waterway.
 - Use only State registered pesticides.
 - Follow all label directions.
 - Do not spray in windy or wet conditions.
 - Do not spray within "Owner Will Maintain" areas.
 - Do not spray within eroded areas where vegetation would be beneficial unless the vegetation are noxious weeds that are legally required to be controlled/eradicated.
 - Replant, reseed in areas that are denuded of desirable vegetation.
 - Carry spill kit appropriate for equipment and pesticide used.
- c) "Owner Will Maintain" Program

When appropriate, participating departments and divisions should offer property owners the option of maintaining the right-of-way adjacent to their property in lieu of regular maintenance activities by King County. The "Owner Will Maintain" program typically applies to owners who wish to maintain their road-side properties to meet applicable standards without the use of herbicides. The "Owner Will Maintain" program should be advertised annually with adequate notice for property owners to participate in the program prior to application of herbicides or other pesticides by the public jurisdiction. Conditions of the agreement as it pertains to adequate control will be at the discretion of the local jurisdiction. Land owners participating in "Owner Will Maintain" program shall be contacted if the County Noxious Weed Control Program finds noxious weeds on their property.

B. Developed Landscapes

Many parks, public grounds, yards surrounding public buildings and other facilities, and groomed roadside medians, islands and planter strips along urban streets are developed landscapes to varying degrees. These landscapes require careful design and maintenance in order to maximize their desired uses while minimizing pest problems. The following specific guidelines apply to these developed areas:

1. Planning and Design

A successful landscape requires comprehensive analysis and planning in a variety of areas when anticipating new site or redevelopment projects. Consider the following when planning or designing a landscape:

- a) Evaluate physical site characteristics (e.g., soil characteristics, slope issues, and proximity to sensitive areas, etc.).
- b) Consider how the site will be used and how it will affect neighboring properties.
- c) Identify existing plants for retention or salvage, as appropriate.
- d) Develop a program theme with stakeholders.
- e) Identify maintenance impacts.
- f) Debrief completed project with team.
- g) Use native plants when practical.
- h) Do not plant species that exhibit invasive characteristics.

2. Drainage

Healthy plants are easiest to maintain when site and soil conditions are suitable for the plants. Drainage patterns, slope, sun exposure, soil type, nutrients present, plant species present, and patterns of use all play a role in determining how plants will grow in a particular location. Most plants do not grow well in saturated soil. Plants need two types of drainage, surface and sub-surface. Planting areas need a surface shape that has no low spots where water can puddle and a slight slope so that some water from heavy rains can run off. Plants need a soil profile that is well drained, where water can percolate through to below the root-zone. Properly designed drainage systems can help provide the correct environment for growing healthy plants. The following are design guidelines to assist in a site drainage plan design:

- a) Ensure the project manager and maintenance supervisors have provided adequate staffing and funding for ongoing maintenance of any drainage plan.
- b) Minimize alteration of natural drainage patterns around existing vegetation that is to be preserved.
- c) Conform to natural drainage patterns.
- d) Provide opportunities for surface runoff of water to replenish the groundwater table.
- e) Minimize soil erosion by dispersing water flow across the ground surface.
- f) Reduce water velocity and increase soil permeability with plantings and organic amendments such as compost or mulch.
- g) On steep slopes or areas that are prone to landslides, avoid using plants that require supplemental irrigation.
- h) Implement erosion control devices as a form of preventative maintenance, e.g., application of compost or other organic soil amendments, slope protective material, protective berms, silt fences.
- i) Avoid installation of permanent irrigation systems in landslide hazard areas.

3. Plant Selection

The successful landscape or grounds maintenance of an area is dependent on the initial plant selection in the design phase. Plant selection should be guided by four criteria:

- a) Aesthetic and thematic schemes. Use of indigenous native plantings should be considered first, especially in large areas. The full range of horticultural species and cultivars may be appropriate for high use, high visibility landscapes.
- b) Match environmental conditions of the site with the cultural requirements of the plant. It is essential that the cultural and environmental requirements of the plants be matched with the site conditions. Healthy landscapes are easiest to maintain when site and soil conditions are proper for growing the plants chosen. Drainage, slope, sun, soil texture and structure, nutrient levels in the soil, plant species and cultivars present, and patterns of use all play a role in determining how plants will grow in a particular location.
- c) Maintenance impacts
 - Pruning. To avoid routine pruning, select plant cultivars based on their size and shape when mature. When specific site issues override pruning concerns and when associated resource impacts are identified, plants requiring frequent pruning may be considered. Plants such as roses and sheared hedges may be appropriate for specialty gardens and selected focal points.
 - Weed management. Plant selection and placement should embrace IPM principles.
 Vigorous groundcovers, mulches, shade canopies and plant spacing are factors that can reduce the need for weed control. Noxious weed laws and quarantines should be followed. In existing plantings, IPM principles should be applied to weeds and other pests.
 - iii) Plant pest management. In new plantings, use species and cultivars that are resistant to insect infestations and plant disease. Only in limited situations (e.g., replacement of ornamental historical plantings) should exceptions occur. It is important to follow IPM principles.
- d) Environmental issues to be considered in plant selection include:
 - i) Provide native wildlife habitat whenever possible, such as when adjacent landscapes currently provide habitat.
 - ii) Select plants with water needs appropriate to the site. Limit high-water-use plants to specialty plantings or where the natural water table will support the plants without supplemental irrigation. Group plants with similar water needs together.
 - iii) Avoid plants that will require significant pest management. Select native plants or disease resistant cultivars and avoid insect-prone species.
 - iv) Avoid plant species with invasive growth or seeding habits. See Section III.F for more guidelines on noxious weeds.
 - v) Prevent surface soil erosion by covering soil with plants or mulch.
 - vi) Select plants with similar horticultural needs for groupings.

vii) Avoid the use of commercial wildflower seed mixes. These tend to contain weed seeds and introduce exotic invasive plants and noxious weeds. If a seed mix is used, use only weed-free mixes from reputable local sources.

4. Plant Health

Healthy plants are better at reducing pest infestations and out-competing weeds, and they need less water. The following are guidelines for environmentally responsible maintenance of plant health:

- a) Plant in the fall, when feasible, to take advantage of fall and winter rains and to reduce the need for supplemental irrigation.
- b) Prior to planting, assess and monitor soil conditions. Soil tests are the most effective method of determining soil conditions. Monitor regularly and modify practices accordingly. If necessary, amend the soil appropriately; include organic material such as compost.
- c) When replanting beds or turf areas, mature compost (about 20 percent by volume) should be incorporated to a depth of 8 to 12 inches or, preferably, the full rooting depth of the plants to be installed.
- d) Base fertilizer applications on soil test and plant requirements. Fertilizer sources should be chosen to minimize leaching and toxicity. Natural organic and synthetic slow-release fertilizers should be considered before soluble fertilizer sources. Avoid applying phosphorus unless a soil test indicates that it is necessary.
- e) Avoid over-watering plants to conserve water, improve plant health and minimize leaching into surface and ground water. Over-watering is a primary cause of plant disease and demise.
- f) Determine the seasonal evapotranspiration (ET) rate for the site and use it to estimate the amount of irrigation water needed to replace that lost as ET. During Puget Sound summers the average ET is about one inch of water per week (somewhat less than one inch in May, June, and September, and somewhat more than one inch in July and August).
- g) Use weed-free compost, gravel, and mulch materials.
- h) If a site has large established populations of invasive plants, remove the invasive plants prior to establishing new plantings.

5. Mulch

Using organic material as a soil topping improves soil conditions by:

- a) Reducing evaporation.
- b) Improving water infiltration.
- c) Reducing run-off and erosion.
- d) Enriching soil fertility and texture.
- e) Immobilizing or degrading pollutants.

f) Inhibiting the growth of competing, nutrient-absorbing weeds.

The following are guidelines for using mulch in plantings:

- a) Do not apply mulches where they may migrate or leach nutrients or tannins into waterways.
- b) Maintaining a 2-inch minimum layer of mulch in planted areas is recommended.
- c) A mulch-less zone around the base of tree trunks is recommended to discourage root-rotting fungi.
- d) Wood chips should be used whenever appropriate. On-site chipping simplifies the maintenance process by providing chips that are effective, free, readily available, and have a natural look. In addition, using wood chips generated on-site for mulch reduces the need to haul green-wastes, thereby saving energy. It should be noted that, where wood chips are used for mulch, nitrogen might need to be added (5 pounds/1000 square feet).
- e) Other acceptable materials include compost, shredded bark, Steerco, Groco, or Nutra Mulch.
- f) When purchasing mulch materials, specify that they should be "weed- and diseasefree."
- g) Unless disease problems are present, allow leaf litter to accumulate upon the soil within planted areas that are not intended to have a manicured appearance.
- h) Prevent weed infestations by covering mulch, soil, and compost piles with plastic tarps, as needed.

6. Automatic Irrigation Systems

Efficient use of irrigation water conserves water and reduces runoff. Irrigation of landscapes is one of the most publicly visible landscaping activities, reinforcing the need for effective water management by public entities. Agencies should seek the advice of their local water purveyor for conservation planning. The following guidelines will assist in conserving water for landscape maintenance:

- a) Identify site irrigation needs based on use, plant needs, soil permeability, and topography.
- b) Use water efficiently.
 - i) To achieve maximum efficiency, perform system maintenance and repairs.
 - ii) Check and repair all problems at system turn-on in the spring.
 - iii) Inspect backflow preventors annually, consistent with state law.
 - iv) Conduct a complete system audit during design and when major changes occur to the system.
 - v) Once an effective schedule is established, it should be monitored bi-weekly to avoid "brown outs."
 - vi) Avoid irrigating in the heat of the day.
- c) Conserve water.

- i) Reclaimed water is desirable where it is available to promote the conservation of limited potable water
- ii) Cut back on irrigation as weather indicates. Use historic evapotranspiration data for your area.
- iii) Reduce irrigation incrementally in late summer.
- iv) Many planting areas can be irrigated less as the plants mature and become established. Plantings designed with native or drought tolerant species should gradually be weaned from all irrigation on a 3 to 5 year schedule.
- d) Create a permanent irrigation record system that documents where, when and how much water was used to "fine tune" a system, rather than recreate it each year.

C. Lawns and Turf

Lawns and turf areas are an important subset of developed landscapes that demand specific attention regarding IPM implementation. Lawns are used for a variety of purposes. Lawn maintenance can significantly affect the environment in a negative way if not carried out with attention to proper environmental practices. The intended use of a lawn or turf area will determine many of the maintenance specifics. Healthy lawns can resist disease, pests and drought damage and can out-compete most weeds without reliance on chemicals. Properly maintained lawns also require less supplemental irrigation. Some lawns are non-irrigated or minimally irrigated and brown out in the summer. Where it is possible, irrigate deeply once each summer month; this will help keep the crowns of the desired grasses alive. Continue mowing throughout the summer months to reduce the quantity of weed seeds produced. Turf that is heavily used should be irrigated, if possible, to avoid serious degradation. Improving cultural practices such as fertilizing, over-seeding, and aerating can make a lawn more drought resistant. The following guidelines will assist in maintaining lawns and turf areas in an environmentally responsible manner:

1. Assess Turf Condition.

Assess the condition of the lawn or turf. Look for turf density, turf species present, percent weed cover, and color. Healthy lawns in the Puget Sound region are a medium green color.

2. Determine Maintenance Effectiveness.

Review the maintenance schedule to assess effectiveness. Consider whether acceptable results can be achieved at lower maintenance levels or significant improvements can be realized through minor program adjustments. The following areas should be addressed:

- a) Soil testing and results.
- b) Mowing and edging.
- c) Irrigating.
- d) Fertilizing.
- e) Hand weeding.
- f) Pesticide application.

- g) Aerating.
- h) De-thatching.
- i) Overseeding.
- j) Drainage.
- 3. Develop Maintenance Standards and Thresholds

Develop maintenance standards and threshold levels for categories of use and types of turf. For example, low use, low visibility turf areas have higher weed and pest thresholds than heavily used and high visibility lawns do. Develop maintenance schedules that reflect the assessment for each of the elements of 2 above. Use the following maintenance practices for high use turf areas:

- a) In general, mow high, mow often, and leave the clippings. Mow at correct mowing height for the grass species in the turf. Mow at least weekly in spring.
- b) Fertilize lightly in the early fall and late spring with a natural organic or slow-release fertilizer.
- c) Water deeply to moisten the root zone, but water infrequently. Lawns newly planted in spring, however, need frequent watering.
- d) Periodically top dress with an organic amendment such as compost.
- e) Avoid using quick-release fertilizers.
- f) Do not use weed and feed products.
- g) Evaluate the need for, and impacts of use before applying pesticides. Ensure that all regulations related to pesticide application are followed if use is approved.
- h) Follow buffer recommendations contained in the Waterways section (3.A) where lawns abut streams, lakes or other waterways.
- i) Annually aerate lawns in the spring or fall to improve root development; high-use turf should ideally be aerated two to three times a year.
- j) Consider purchasing electric mulching mowers, when new machines are needed.

D. Natural/Open Spaces

- 1. Natural or open space lands should be managed under the following general guidelines:
 - a) Conserve wildlife habitat and foster native species. This may include restoring degraded natural areas to increase their habitat and educational values.
 - b) Maintain, enhance and restore vegetation for its ecological and wildlife habitat value and visual benefits.
 - c) Emphasize the use of drought tolerant plants and native vegetation in site development and restoration to minimize the need for irrigation and reduce damage caused by non-native species.
 - d) Use proper plant selection with regard to natural site moisture conditions.

- e) Work with other agencies to maintain the necessary quality and quantity of water in streams and lakes to provide for plant communities, suitable fish and wildlife habitat and recreational use.
- f) Develop and apply environmentally sensitive maintenance techniques and BMPs as responsible stewards and caretakers of the system.

E. Noxious Weeds

Noxious weeds, as defined by Chapter 17.10 RCW, are non-native plants that are highly destructive, competitive or difficult to control. They have been introduced accidentally or as ornamentals, can impact or destroy native plant and animal habitat, reduce crop yields, poison humans and livestock, clog waterways, reduce recreational opportunities and lower land values. A state noxious weed list is adopted annually in WAC Chapter 16-750. State law requires both private and public landowners to eradicate certain plants, prevent seed production and prevent the spread of state listed noxious weeds. Failure to comply with the state weed control law can result in an enforcement action or civil infraction.

1. Noxious Weed Classes

The three classes of noxious weeds are:

- a) Class A weeds have a limited distribution in Washington. Control and eventual eradication of these species is required in all of Washington State.
- b) Class B weeds are currently limited to portions of Washington. Class B weed lists will differ from county to county based on the weeds' distribution and each county weed board's policy. Control of certain Class B weeds may be required.
- c) Class C weeds are common throughout Washington. Counties can select priority weeds off the Class C list for mandatory control. Contact your county weed board for a full noxious weed list for your county. The state noxious weed list is updated annually. The County Weed Control Boards also adopt a weed list annually. The King County Noxious Weed List is available on the web (www.kingcounty.gov/weeds). Contact the King County noxious weed control program for educational and technical assistance on identifying, controlling, and preventing noxious weed infestations at 206-296-0290.

2. Noxious Weeds and IPM

A few of the IPM techniques to follow when dealing with noxious weeds are:

- a) Prevent noxious weed problems; learn how to identify noxious weeds, learn strategies for controlling or eliminating them.
- b) Monitor for the presence of noxious weeds and weed damage.
- c) Treat noxious weed problems to reduce populations using strategies that may include biological, cultural, mechanical, and chemical control methods – always consider human health, ecological impact, feasibility, and cost-effectiveness.
- d) Minimize the use of chemical pesticides by using alternative control methods when appropriate and by using chemical controls correctly.

e) Evaluate the effects and efficacy of noxious weed control treatments. The methods of control include pulling, repeated mowing (effective in controlling only certain species), digging to eliminate all roots and rhizomes, cutting and bagging to remove seeds, use of landscape fabric, replanting with appropriate species, and in some cases herbicide applications. It is usually necessary to constantly check the site for newly emerging seedlings and plants missed in previous control efforts.

3. Additional Guidelines

Additional guidelines regarding noxious weeds include:

- a) Learn to recognize and eliminate noxious and invasive weeds before they establish.
- b) Choose non-invasive species for landscapes and gardens.
- c) Prevent noxious weed infestations by checking vehicles, clothing and equipment for weeds and seeds.
- d) Remove or control weeds safely and appropriately. The most important step is to control seed production by cutting down and bagging noxious plants.
- e) Protect yourself when working with noxious weeds; some, such as hogweed and leafy spurge, contain toxins that can damage skin on contact.
- f) Replant with appropriate species to prevent weeds from returning.
- g) Dispose of noxious weeds and weed seeds properly. Consult with the County program (contacts above) for specific recommendations. Do not compost any noxious weed debris that may contain seeds or plant parts that might take root.
- h) In cases where noxious weeds may impact habitat (aquatic or terrestrial), control measures may need to be taken to restore the habitat functions.
- i) Clean equipment, shoes, clothing before moving off of work site if the site is contaminated with noxious/invasive species.

4. Common Noxious Weeds

Some of the common noxious weeds found in this region are:

- a) Giant hogweed predominantly an urban weed and an escaped garden ornamental, its sap can cause skin blistering and scarring. Washington State law requires that giant hogweed be eradicated.
- b) Tansy ragwort likely to infest pastures and roadsides, it has toxins that can be fatal to cows and horses and can be found in milk and honey.
- c) Spotted and diffuse knapweeds threaten wildlife habitat, pastures, and grasslands by displacing beneficial species.
- d) Purple loosestrife grows in wetlands and along lakes, rivers and streams; it chokes out wildlife habitat and clogs drainage ditches and irrigation canals. Purple loosestrife now invades wetlands in numerous states at an estimated cost of \$45 million a year for control and loss of forage crops, crowding out native plants and endangering the wildlife that depend on the native plants.

F. Electrical Facilities

1. Substation Gravels

Electrical substations, switchyards, and other installations housing electrical equipment typically have a 6-12" gravel surface as an insulating barrier above a subsurface electrical grounding mat. The gravel protects workers from voltage differences and high electrical currents that can occur during electrical fault episodes. Weeds growing in electrical substation gravel compromise the gravel's ability to insulate workers from the ground mat, which increases the risk of electrical hazards. The following guidelines will assist in maintaining electrical substations in an environmentally responsible manner that is protective of worker safety:

- a) Utility electrical engineers should evaluate the potential electrical effect of vegetation inside substations depending on the type of substation or electrical installation. Develop maintenance standards which define the level of weed management necessary for safety. For example, receiving substations, cable terminuses and switchyards which pose the greatest electrical hazards may have a zero tolerance for vegetation and need to be maintained weed-free. Other installations which pose lesser risk, such as 4 kV stations and enclosed industrial transformers, may require less rigorous weed control, e.g., to avoid trip hazards or impeding work inside a confined area.
- b) Use IPM strategies to control weed growth over the short-term, including:
 - i) Burning weeds with flame or steam.
 - ii) Mechanical removal.
 - iii) Elective use of pre- and post-emergent herbicides.
- c) When feasible, use long-term solutions such as:
 - i) Replacing gravel more frequently.
 - ii) Designing new substations, or renovating existing installations, with electrical ground mat/insulating systems which prevent weed growth or preclude need for rigorous weed control.

2. Electrical Transmission Rights-of-Way

As a matter of public safety and system reliability, electric utility rights-of-way (ROW) have a continuing need to preclude the establishment and subsequent growth of vegetation into and close to overhead electric lines. The situations on the electric utility rights-of-way that necessitate vegetation management are:

- a) Tall-growing trees below the overhead electric lines that will grow upwards into the conductors (electric lines).
- b) Tall-growing "danger trees" encroaching from the ROW's edge that may fall into the conductors.
- c) Vegetation blocking access to the transmission system.
- d) Noxious weeds.
- e) Aesthetic improvement of ROWs.

The following guidelines utilize an IPM approach to ROW maintenance which provides a safe and environmentally sound program:

- a) Emphasize proper selection and placement of trees on the ROW.
- b) Improve streamside management techniques (erosion control, riparian habitat enhancement, improve fish passage).
- c) Encourage low-growing native species.
- d) Use beneficial insects to control noxious weeds.
- e) Use manual or mechanical vegetation removal methods.
- f) Selectively use herbicide for cut stump treatment, applied only to tall growing tree species to reduce resurgent tree growth problem.
- g) When pesticide is needed, select the proper pesticide best suited to control that pest.

G. Pesticide Handling

When a decision is made to use a pesticide as part of a specific IPM strategy, precautions should be followed for storage, mixing, loading, application, cleaning and disposal, to ensure public health and safety as well as environmental protection.

1. Storage Areas

Storage areas should be carefully surveyed. Spills are very likely where containers are handled. Good storage practices include:

- a) Provide secondary containment. Store pesticides in an area that will keep any spilled material in a bermed or enclosed area with a concrete floor and no drain until clean-up can occur. High-sided plastic containers offer at least interim protection, depending on the product being stored.
- b) Store pesticides in their original containers.
- c) Keep pesticides out of the reach of children, pets, and livestock.
- d) Store liquids on the bottom shelf.
- e) Do not store bagged material below liquids.
- f) Separate insecticides, herbicides, etc.
- g) Inspect containers periodically for leaks and spills.
- h) Determine whether stored products can withstand freezing and store appropriately.
- i) Rotate stock; use the oldest first.
- j) Provide adequate ventilation.
- k) Store Personal Protective Equipment in a separate location.
- 1) Keep labels and MSDSs current and available on site.

2. Mixing and Loading

Pesticides can be spilled during mixing and loading. If spilled on the ground, they can eventually contaminate groundwater. If spilled on a paved area, they can eventually wash into floor or storm drains. This should be avoided.

- a) Read the label thoroughly before mixing and follow all directions carefully. Handle pesticide concentrates carefully to avoid accidental spills and personal harm.
- b) Because the applicator is handling concentrated product, this is the most dangerous phase of pesticide use. Be sure to wear all Personal Protective Equipment (PPE) required by the label.
- c) Measure accurately. It is illegal to mix pesticides at rates higher than those listed on the label.
- d) Calculate the area to be treated and the amount of material needed carefully. Calibrate a equipment accurately. Mix only the amount needed.
- e) Avoid contaminating water supplies by avoiding back-siphoning while adding water to tanks.
- f) Triple rinse containers immediately upon emptying. Pour rinsate into application tank to use in subsequent treatments. Make sure containers are appropriately marked or labeled.

3. Application

When mixing and applying pesticides, all label precautions must be followed. It is a violation of federal and state laws to disregard label directions.

- a) Spot treat only the area or pest where the problem occurs, following the selected IPM strategy. Avoid broadcast application.
- b) Follow label directions for PPE and for weather and other conditions appropriate for treatment. Do not spray or otherwise treat if it is too windy (> 8-10 mph) or too wet. The pesticide should reach only the intended target.
- c) If pesticide is spilled on skin or clothing, remove clothing and wash skin thoroughly.
- d) Leave no-spray buffer strips near surface waters. See Section III.A for specific guidelines.
- e) Be prepared for spills. Have clean-up materials available for immediate use.
- f) Keep people and animals off of sprayed areas as noted in the label directions.
- g) Post appropriate signage at applied areas, following WSDA regulations.

4. Cleaning

Cleaning of pesticide application tools presents another significant opportunity for spills or other contamination incidents. Caution should be exercised.

a) Clean equipment after each use unless it will be used for the same chemical the next time.

b) Rinse equipment thoroughly; triple rinsing is the standard. Rinsate should be saved for use in the next application. If rinsate is used in further applications, it must be applied according to label directions and the selected IPM strategy.

5. Disposal

Containers, equipment and unused, surplus, or waste pesticide product must be disposed of in ways protective of public safety and the environment.

- a) Properly dispose of empty containers. Triple-rinsed plastic containers should be recycled through the Plastic Pesticide Container Collection Program run by Washington Pest Consultants Association 509-457-3850. Thoroughly emptied bags and triple-rinsed liquid containers that cannot be recycled can usually be disposed of at a solid waste facility; follow label directions and advice of the King County solid waste characterization program 206-296-4633.
- b) Rotate stock of chemicals so the oldest is used first; thus reducing the need to dispose of outdated chemicals.
- c) Some pesticides are ineffective if stored at freezing temperatures; read the labels and store appropriately to avoid having to dispose of frozen products.
- d) Surplus pesticide which is still usable and which would meet the conditions for use in the King County IPM program (i.e., not banned or restricted, and not surplused because it is found to be too hazardous, toxic, mobile or other detrimental reason) may be referred to the Industrial Materials Exchange ("IMEX") at 206-296-4899 to find an appropriate user.
- e) Unusable, waste pesticide must be disposed legally, usually as a hazardous waste. Follow all applicable laws and regulations, using a licensed hauler and permitted treatment, storage and disposal facility if required. The Washington State Department of Agriculture offers a Pesticide Waste Disposal Program where unusable pesticides might be able to be disposed at no cost. Regional events are held around the state as funding allows. There is no charge to participate in these disposal events. Contact WSDA at 360- 902-2056 for more information or to preregister for an event.

King County WTD Barton CSO Control Project

APPENDIX F

GSI MAINTENANCE REFERENCE LIST
APPENDIX F

GSI MAINTENANCE REFERENCE LIST

PART 1 GENERAL

1.01 PURPOSE

A. The primary purpose Barton CSO Control Project Facilities is to intercept the stormwater runoff from the street gutters and sidewalks into the bioretention swales for treatment and into the UIC wells for deep infiltration in order to reduce the amount of stormwater flowing into the combined sewer system and causing a CSO event downstream at the Barton pump station. Gutter flow discharges into the bioretention swales via drain curb cuts. Stormwater the filters downward through the bioretention plants and soil for treatment. Once it has been filtered it flows into an underdrain pipe that conveys the flows to a UIC well located in a MH for deep infiltration.

1.02 SUMMARY

A. This Section provides a list of recommended publications, resources and references for use by maintenance personnel to ensure that the system will function as intended for CSO control.

1.03 RECOMMENDED PUBLICATIONS, RESOURCES AND REFERENCES

- A. General Gardening
 - 1. King County Going Native brochure Planting techniques and suggested native plants and and layouts <u>http://your.kingcounty.gov/dnrp/library/2003/gonative.pdf</u>
 - 2. Seattle Tilth: A non-profit organic gardening and urban ecology organization. Their website provides links to information on organic gardening, soils, plant selection and many other topics. Their Maritime Northwest Garden Guide may be purchased from their website. http://www.seattletilth.org/
 - 3. Seattle Public Utilities: This agency provides information on natural systems drainage, lawn care, plant selections, water use and other topics. http://www.seattle.gov/util/EnvironmentConservation/MyLawnGarden/index.htm
 - 4. Sunset Western Garden Book, 2001 Edition by Kathleen Norris Brenzel, 2001
 - 5. WSU Extension Gardening Fact Sheets http://county.wsu.edu/king/gardening/mg/factsheets/Pages/default.aspx
 - 6. WSU Extension Planting Landscape Plants Fact Sheet http://county.wsu.edu/king/gardening/mg/factsheets/Fact%20Sheets/Planting%20Techniqu es%20for%20Landscape%20Plants.pdf
 - WSU Snohomish County Extension An organization that provides year-round advice on landscape issues, such as pests, diseases and plant selection. They are available weekdays by phone at (425) 338-2400. <u>http://snohomish.wsu.edu/</u>
- B. Plant Selection and Identification
 - 1. <u>A Field Guide to the Common Wetland Plants of Western Washington & Northwestern</u> <u>Oregon</u> by Sarah S. Cooke, 1997
 - 2. <u>Plants Of The Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska</u> by Pojar and MacKinnon, 2004
 - 3. Right Plant, Right Place by Nicola Ferguson, 1984

C. Plant Maintenance

- 1. Tri-County Integrated Pest and Vegetation Management Guidelines <u>http://www.lhwmp.org/home/ChemToxPesticides/documents/IPMTriCountyGuidelines.pdf</u>
- 2. <u>Cass Turnbull's Guide to Pruning: What, When, Where, and How to Prune for a More</u> <u>Beautiful Garden</u> by Cass Turnbull, 2004



- 3. <u>Pruning Made Easy : A gardener's visual guide to when and how to prune everything, from</u> <u>flowers to trees</u> by Lewis Hill, 1998
- 4. <u>Pruning and Training: A fully illustrated plant-by-plant manual</u> by Christopher Brickell and David Joyce, 1996
- 5. <u>The Compost Tea Brewing Manual</u> by Dr. Elaine Ingham, 2005 (5th ed.)
- D. Disease and Pest Control
 - 1. <u>American Horticultural Society Pests and Diseases: The Complete Guide to Preventing,</u> <u>Identifying and Treating Plant Problems</u> by Pippa Greenwood and Andrew Halstead, 2000
 - Journal of Pesticide Reform Nonchemical Methods for Removing Unwanted Blackberry Plants <u>http://www.pesticide.org/solutions/home-and-garden-toolbox/weed-</u> solutions/blackberries
 - 3. King County Department of Natural Resources This agency provides information on a variety of natural lawn and garden care topics. Detailed information on pest and weed-identification and control are available. http://www.kingcounty.gov/environment/stewardship/nw-yard-and-garden.aspx
 - King County Noxious Weed Control Brochures
 <u>http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/brochures-</u>reports.aspx
 - 5. <u>The Organic Gardener's Handbook of Natural Insect and Disease Control: A Complete</u> <u>Problem-Solving Guide to Keeping Your Garden and Yard Healthy Without Chemicals</u> by Barbara W. Ellis, 1992
 - TNC Weed Management Documents for Reed Canary Grass, English Ivy and Himalayan Blackberry <u>http://www.invasive.org/gist/moredocs/phaaru01.pdf</u>

http://www.invasive.org/gist/moredocs/hedhel02.pdf http://www.invasive.org/gist/moredocs/rubarm01.pdf

- 7. Washington Department of Ecology Mosquito Control http://www.ecy.wa.gov/pubs/0310023.pdf
- WSU Extension Insecticidal Soaps Info Sheet <u>http://spokane-</u> <u>county.wsu.edu/spokane/eastside/Fact%20Sheets/C183%20Insecticidal%20Soaps%2005.</u> <u>pdf</u>
- E. Irrigation
 - 1. Rain Bird Winterization Guide www.rainbird.com/documents/diy/WinterizationGuide.pdf
- F. Additional resources and references
 - 1. King County Stormwater Services <u>http://www.kingcounty.gov/environment/waterandland/stormwater/problem-investigation-line</u>.
 - 2. Department of Ecology Stormwater Management Manual for Western Washington, 2012 Edition, Volume V.
 - 3. Department of Ecology Guidance Document Western Washington Low Impact Development (LID) Operations and Maintenance (O&M), Current addition.
 - 4. Low Impact Development Technical Guidance Manual for Puget Sound, December 2012, Washington State University Extension and Puget Sound Partnership.
 - 5. Washington State Department of Ecology 2006 Guidance for UIC Wells that Manage Stormwater.
 - 6. Washington Administrative Code 173-160, Minimum Standards for Construction and Maintenance of Wells.
 - 7. City of Seattle Standard Specifications for Road, Bridge and Municipal Construction, 2011 Edition.
 - 8. City of Seattle Standard Plans, 2011 Edition;



Seattle Department of Transportation Director's Rule 5-2009 for Street and Sidewalk Pavement Opening and Restoration (current edition) 9.

APPENDIX G

CHECKLISTS



GSI Surface Facilities Maintenance Checklist for Establishment





Street Name (btw streets: intersectio	n to intersection):		
Checked By:	Ph:	Date of Site Visit:	Time of Site Visit :
Date of Last Inspection:	As-Built Plan Available Yes 🗆 No 🗆	Does site need maintenance action? (Yes, if condition/function Moderate or Low)	Ok Action Required
Weather at time of site visit:		Does site need follow-up review upon completion of maintenance action (condition moderate or low)?	Ok Action Required
Purpose of visit: Check vegetation Check drain inlets, grates, curb cuts & weirs Check soils in swale 	 Check swales before/after storm event Check paved paths & sidewalks Check spill/ pest Other 	Rain Precipitation (inches) in last 72 hours (note source for information):	
Vegetation - see page 2		T	1
Drain Structure Inlets, Grates, Curb Cuts	& Weirs		
HIGH	MODERATE	LOW	
 Facility is ready for a storm event: Minor blockage from sediment or vegetation, no damaged structures, and no ponding. 	 Facility is partially ready for a storm event: Moderate blockage from sediment or vegetation, some damaged structures, and/or some ponding. 	 Facility is NOT ready for a storm event: Heavy blockage from sediment or vegetation, many damaged structures, and/or ponding. 	Comment:
 There is minor blockage from plants at drain curb cuts, weirs, and CB grates. 	 There is moderate blockage from plants at drain curb cuts, weirs, and CB grates. 	There is heavy blockage from plants at drain curb cuts, weirs, and CB grates.	Comment:
 There is minor amount of trash, debris, fall leaf litter or sediment at drain curb cuts, weirs, and CB grates. 	 There is moderate trash, debris, fall leaf litter and sediment at drain curb cuts, weirs, and CB grates. 	 There is heavy amounts of trash, debris, fall leaf litter and sediment at drain curb cuts, weirs, and CB grates. 	Comment:
 No damaged drain curb cuts, grates or weirs. 	 One or two damaged drain curb cuts, grates or weirs. 	 Several damaged drain curb cuts, grates or weirs. 	Comment:
Soils in Swale			
HIGH	MODERATE	LOW	
 Minor erosion, channelization or scouring with less than 25% bare spots. Settlement is less than 1 inch. 	 Moderate erosion, channelization or scouring with less than 40% bare spots. Settlement is between 1" and 3" inches. 	 Heavy erosion, channelization or scouring with greater than 40% bare spots. Settlement is greater than 3 inches. 	Comment:
 Soil is loose, not compacted and water drains within 24 hours and is not ponding. 	 Soil is slightly compacted and/or signs of slower infiltration. 	□ Soil highly compacted and water is ponding.	Comment:
Paved Paths & Sidewalks - check 1X min.	per year		
HIGH	MODERATE	LOW	
Less than 25% of pavement is covered with Moss, debris, leaves and sediment.	 Between 25-40% of pavement is covered with Moss, debris, leaves and sediment. 	□ More than 40% of pavement is covered with Moss, debris, leaves and sediment .	Comment:
There are no grade changes, cracks or upheaval. The surface is smooth.	There are slight grade changes, cracks or upheaval. The surface is moderately smooth.	There are grade changes greater than 1" or significant cracks or upheavals. The surface is uneven or very rough.	Comment:
Spill Prevention and Response, and Pest	Control		
	HIGH		
 Exercise spill prevention measures when are prohibited in GSI. Clean up spills as soon as possible to pre Management, for spill prevention and response 	ever handling or storing potential contaminants. F event contamination of stormwater. See O&M Man inse.	ertilizers, Herbicides, Fungicides and Insecticides ual and follow Specification 01560, Environmental	Comment:
 Insects: No standing water observed in th Rodents: Few or no rodent holes are pres 	e basin for time periods suitable for insect develo sent.	pment (designed to drain in 24 hours).	Comment:

GSI Surface Facilities Maintenance Checklist For Establishment

Barton CSO Control Project with GSI



vegetation			
HIGH	MODERATE	LOW	
Vegetation at intersection is under 24	D Vegetation is slightly over 24 inches at	D Vegetation at intersection is over 24 inches.	Comment:
inches. Vegetation is clear from sidewalk,	intersection and slightly over 36 inches along	Vegetation overhangs sidewalk, curbs and/or	
curbs and ramps. Visibility through planter	swale. Vegetation partially overhangs	ramps. Predominant vegetation along swale is	
is good. Perennials and grasses are	sidewalk, curbs and/or ramps. Visibility is	over 36 inches and visibility is impaired	
trimmed.	partially impaired through planter. Perennials	through planter. Perennials and grasses are	
Fire hydrant access clearly visible and	and grasses are not trimmed.	not trimmed.	
accessible .	Fire hydrant access clearly visible and	Fire hydrant access clearly visible and	
	accessible .	accessible .	
Swale bottom coverage by emergents,	Swale bottom coverage by emergents,	Swale bottom coverage by emergents,	Comment:
vegetation and mulch is 90%.	vegetation and mulch is between 75% and	vegetation and mulch is between 60% and	
	100%.	75%.	
Minor amount of trash, pet waste. No	Moderate amount of trash, pet waste. No	Heavy amount of trash, pet waste, leaf litter	Comment:
contaminants.	contaminants.	and/or downed branches. No contaminants.	
Little or minor amount of weeds (Less	Between 15% and 35% of the vegetation	□ Great than 35% of the vegetation are weeds.	Comment: Estimate percent coverage of
than 15% of the vegetation are weeds). No	are weeds. Less than 2% noxious weeds	Greater than 2% noxious weeds present. Goal	representative 10 square foot area.
class A, B, C or non-regulated noxious	present. Goal is for no noxious weeds.	is for no noxious weeds.	
weeds present.			
Mulch covers 100% of the swale side	Mulch covers at least 70% of the swale	Image Mulch covers at least 60% of the swale side	Comment:
slopes and is approximately 3" deep.	side slopes and is at least 2" deep.	slopes or is less than 2" deep.	
Pruning: Branches meet clearance over	Pruning: Branches meet most clearances	Pruning: Branches do not meet clearance	Comment:
sidewalk (8') over road (14'). Accent shrubs	over sidewalk (8') and road (14'). Accent	over sidewalk (8') and road (14'). Accent	
pruned.	shrubs need pruning.	shrubs need pruning.	
Plants species are growing well together	One plant species is overtaking other	More than one plant species is overtaking	Comment: Bare spot is an area of dead or
and not blocking drainage. Pruning is easy	plants and/or pavement and plants are	other plants and/or pavement and plants are	missing plants or an area without mulch.
and not frequently required. No bare spots.	blocking drainage. Pruning for that species is	blocking drainage. Pruning is intense and	
	frequently required. Consider removal of	frequently required. Consider plant species	
	selective plants.	replacement.	
At least 95% of planted vegetation is	Between 60%-95% of planted vegetation is	Less than 60% of planted vegetation is	Comment: Provide Pictures of Stress or Dead
healthy and with a generally good	healthy and with a generally good	healthy and with a generally good appearance.	Plants
appearance. Plants are healthy and	appearance. Plants exhibit signs of moderate	Plants exhibit signs of significant stress,	
growing, minor amount of wilting, spotting,	stress, wilting, spotting or holes in leaves,	wilting, spotting or holes in leaves, broken	
holes in leaves, broken leaders, dead	broken leaders, dead wood, suckers or	leaders or branches, leaning trees.	
wood, suckers or branches, trees are	branches, leaning trees.		
plumb.			
Irrigation system is working, no broken	Irrigation system is working, a few broken	Irrigation system is not working. Coverage is	Comment: Perform annual backflow test.
heads, equipment or lines. Coverage is	parts. Coverage is slightly uneven. Broken	uneven, areas unusually dry or wet. Soils	Startup in spring and winterize in the fall.
even.	equipment or lines to be capped and hand	washed out. System needs immediate repair.	
	water until system is repaired.		
Other Comments or Issues?			

Conversations with Home Owners:

GSI Storm Drainage System Maintenance Checklist

Barton CSO Control Project



Street Name (btw streets: intersection	n to intersection):		
Checked By:	Ph: Email:	Date of Site Visit:	Time of Site Visit :
Date of Last Inspection:	As-Built Plan Available Yes 🗉 No 🗆	Does site need maintenance action? (Yes, if Condition Moderate or Low)	Ok Action Required
Weather at time of site visit:		Does site need follow-up review upon completion of maintenance action?	Ok Action Required
Purpose of visit: Routine Maintenance Check swales before rain event 	 Check swales after rain event *Annual Inspection of CB, UMH, COs Other 	Rain Precipitation (inches) in last 72 hours (note source for information):	
Catch Basins, Drain Curb cuts and Storm	Drain Pipes Discharging to Swales		
HIGH	MODERATE	LOW	
 There is minimal trash, debris and sediment at drain curb cuts, weirs, and CB grates 	 There is moderate trash, debris and sediment at drain curb cuts, weirs, and CB grates 	 There is significant trash, debris and sediment at drain curb cuts, weirs, and CB grates 	Comment:
 There is none to minimal blockage at drain curb cuts, weirs, pipe outfalls and CB grates 	□ There is moderate blockage at drain curb cuts, weirs, pipe outfalls and CB grates	There is significant blockage at drain curb cuts, weirs, pipe outfalls and CB grates	Comment:
□ No damage to interior of CB*	In Minor damage to interior CB*	Major damage to interior of CB*	Comment:
Underdrain Maintenance Holes (UMH, lab	eled "GSI DRAIN" on lid), Cleanouts and Und	lerdrain Pipes	
HIGH	MODERATE	LOW	
 There is minimal trash, debris and sediment in Underdrain MHs 	 There is moderate trash, debris and sediment in Underdrain MHs 	 There is significant trash, debris and sediment in Underdrain MHs 	Comment:
 There is none to minimal blockage at Underdrain Pipe 	 There is moderate blockage at at Underdrain Pipe 	 There is significant blockage at at Underdrain Pipe 	Comment:
No damage to interior of MH or Cleanout *	 Minor damage to interior of UMH or Cleanout* 	 Major damage to interior or MH or Cleanout* 	Comment:
			1
Debris is street upstream of bioretention			Т
HIGH	MODERATE	LOW	Commont
			Comment:
Other Comments or Issues?			
Conversations with Home Owners:			



SVK	Inspected I	by:	Date of Site Visit:							
Current Wea Amt of Rain	ther Condit during prev	ions: ious 24-hours:	Do UIC Well MHs need maintenance action? If so, list UIC Well O NO Action Required							
Purpose of v Annual Insp Other. Desc	r isit: lection of UIC cribe:	Well MH	Do UIC well MHs need follow-up review upon completion of action? □ No action? □ Action Required If so, list UIC Well MHs that need follow-up after repairs are done? □							
If there were o	conversation	s with home owners, describe:								
Street	Site ID	UIC Well Seal in good condition?	Pipe Supports, Drop Pipe Assembly in good condition?	MH Interior Structurally Sound?	MH Lid Operational?					
34th Ave SW SW Othello St to SW Webster St	UIC MH #1-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					
34th Ave SW SW Webster St to SW Holden St	UIC MH #2-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					
34th Ave SW SW Kenyon St to SW Elmgrove St	UIC MH #4-32	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					



SVK	Inspected I	by:	Date of Site Visit:								
Current Wea	ther Condit	ions:	Do UIC Well MHs need mainter	Do UIC Well MHs need maintenance action? If so, list UIC Well Do Action Required							
Amt of Rain Purpose of v Annual Insp Other. Desc If there were c	during prev risit: eection of UIC cribe: conversation	Well MH	Do UIC well MHs need follow-up review upon completion of action? If so, list UIC Well MHs that need follow-up after repairs are done?								
Street	Site ID	UIC Well Seal in good condition?	Pipe Supports, Drop Pipe Assembly in good condition?	MH Interior Structurally Sound?	MH Lid Operational?						
34th Ave SW SW Thistle St to SW Cloverdale St	UIC MH #5-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 						
34th Ave SW SW Cloverdale St to SW Trenton St	UIC MH #6-31	 □ Yes □ No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 						
32nd Ave SW SW Othello St to SW Webster St	UIC MH #7-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 						



BVK	Inspected I	by:	Date of Site Visit: Date of Last Inspection:							
Current Wea Amt of Rain	ther Condit during prev	ions: ious 24-hours:	Do UIC Well MHs need maintenance action? If so, list UIC Well ORCHARCE NO ORCHARCE ACTION Required ORCHARCE ACTION Required							
Purpose of v Annual Insp Other. Desc	visit: ection of UIC pribe:	Well MH	Do UIC well MHs need follow-up review upon completion of action? No Action Required If so, list UIC Well MHs that need follow-up after repairs are done? Action Required Action Required 							
If there were o	conversation	s with home owners, describe:								
Street	Site ID	UIC Well Seal in good condition?	Pipe Supports, Drop Pipe Assembly in good condition?	MH Interior Structurally Sound?	MH Lid Operational?					
32nd Ave SW SW Webster St to SW Holden St	UIC MH #8-31	 □ Yes □ No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					
31st Ave SW SW Othello St to SW Webster St	UIC MH #10-31	 □ Yes □ No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					
31st Ave SW SW Webster St to SW Holden St	UIC MH #11-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					



SVK	Inspected I	by:	Date of Site Visit:							
Current Wea Amt of Rain	ther Condit during prev	ions: ious 24-hours:	Do UIC Well MHs need maintenance action? If so, list UIC Well O NO Action Required							
Purpose of v Annual Insp Other. Desc	r isit: lection of UIC cribe:	Well MH	Do UIC well MHs need follow-up review upon completion of action? □ No action? □ Action Required If so, list UIC Well MHs that need follow-up after repairs are done? □ Action Required							
If there were o	conversation	s with home owners, describe:								
Street	Site ID	UIC Well Seal in good condition?	Pipe Supports, Drop Pipe Assembly in good condition?	MH Interior Structurally Sound?	MH Lid Operational?					
31st Ave SW SW Holden St to SW Kenyon St	UIC MH #12-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					
31st Ave SW SW Kenyon St to SW Elmgrove St	UIC MH #13-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					
31st Ave SW SW Elmgrove St to SW Thistle St	UIC MH #14-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 					



BVK	Inspected	by:	Date of Site Visit:						
Current Wea Amt of Rain	ther Condit during prev	ions: ious 24-hours:	Do UIC Well MHs need maintenance action? If so, list UIC Well Image: No MHs that need repairs: Image: Action Required						
Purpose of v Annual Insp Other. Desc	visit: pection of UIC pribe:	Well MH	Do UIC well MHs need follow-up review upon completion of action? No Action Required If so, list UIC Well MHs that need follow-up after repairs are done?						
If there were o	conversation	s with home owners, describe:							
Street	Site ID	UIC Well Seal in good condition?	Pipe Supports, Drop Pipe Assembly in good condition?	MH Interior Structurally Sound?	MH Lid Operational?				
31st Ave SW SW Cloverdale St to SW Trenton St	UIC MH #15-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 				
30th Ave SW SW Othello St to SW Webster St	UIC MH #16-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 				
SW Kenyon St 34th Ave SW to 32nd Ave SW	UIC MH #18-31	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 	 Yes No If issues observed describe: 				



- In co	rporated		Date	Date of Site Visit: Date of Last Inspection:										
Current Wea	ther Conditio	ns:			Do wells	Do wells need maintenance action?								
Amt of Rain	during previo	ous 24-ho	urs:		If so, list	UIC Wells	that need a	action:			Actio	n Required		
Purpose of v	visit:				Do UIC w	To UIC wells need follow-up review upon completion of								
□ Routine W	ell Inspection 🛛	Inflow Te	sting		maintena	nce action	? If so, list	UIC Wells	that need f	follow-up ?	Actio	n Required		
Downhole	VideoSurvey 🗆	Screen F	Rehabilitatio	on										
					If there w	f there were conversations with home owners, describe:								
UIC Wells - Al	l measurement	s in feet f	rom fixed r	neasuring	point (MP). See last	t page for l	MP descrip	ptions.	T				
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						□ Steady	□ Thick		Offensive Neticable	□ Extensive >75%				
24th Ave SM	#1-31						□ Gint □ Soft		□ Faint	□ Sparse <25%				
SW Othello St to	"									□ Trace <5%				
SW Webster St	(GSI DRAIN)					□ Steady □ Trickle	□ Thick □ Grit		 Offensive Noticable 	 □ Extensive >75% □ Some 25-75% 				
	UMH #1-21					Level	□ Soft		□ Faint	□ Sparse <25%				
		Time				□ None	□ None Turbidit	(Deedinge		□ Trace <5%				
	Site ID	(PST)	Temp°C	SpC	рН	#1 NTU		#3 NTU		Comments.				
		(101)				#1110	#21110	#01110	Aighto					
										-				
(GSI DRAIN	I) UMH #1-21						-							
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						Steady Tricklo	□ Thick		Offensive Noticable	□ Extensive >75%				
34th Avo SW	#2-31						□ Soft		□ Faint	□ Sparse <25%				
SW Webster St										□ Trace <5%				
to SW Holden St	(GSI DRAIN)					 Steady Trickle 	□ Thick □ Grit		 Offensive Noticable 	 □ Extensive >75% □ Some 25-75% 				
	UMH #2-21					Level	□ Soft		□ Faint	□ Sparse <25%				
		Time				□ None	None	(Deedinge		□ Trace <5%				
	Site ID	(PST)	Temp°C	SpC	рН	#1 NTU	#2 NTU	#3 NTU	Avg NTU	<u>comments.</u>				
UIC MH #2-31														
(GSI DRAIN	I) UMH #2-21													



	Incorporated Checked By:					Date of Site Visit: Date of Last Inspection:							
Current Wea	ther Conditio	ons:			Do wells	Do wells need maintenance action?							
Amt of Rain	during previo	ous 24-ho	urs:		If so, list	f so, list UIC Wells that need action:						on Required	
Purpose of v	/isit:				Do UIC w	ells need f	ollow-up r	eview upo	n completio	on of	🗆 No		
Routine W	ell Inspection 🗆	Inflow Te	sting		maintena	nce action	? If so, list	UIC Wells	s that need t	follow-up?	Actic	on Required	
Downhole	Video Survey 🗆	Screen F	Rehabilitatio	on									
					If there w	f there were conversations with home owners, describe:							
UIC Wells - Al	I measuremen	ts in feet fi	rom fixed ı	measuring	point (MP). See las	t page for l	MP descrip	otions.				
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
						Steady	Thick		Offensive	□ Extensive >75%			
	UIC MH						□ Grit		Noticable	□ Some 25-75%			
34th Ave SW	#4-32						 Soπ None 			□ Sparse <25%			
SW Kenyon St to						□ Steady				□ Extensive >75%			
SW Elmgrove St	(GSI DRAIN)					□ Trickle	□ Grit		Noticable	□ Some 25-75%			
	UMH #4-21					Level	□ Soft		Faint	□ Sparse <25%			
						None	□ None			□ Trace <5%			
	Site ID	Time (PST)	Temp°C	SpC	pН		Turbidity	/ Readings		Comments:			
			-	-		#1 NTU	#2 NTU	#3 NTU	Avg NTU	-			
	UIC MH #4-32												
(GSI DRAIN	I) UMH #4-21												
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
						Steady	Thick		Offensive	Extensive >75%			
	UIC MH						□ Grit		 Noticable Faint 	□ Some 25-75%			
34th Ave SW	#5-31						□ Soπ □ None			□ Sparse <25% □ Trace <5%			
SW Thistle St to						□ Steady				□ Extensive >75%			
SW Cloverdale St	(GSI DRAIN)					Trickle	□ Grit		Noticable	□ Some 25-75%			
	UMH #5-21						□ Soft		□ Faint	□ Sparse <25%			
			None	□ None	l		□ Trace <5%						
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	Turbidity	/ Readings		Comments:			
	UIC MH #5-31					#1110	#2 1110		AVGNIU	1			
	I) I IMH #5 21									4			
	101VIII #0-21									1			



- In co	rporated		Date of Site Visit: Date of Last Inspection					ast Inspection:					
Current Wea	ther Conditio	ons:			Do wells	Do wells need maintenance action?							
Amt of Rain	during previo	ous 24-ho	urs:		If so, list	UIC Wells	that need a	action:			Actic	on Required	
Purpose of v □ Routine W □ Downhole	risit: ell Inspection □ Video Survey □	Inflow Te	sting Rehabilitatio	วท	Do UIC w maintena	o UIC wells need follow-up review upon completion of INO NO Initial No Initial Initial No Initia No Initi							
					If there w	^t there were conversations with home owners, describe:							
UIC Wells - Al	I measurement	ts in feet fi	rom fixed ı	measuring	point (MP). See last	t page for I	MP descrip	otions.				
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
34th Ave SW SW Cloverdale St	UIC MH #6-31					 Steady Trickle Level None 	 Thick Grit Soft None 		 Offensive Noticable Faint None 	 Extensive >75% Some 25-75% Sparse <25% Trace <5% 			
SW Cloverdale St to SW Trenton St	(GSI DRAIN) UMH #6-21					 Steady Trickle Level None 	 Thick Grit Soft None 		 Offensive Noticable Faint None 	 □ Extensive >75% □ Some 25-75% □ Sparse <25% □ Trace <5% 			
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	Turbidity #2 NTU	/ Readings #3 NTU	Avg NTU	Comments:			
	UIC MH #6-31												
(GSI DRAIN	I) UMH #6-21												
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
32nd Ave SW	UIC MH #7-31					 Steady Trickle Level None 	 Thick Grit Soft None 		 Offensive Noticable Faint None 	 Extensive >75% Some 25-75% Sparse <25% Trace <5% 			
SW Webster St	(GSI DRAIN) UMH #7-21					 Steady Trickle Level None 	 Thick Grit Soft None 		 Offensive Noticable Faint None 	 □ Extensive >75% □ Some 25-75% □ Sparse <25% □ Trace <5% 			
	SpC	рН	#1 NTU	Turbidity #2 NTU	/ Readings #3 NTU	Ava NTU	Comments:						
	UIC MH #7-31												
(GSI DRAIN	I) UMH #7-21]			



- In co	rporated		Date of Site Visit: Date of Last Inspection:										
Current Wea	ther Conditio	ons:			Do wells	Do wells need maintenance action? Do No							
Amt of Rain	during previo	ous 24-ho	urs:		lf so, list	so, list UIC Wells that need action:						n Required	
Purpose of v	visit:				Do UIC w	ells need f	ollow-up r	eview upo	n completio	on of	🗆 No		
Routine W	ell Inspection	Inflow Te	sting		maintena	iaintenance action? If so, list UIC Wells that need follow-up?							
Downhole	Video Survey □	Screen F	Rehabilitatio	on	16 (1)								
					If there w	there were conversations with home owners, describe:							
UIC Wells - Al	measurement	ts in feet fi	rom fixed ı	neasuring	point (MP). See last	t page for l	MP descri	otions.		-		
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
						□ Steady	□ Thick		Offensive Neticable	□ Extensive >75%			
32nd Ave SW	#8-31						□ Soft		□ Faint	□ Sparse <25%			
SW Webster St						□ None			□ None	□ Trace <5%			
to SW Holden St	(GSI DRAIN)					 Steady Trickle 	□ Thick □ Grit		 Offensive Noticable 	□ Extensive >75% □ Some 25-75%			
	UMH #8-21					□ Level	□ Soft		□ Faint	□ Sparse <25%			
	011 10						Turbidity	/ Readings	None	Comments:			
	Site ID	Time (PST)	Temp ^e C	SpC	рн	#1 NTU	#2 NTU	#3 NTU	Avg NTU				
	UIC MH #8-31												
(GSI DRAIN) UMH #8-21												
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
						 Steady Trickle 	□ Thick		Offensive Neticable	□ Extensive >75%			
31st Ave SW	#10-31						□ Soft		□ Faint	□ Sparse <25%			
SW Othello St to						□ None			□ None	□ Trace <5%			
SW Webster St	(GSI DRAIN)					 Steady Trickle 	□ Thick □ Grit		 Offensive Noticable 	□ Extensive >75% □ Some 25-75%			
	UMH #10-21					□ Level	□ Soft		□ Faint	□ Sparse <25%			
						□ None	□ None Turbidity	/ Readings	□ None	□ Trace <5% Comments:			
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	#2 NTU	#3 NTU	Avg NTU				
	JIC MH #10-31												
(GSI DRAIN)	UMH #10-21												



Incorporated Checked By:						Date of Site Visit: Date of Last Inspection								
Current Weather Conditions:						Do wells need maintenance action?								
Amt of Rain	Amt of Rain during previous 24-hours:					If so, list UIC Wells that need action:								
Purpose of visit:					Do UIC w	ells need f	ollow-up r	eview upo	n completio	on of	🗆 No			
Routine W	ell Inspection 🗆	Inflow Te	sting		maintena	nce action	? If so, list	UIC Wells	s that need	follow-up ?	Actic	n Required		
Downhole	Video Survey 🗆	Screen F	Rehabilitatio	on										
					If there w	f there were conversations with home owners, describe:								
UIC Wells - All measurements in feet from fixed measuring point (MP). See last page for MP descriptions.											1			
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						Steady			Offensive	□ Extensive >75%				
21 at Ava SW							□ Gnt □ Soft		 Noticable Faint 	 □ Some 25-75% □ Sparse <25% 				
SW Webster St	#11-31					□ None	□ None		□ None	□ Trace <5%				
to SW Holden St	(GSI DRAIN)					Steady Tricklo	□ Thick		Offensive Neticable	□ Extensive >75%				
	UMH #11-21						□ Soft		□ Noticable □ Faint	□ Sparse <25%				
						None		/ Poodings	None	□ Trace <5%				
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	#2 NTU	#3 NTU	Ava NTU	<u>Comments.</u>				
l	UIC MH #11-31								,					
(GSI DRAIN)	UMH #11-21													
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						□ Steady	□ Thick		Offensive	□ Extensive >75%				
21 at Avia SW						□ I rickie □ Level	□ Grit □ Soft		 Noticable Faint 	 □ Some 25-75% □ Sparse <25% 				
SW Holden St to	#12-31					□ None	□ None		□ None	□ Trace <5%				
SW Kenyon St	(GSI DRAIN)					□ Steady	□ Thick		Offensive Neticable	□ Extensive >75%				
	UMH #12-21						□ Gnt □ Soft		 Noticable Faint 	 □ Some 25-75% □ Sparse <25% 				
	01111 12 21					□ None	□ None			□ Trace <5%				
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	I urbidity	/ Readings		Comments:				
ι	L JIC MH #12-31					#11110	#2 N I U	#3 NTU	AVGINTU	-				
(GSI DRAIN)	UMH #12-21									1				



Incorporated Checked By:						Date of Site Visit: Date of Last Inspection								
Current Weather Conditions:					Do wells need maintenance action?									
Amt of Rain	Amt of Rain during previous 24-hours:					If so, list UIC Wells that need action:								
Purpose of visit:					Do UIC w	ells need f	ollow-up r	eview upo	n completio	on of	🗆 No			
Routine W	ell Inspection	Inflow Te	sting		maintena	nce action	? If so, list	UIC Wells	s that need f	follow-up ?	Actic	n Required		
Downhole	Video Survey 🗆	Screen F	Rehabilitatio	n										
						f there were conversations with home owners, describe:								
UIC Wells - Al	measurement	ts in feet fi	rom fixed ı	neasuring	point (MP). See last	t page for l	MP descrip	ptions.					
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						□ Steady	□ Thick		Offensive	□ Extensive >75%				
21 at Avia SIM						 Irickle Level 	□ Grit □ Soft		 Noticable Faint 	□ Some 25-75% □ Sparse <25%				
SW Kenvon St to	#13-31					□ None	□ None		□ None	□ Trace <5%				
SW Elmgrove St	(GSI DRAIN)					Steady Tricklo	□ Thick		Offensive Netiophie	□ Extensive >75%				
	UMH #13-21						□ Soft		□ Noticable □ Faint	□ Sparse <25%				
						None	None Turbidity	/ Poodings	None	□ Trace <5%				
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	#2 NTU	#3 NTU	Ava NTU	<u>Comments.</u>				
l	JIC MH #13-31									-				
(GSI DRAIN) UMH #13-21														
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						Steady Tricklo	□ Thick		Offensive Netiophie	□ Extensive >75%				
31st Ave SW	#14-31						□ Soft		□ Noticable □ Faint	□ Sparse <25%				
SW Elmgrove St	#14-01					None	None		None	□ Trace <5%				
to SW Thistle St	(GSI DRAIN)					Steady	□ Thick □ Grit		 Offensive Noticable 	□ Extensive >75%				
	UMH #14-21					□ Level	□ Soft		□ Faint	□ Sparse <25%				
						□ None	□ None	/ Poadings		□ Trace <5%				
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	#2 NTU	#3 NTU	Ava NTU	Comments.				
	JIC MH #14-31													
(GSI DRAIN)	UMH #14-21													



Incorporated Checked By:						Date of Site Visit: Date of Last Inspection								
Current Weather Conditions:					Do wells need maintenance action?									
Amt of Rain	Amt of Rain during previous 24-hours:					If so, list UIC Wells that need action:								
Purpose of v	Purpose of visit:					ells need f	ollow-up r	eview upo	n completio	on of	🗆 No			
Routine W	ell Inspection	Inflow Te	sting		maintena	nce action	? If so, list	UIC Wells	s that need f	follow-up ?	Actic	n Required		
Downhole	Video Survey □	Screen F	Rehabilitatio	on										
					If there w	f there were conversations with home owners, describe:								
UIC Wells - All measurements in feet from fixed measuring point (MP). See last page for MP descriptions.														
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						Steady Tricklo	□ Thick		Offensive Netiophie	□ Extensive >75%				
31st Ave SW	#15_31						□ Gnt □ Soft		 Roticable Faint 	□ Sparse <25%				
SW Cloverdale St	#10-01					None	None		None	□ Trace <5%				
to SW Trenton St	(GSI DRAIN)					Steady Trickle	□ Thick □ Crit		Offensive Noticable	□ Extensive >75%				
	UMH #15-21						□ Soft		□ Faint	□ Sparse <25%				
						None	None Turbidity	/ Readings	None	□ Trace <5%				
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	#2 NTU	#3 NTU	Avg NTU	<u>oominento.</u>				
ι	UIC MH #15-31													
(GSI DRAIN)	UMH #15-21													
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time		
						Steady			Offensive	□ Extensive >75%				
30th Avia SW	#16_31					 Trickle Level 	□ Gnt □ Soft		 Noticable Faint 	 □ Some 25-75% □ Sparse <25% 				
SW Othello St to	#10-31					None	None		None	□ Trace <5%				
SW Webster St	(GSI DRAIN)					Steady Tricklo	□ Thick		Offensive Neticable	□ Extensive >75%				
	UMH #16-21						□ Soft		□ Noticable □ Faint	□ Sparse <25%				
						□ None		. Deedinge	□ None	□ Trace <5%				
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU		#3 NTU	Ανα ΝΤΗ	Comments:				
l	JIC MH #16-31					#1110	#2 1110	#0 10	Agito	-				
(GSI DRAIN)	UMH #16-21									1				



associated UIC Well Maintenance Checklist earth sciences

- In co	rporated	Checked	l By:		Date	of Site Vi	sit:		Date of L	ast Inspection:			
Current Weather Conditions: Amt of Rain during previous 24-hours:					Do wells If so, list	need main UIC Wells		NoAction	n Required				
Purpose of visit: □ Routine Well Inspection □ Inflow Testing □ Downhole Video Survey □ Screen Rehabilitation					Do UIC wells need follow-up review upon completion ofDo Nomaintenance action? If so, list UIC Wells that need follow-up?Action Require								
	masuraman	te in foot fr	rom fixed	mossuring	If there w		sations wi	ith home o	owners, des	scribe:			
Street	Site ID	Time (PST)	MH Water Level	MH Clarity Depth	MH Depth	Inlet Flowing Yes/No	Sediment	UIC Well WL & TD	Odor?	Foam/Scum Layer?	Photos Y/N	Download & Restart Time	
SW Kenyon St	UIC MH #18-31					 Steady Trickle Level None 	 Thick Grit Soft None 		 Offensive Noticable Faint None 	 Extensive >75% Some 25-75% Sparse <25% Trace <5% 			
34th Ave SW to 32nd Ave SW	(GSI DRAIN) UMH #18-21					 □ Steady □ Trickle □ Level □ None 	 □ Thick □ Grit □ Soft □ None 		 Offensive Noticable Faint None 	 □ Extensive >75% □ Some 25-75% □ Sparse <25% □ Trace <5% 			
	Site ID	Time (PST)	Temp°C	SpC	рН	#1 NTU	Turbidity #2 NTU	/ Readings #3 NTU	Ava NTU	Comments:			
l	JIC MH #18-31								, again	1			
(GSI DRAIN)	UMH #18-21									1			

Miscellaneous Notes:

Note: Measuring point (MP) for MH water level, depth and clarity is the inner rim of the lid.

Note: Measuring point (MP) for UIC water level and depth is the top of the 2-inch schedule 80 PVC casing.

Note: Clarity estimated by using a yellow measuring tape. The depth below the MP at which the yellow end the tape

is no longer visible below the surface of the standing water is the depth recorded. This is compared to the

depth of water surface, by subtracting, to get the depth below the water surface where the tape is no longer visible. PST: Pacific Standard Time

APPENDIX H

AS-BUILT PROJECT PLANS, REFERENCE PLANT PHOTOS & LINK TO COS STANDARDS

City of Seattle Standard Specifications for Municipal Constructions and Standard Plans for Municipal, current edition.

http://www.seattle.gov/util/Engineering/Standard Plans & Specs/



Appendix H. As-Builts

The As-Builts (151MB, PDF) can be downloaded at:

http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/Barton/Barton-CSO-GSI_Appendix-H_As-Builts.pdf



APPENDIX I

CONTACT CHARTS



CONSTRUCTION IN THE RIGHT OF WAY THROUGH WTD GSI FACILITY

Process/communication flow chart for construction in the ROW through a WTD GSI Facility:

- 1. Private parcel owner/franchise/agency (applicant) needs to perform construction through the GSI swale that is a WTD CSO control facility.
- 2. Applicant contacts the City for a permit.

Barton CSO Control Project – September 14, 2015

- 3. The City provides as-builts and requirements to the applicant.
- 4. The City notifies King County LPA coordinator of proposed work and provides applicant's submitted materials.
- 5. The County's WTD LPA coordinator distributes to the applicant's proposal to CSO control GSI program and O&M groups.
- 6. The County provides comments to the City on the applicants proposal in XXX (TBD) days.
 - a. If applicant's proposal for restoration of WTD CSO control facility is acceptable to King County then King County provides approval letter to the City for the proposed work.
 - b. If applicant's proposal for restoration of WTD CSO control facility is not acceptable to King County then King County submits letter with comments to City who provides it to the applicant for resubmittal. Applicant revises and resubmits to City and City then sends to WTD LPA Coordinator and goes through step 5 above.
- 7. The City and the County inspect the work for compliance to the permit requirements, including contacting County's WTD CSO Control/GSI Program representative to confirm GSI facility was restored to WTD's satisfaction.
- 8. Copies of as-builts are provided to the applicable O&M groups (storm drainage. UIC or surface facilities).



RESIDENT OBSERVATION

Communication flow chart when resident contacts the KC Hotline of an issue (complaint/observation):



APPENDIX J

IRRIGATION WATERING SCHEDULE



Barton Irrigation Watering Schedule Establishment

Second & Third Year of Watering

Fourth year - Routine Maintenance - turn off trees and do not water on Wednesday Recommend Water Schedule in Minutes

1 inch of water a week with 15 extra gallons of water for each tree.

SvR 11021 - 7-08-2015 - JAL

Street	Street Name/Cross Street	Zone	Туре	Days	Minutes
L-1	34th Ave SW /			,	
PSI 41	SW Webster St	1		M,W,F	14
-2014		2		M,W,F	14
		3		M,W,F	14
		4	trees	M.F	8
		5		M.W.F	14
		6		M W F	14
1-2	34th Ave SW /	0		,,.	
 PSI 49	SW Holden St	1		M W F	14
-2014		2	trees	M F	8
2014		2		M W F	14
		3		M W F	14
				N/ W/ E	14
1_1	24th Ave SW/	5		101,00,1	14
	SW/ Elmgrove St	1		N/ W/ E	12
2014	SVV EIIIgi Ove St	1	troop		13
-2014		2	uees		/
		5			13
	24th Avo 514/	4		IVI, VV, F	13
L-5	34th Ave SW /			NA 14/ 5	12
PSI 91	SW Cloverdale St	1		M,W,F	13
-2014		2		M,W,F	13
		3		M,W,F	13
		4	trees	M,F	7
L-6	34th Ave SW /				
PSI 97	SW Trenton St	1		M,W,F	13
-2014		2		M,W,F	13
		3		M,W,F	13
		4	trees	M,F	7
L-7	32nd Ave SW /				
PSI 52	SW Webster St	1		M,W,F	13
-2015		2		M,W,F	13
		3		M,W,F	13
		4	trees	M,F	7
L-8	32nd Ave SW /				
PSI 59	SW Holden St	1		M,W,F	13
-2015		2		M,W,F	13
		3	trees	M,F	7
		4		M,W,F	13
L-10	31st Ave SW				
PSI 56	SW Webster St	1		M,W,F	13
-2014		2	1	M,W.F	13
		3		M,W.F	13
		4	trees	M,F	7
		5		M.W.F	13
L-11	31st Ave SW			,,.	13
PSI 62	SW Holden St	1		M.W.F	13
-2014		2	trees	MF	7
2014		2		M W/F	12
		1			10
1-12	21st Ave SW	4		111, 11, 11,	13
	SWI Konvon St	1			10
L 1 1 1	SVV KENYON SL		troop		13
-2014		2	11662		/
ļ		3	<u> </u>		13
1	1	4		IVI,W,F	13

Street	Street Name/Cross Street	Zone	Туре	Days	Minutes
L-13	31st Ave SW				
PSI 82	SW Elmgrove St	1		M,W,F	13
-2014		2		M,W,F	13
		3	trees	M,F	7
		4		M,W,F	13
L-14	31st Ave SW				
PSI 93	SW Thistle St	1		M,W,F	13
-2015		2		M,W,F	13
		3	trees	M,F	7
		4		M,W,F	13
L-15	31st Ave SW	1			
PSI 109	SW Thistle St	1		M,W,F	13
-2015		2		M,W,F	13
		3	trees	M,F	7
		4		M,W,F	13
L-16	30th Ave SW	Т			
PSI 57	SW Webster St	1		M,W,F	13
-2015		2		M,W,F	13
		3	trees	M,F	7
		4		M,W,F	13
L-18A	SW Kenyon St				
PSI 68	32nd to 34th Ave SW	1		M,W,F	13
-2014		2		M,W,F	13
		3	trees	M,F	7
		4		M,W,F	13