

USER GUIDE: HOW TO USE THESE RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

THESE TYPICAL DETAILS WERE DEVELOPED TO BE **REVISED AND CUSTOMIZED FOR EACH INDIVIDUAL PROJECT BY DESIGN PROFESSIONALS**. THESE TYPICAL DETAILS ARE INTENDED FOR USE DURING THE RESIDENTIAL GI PILOT PROGRAM AND ARE SUBJECT TO CHANGE BASED ON LESSONS LEARNED.

THESE TYPICAL DETAILS SHOW **TYPICAL** CONFIGURATIONS, RATHER THAN A REQUIRED CITY **STANDARD** CONFIGURATION. TO CREATE GI PROJECTS THAT ARE FUNCTIONAL, CONTEXTUAL, AND AESTHETIC, DESIGN PROFESSIONALS MUST USE THEIR PROFESSIONAL JUDGMENT AND CREATIVE THINKING TO BE RESPONSIVE TO EACH SITE-SPECIFIC CONDITION. THEREFORE, THE DESIGN PROFESSIONALS MUST MODIFY THE PLAN, SECTIONS, CALL-OUTS, AND/OR CONSTRUCTION NOTES TO ADDRESS THE PROJECTS SITE-SPECIFIC CONDITIONS.

USE ON CONSTRUCTION DOCUMENTS

DESIGN PROFESSIONALS USING THESE DRAWINGS **MUST REVIEW AND ADJUST THE DETAILS AND CONSTRUCTION NOTES TO ADDRESS THEIR SITE-SPECIFIC CONDITIONS**. TO ALLOW FOR SITE-SPECIFIC DESIGN ADJUSTMENTS THE TYPICAL DETAILS ARE DEVELOPED AS "**NOT FOR CONSTRUCTION**" DRAWINGS. TITLE BLOCKS ARE PROVIDED FOR DOCUMENT ORGANIZATION AND REFERENCE ONLY.

- **DO NOT** INCLUDE THE NON-ADJUSTED DETAIL WITH TITLE BLOCK WITHIN THE CONSTRUCTION DOCUMENTS.
- **DO NOT** INCLUDE NON-ADJUSTED DETAIL PLANS, SECTIONS, OR CONSTRUCTION NOTES WITHIN THE CONSTRUCTION DOCUMENTS.
- **DO NOT** REFERENCE THE GI TYPICAL DETAIL SHEET NAME AND/OR NUMBER (I.E. RGI 2.1) AS A STANDARD DETAIL CALL-OUT WITHIN THE CDs.
- **DO NOT** EXPECT CONTRACTORS TO CONDUCT CALCULATIONS OR BE RESPONSIBLE FOR MISSING DESIGN INFORMATION.

SUMMARY OF REQUIREMENTS AND GUIDANCE FOR INFILTRATION-BASED BMPS:

REFER TO STORMWATER MANAGEMENT REQUIREMENTS APPENDIX C: CRITERIA FOR INFILTRATION - BASED BMPS FOR MORE DETAILED INFORMATION ON SITING AND DESIGN REQUIREMENTS FOR INFILTRATION-BASED BMPS.

1. STANDARD SETBACK REQUIREMENTS PER THE STORMWATER MANAGEMENT REQUIREMENTS:

SETBACK DISTANCE (FEET)	SETBACK FROM:
5	PROPERTY LINE
10	DOWNGRADIENT FROM ADJACENT FOUNDATIONS
100	UPGRADIENT FROM ADJACENT FOUNDATIONS
100	UPGRADIENT FROM GROUND SLOPES >15%
150	DRINKING WATER WELL

2. **REFER TO APPENDIX C OF THE STORMWATER MANAGEMENT REQUIREMENTS FOR CONDITIONAL SETBACK REQUIREMENTS** AND THE SFPUC ASSET PROTECTION STANDARDS FOR ADDITIONAL SETBACK REQUIREMENTS REGARDING WATER AND SEWER INFRASTRUCTURE.



SAN FRANCISCO PUBLIC
UTILITIES COMMISSION

GENERAL NOTES

RGI 0.1

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

APRIL 2023

RAIN GARDEN NOTES:

1. AVOID COMPACTION OF EXISTING SUBGRADE BELOW BASIN.
2. SCARIFY SUBGRADE TO A DEPTH OF 3 INCHES (MIN) IMMEDIATELY PRIOR TO PLACEMENT OF AGGREGATE STORAGE AND BIORETENTION SOIL MATERIALS.
3. WHEN SITING RAIN GARDENS, LOCATE ALL KNOWN UTILITY CROSSINGS AND CONFLICTS AND ADJUST DESIGN TO AVOID AS MANY EXISTING UTILITIES AS POSSIBLE. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO SFPUC ASSET PROTECTION STANDARDS.
 - CONTACT USA-DIG TO LOCATE EXISTING UTILITIES PRIOR TO CONSTRUCTION.
 - FIELD LOCATE VALVE BOXES TO APPROXIMATE UTILITY LATERAL LOCATIONS.
 - IF AVOIDING UTILITY CROSSINGS ARE INFEASIBLE, REFER TO SFPUC GI TYPICAL DETAILS GC 2.1 THROUGH GC 2.4, GC 2.9 AND GC 2.12. NOTE THAT WATER METERS, WATER VALVES AND SEWER AIR VENTS ARE NOT ALLOWED IN RAIN GARDEN FACILITIES.
4. RAIN GARDENS SHALL NOT BE INSTALLED ON SLOPED AREAS THAT EXCEED 5%.
5. RAIN GARDENS MUST MEET THE SETBACK REQUIREMENTS DESCRIBED IN APPENDIX C OF THE SFPUC STORMWATER MANAGEMENT REQUIREMENTS AND DESIGN GUIDELINES, INCLUDING:
 - MUST PROVIDE A 4-FT MINIMUM VERTICAL SEPARATION FROM BASE OF BMP TO SEASONAL HIGH GROUNDWATER IN ALL BAYSIDE GROUNDWATER; 10-FT MINIMUM VERTICAL SEPARATION FROM BASE OF BMP TO SEASONAL HIGH GROUNDWATER IN THE LOBOS AND WESTSIDE GROUNDWATER BASIN.
 - MINIMUM 5-FT HORIZONTAL SETBACK FROM PROPERTY LINE;
 - MINIMUM 10-FT HORIZONTAL SETBACK FROM UPGRADIENT FOUNDATIONS
 - MINIMUM 100-FT HORIZONTAL SETBACK FROM DOWNGRADIENT ADJACENT FOUNDATIONS.

IMPERMEABLE LINER NOTES:

1. IF MINIMUM HORIZONTAL SETBACK TO BUILDING FOUNDATIONS CANNOT BE MET, AN IMPERMEABLE LINER SHALL BE USED TO PREVENT INFILTRATED WATER FROM IMPACTING THE FOUNDATION. THE BOTTOM OF THE LINER SHALL EXTEND BELOW THE BOTTOM OF THE FOUNDATION OR AS REQUIRED BY THE GEOTECHNICAL ENGINEER.
2. LINER SHALL BE HDPE CONFORMING TO GEOSYNTHETIC RESEARCH INSTITUTE (GRI) GM13, CHLOROSULFONATED POLYETHYLENE (CPSE), ETHYLENE PROPYLENE DIENE MONOMER (EPDM) LINER, OR LLDPE CONFORMING TO GRI GM17.
3. LINER SHALL LAY FLUSH WITH GROUND WITH NO AIR VOIDS BELOW THE LINER PRIOR TO BACKFILLING MATERIAL ABOVE THE LINER. CONTOUR THE SUBGRADE AS NEEDED TO ENSURE LINER LAYS FLUSH WITH GROUND.
4. OVERLAP LINER PER MANUFACTURER'S RECOMMENDATIONS.
5. ALL SEAMS SHALL BE WELDED PER MANUFACTURER'S RECOMMENDATIONS UNLESS OTHERWISE SPECIFIED.
6. IF ANY UTILITIES NEED TO PASS THROUGH THE LINER, REFER TO THE LINER PENETRATION DETAILS, GC 2.9, WITHIN THE SFPUC GI TYPICAL DETAILS.

BIORETENTION SOIL NOTES:

1. BIORETENTION SOIL SHALL BE A MINIMUM 30-40% COMPOST BY VOLUME AND 60-70% SAND BY VOLUME.
2. SOIL SHALL BE FREE OF ALL ROOTS, PLANTS, WEEDS, SOD, STONES, CLOUDS, POCKETS OF COARSE SAND, DEBRIS, OR ANY OTHER EXTRANEIOUS MATERIALS.
3. BIORETENTION SOIL MAY BE PURCHASED FROM THE C.3 TECHNICAL GUIDANCE MANUAL, APPENDIX K: BIOTREATMENT SOIL SUPPLIER LIST.

AGGREGATE STORAGE LAYER NOTES:

AN AGGREGATE STORAGE LAYER BETWEEN THE BIORETENTION SOIL AND SUBGRADE IS REQUIRED WHEN THE RAIN GARDEN CANNOT BE SIZED TO MEET THE MINIMUM BMP SIZING RATIO. AGGREGATE STORAGE LAYER CONSISTS OF THE 3" CHOKER COURSE AND THE DOUBLE WASHED DRAIN ROCK LAYER (DRAIN ROCK LAYER VARIES IN DEPTH).

THE AGGREGATE STORAGE LAYER PROVIDES ADDITIONAL TEMPORARY STORAGE OF TO ALLOW THE DESIGN STORM VOLUME TO INFILTRATE INTO THE SUBGRADE SOIL WITHIN A 48-HOUR (MAXIMUM) DRAWDOWN TIME.

BMP SIZING NOTES:

SIZE THE RAIN GARDEN FOOTPRINT AS A PERCENT OF THE CONTRIBUTING IMPERVIOUS DRAINAGE AREA AND SIZE THE AGGREGATE STORAGE DEPTH BASED ON THE TABLE BELOW. THE RAIN GARDEN BOTTOM AREA IS MEASURED AT THE TOP OF SOIL EXCLUDING THE SIDESLOPES. THE RAIN GARDEN FOOTPRINT IS MEASURED AT THE TOP OF THE SLOPE AT THE FREEBOARD ELEVATION.

THE CALCULATION ASSUMES THE STANDARD PONDING DEPTH, FREE BOARD DEPTH AND SIDE SLOPE STEEPNESS AS DETAILED. IF THE RAIN GARDEN FOOTPRINT VARIES IN DEPTH, SLOPE, HAS IRREGULAR SHAPES, OR IS A TIERED SYSTEM OR INCLUDES MULTIPLE BMPS IN SERIES, USE THE SFPUC MS4 SIZING CALCULATOR TO SIZE THE SYSTEM.

RAIN GARDEN BOTTOM AREA	RAIN GARDEN FOOTPRINT*	AGGREGATE STORAGE DEPTH**
DESIGN INFILTRATION RATE*** > 0.6 in/hr		
≥ 5.5%	≥ 8.5%	0"
4.5% - 5.5%	7.0% - 8.5%	9"
4.0% - 4.5%	6.3% - 7.0%	12"
DESIGN INFILTRATION RATE*** 0.3 - 0.6 in/hr		
≥ 6.0%	≥ 9.0%	0"
5.0% - 6.0%	7.7% - 9.0%	9"
4.5% - 5.0%	7.0% - 7.7%	12"
4.0% - 4.5%	6.3% - 7.0%	15"

*FOOTPRINT OF BASIN TO TOP OF SLOPE WITH 6" PONDING, 3" FREEBOARD, AND 2.5:1 SIDESLOPES
 **AGGREGATE STORAGE DEPTH INCLUDES 3" OF CHOKER COURSE
 ***DESIGN INFILTRATION RATE IS THE CORRECTED INFILTRATION RATE BASED ON THE SIMPLE FIELD INFILTRATION TEST, REFER TO SFPUC DETERMINATION OF DESIGN INFILTRATION RATES FOR THE SIZING OF INFILTRATION BASED GREEN INFRASTRUCTURE FACILITIES FOR REQUIREMENTS AND CALCULATIONS.

OVERFLOW STRUCTURE NOTES:

OVERFLOW STRUCTURE AND OVERFLOW DRAIN LATERAL CONNECTION IS REQUIRED ONLY IN FULL DOWNSPOUT DISCONNECTION SCENARIOS.

PRIOR TO CONSTRUCTION, VERIFY DEPTH OF EXISTING SEWER LATERAL. THE DRAIN PIPE FROM THE OVERFLOW STRUCTURE TO THE EXISTING SEWER LATERAL CONNECTION SHALL HAVE A MINIMUM 1% SLOPE TOWARDS THE SEWER LATERAL. THE SEWER LATERAL SHALL HAVE A SEWER VENT OR BACKFLOW PREVENTER LOCATED BETWEEN THE RAIN GARDEN AND SEWER MAIN CONNECTION TO PREVENT SEWER BACKUP. SEWER VENT ELEVATION SHALL BE LOCATED BELOW THE RIM OF THE RAIN GARDEN OVERFLOW OR BELOW THE INVERT OF THE UNDERDRAIN IF PRESENT.

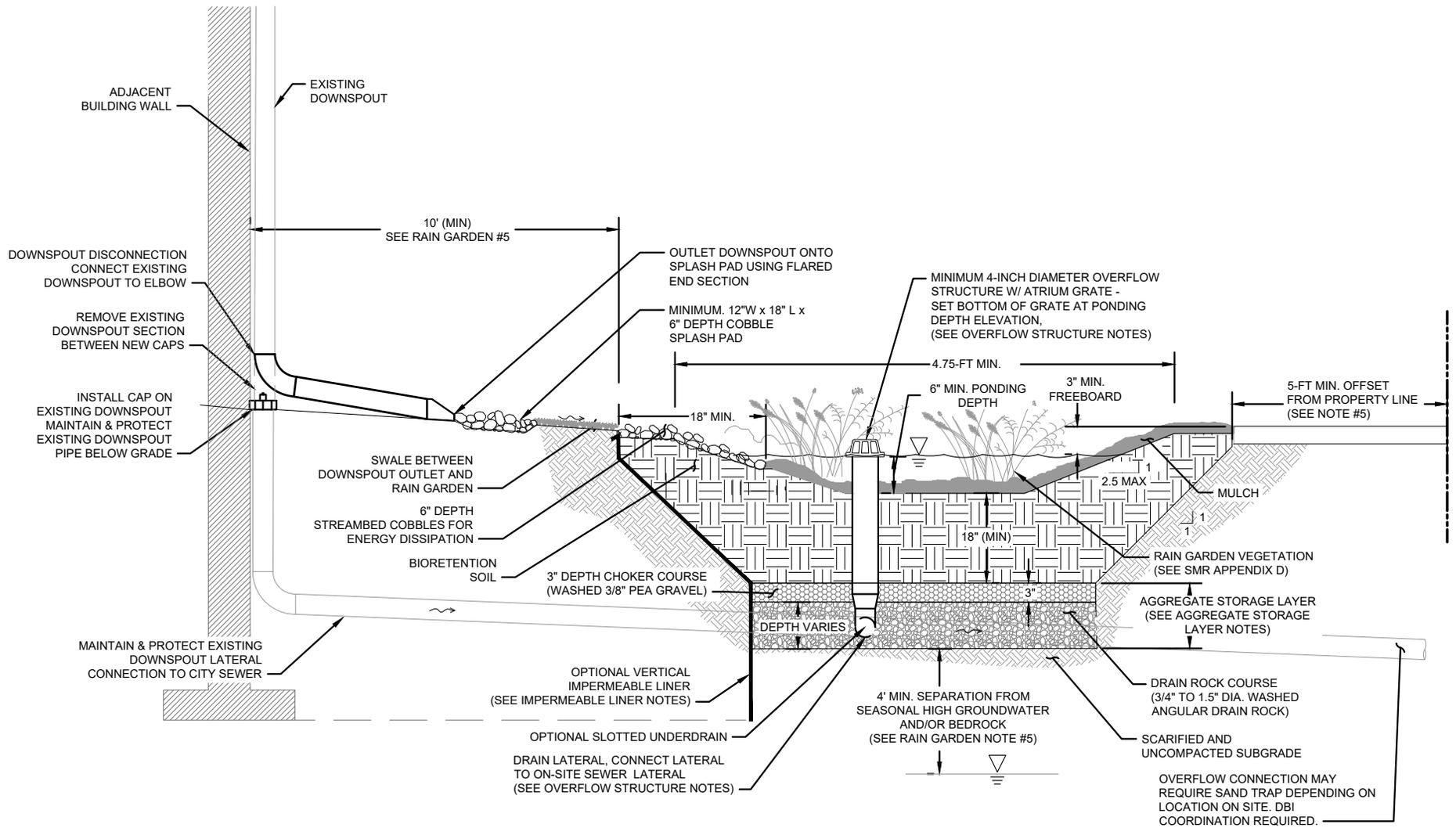


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RAIN GARDEN NOTES

RGI 1.0

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS



*SEE RDD 1.0 FOR ALL REFERENCED NOTES

RAIN GARDEN SECTION
NOT TO SCALE



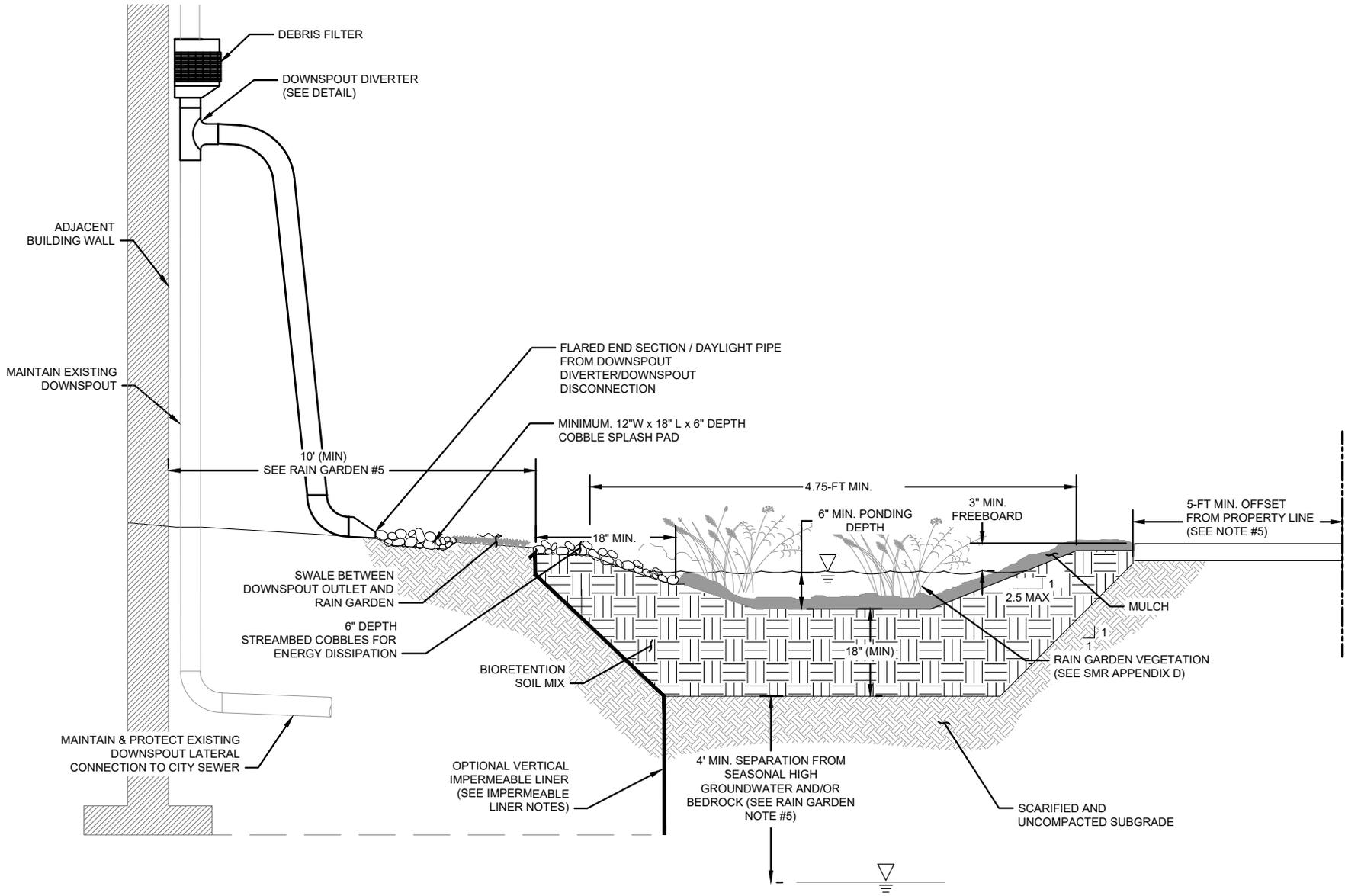
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RAIN GARDEN WITH DOWNSPOUT DISCONNECTION AND AGGREGATE STORAGE LAYER

RGI 1.1

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

APRIL 2023



*SEE RDD 1.0 FOR ALL REFERENCED NOTES

RAIN GARDEN SECTION
NOT TO SCALE



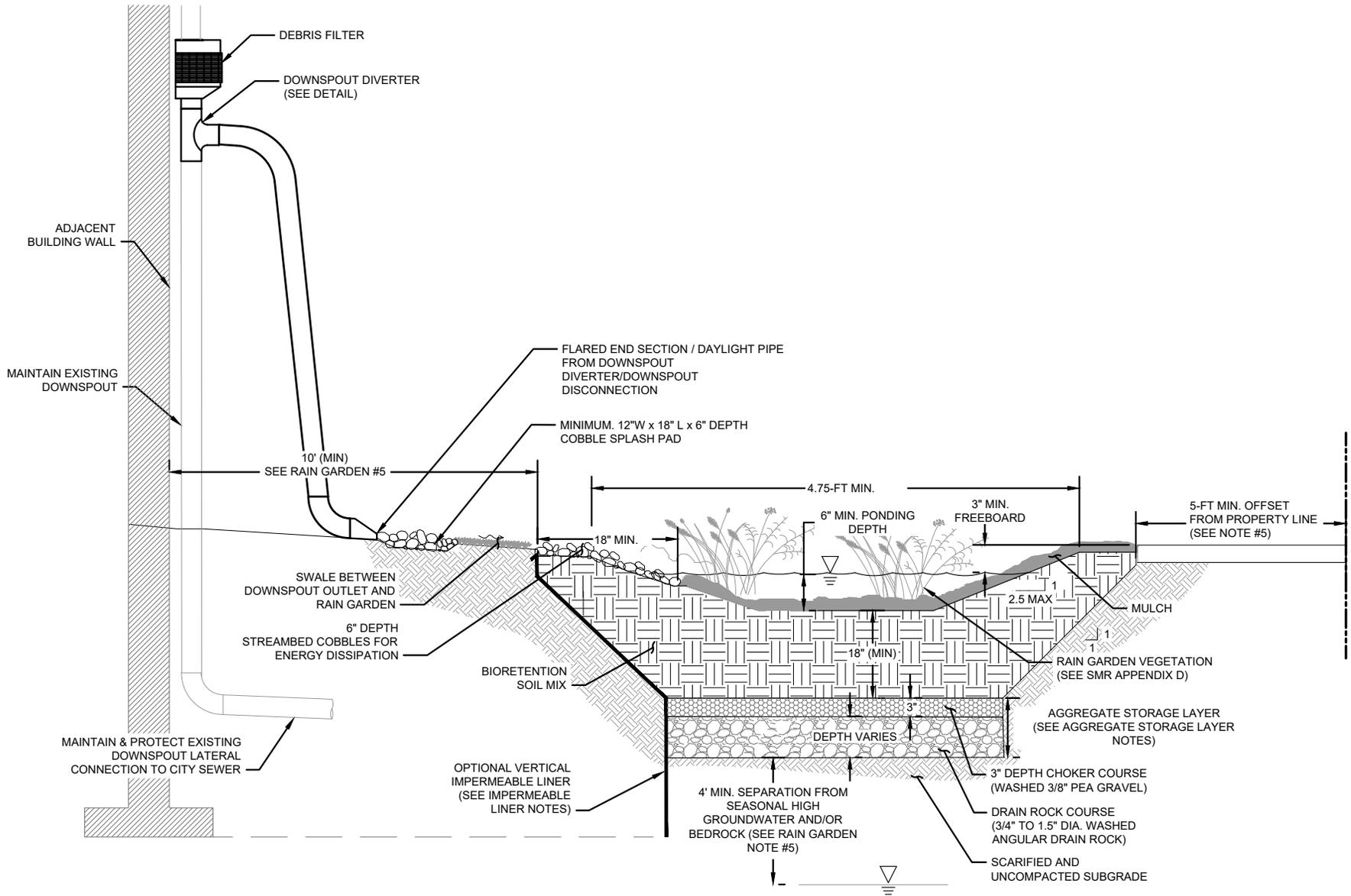
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RAIN GARDEN WITH DOWNSPOUT DIVERTER

RGI 1.2

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

APRIL 2023



*SEE RDD 1.0 FOR ALL REFERENCED NOTES

RAIN GARDEN SECTION
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RAIN GARDEN WITH DOWNSPOUT DIVERTER AND AGGREGATE STORAGE LAYER

RGI 1.3

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

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PERMEABLE PAVER NOTES:

1. SEE PERMEABLE/POROUS UNIT PAVER SPECIFICATIONS FOR PAVERS, PAVEMENT BASE, SUBGRADE PREPARATION, AND OTHER REQUIREMENTS FOR PERMEABLE/POROUS UNIT PAVER FACILITIES.
2. INSTALL PAVEMENT BASE (LEVELING, BASE AND OPTIONAL RESERVOIR COURSE) PER MANUFACTURER RECOMMENDATIONS.
 - THE LEVELING COURSE IS INTENDED TO PROVIDE A SMOOTH, LEVEL SURFACE FOR THE PLACEMENT OF PAVERS. LEVELING COURSE SHALL BE ASTM NO. 8 STONE (MODIFIED), UNLESS SPECIFIED OTHERWISE BY THE PAVER MANUFACTURER.
 - THE BASE COURSE IS INTENDED TO PROVIDE STRUCTURAL LOAD BEARING CAPACITY TO THE PAVERS. THE BASE COURSE SHALL BE ASTM NO. 57(MODIFIED), UNLESS SPECIFIED OTHERWISE BY THE PAVER MANUFACTURER.
 - THE OPTIONAL RESERVOIR COURSE IS INTENDED TO PROVIDE ADDITIONAL WATER STORAGE AND DRAINAGE OF THE PAVEMENT, STRUCTURAL SUPPORT, AND CAPILLARY BREAK. THE MATERIALS SHALL BE CRUSHED, CLEAN, WASHED ROCK, CONSISTING OF ASTM NO. 2 (MODIFIED), ASTM NO. 3 (MODIFIED), OR ASTM NO. 57 (MODIFIED).
3. REFER TO GI TYPICAL DETAILS PC 1.1. THROUGH PC 1.5 FOR EDGE CONSTRAINT DETAILS FOR VEHICULAR AND PEDESTRIAN APPLICATIONS.
4. PERMEABLE PAVEMENT DESIGN MUST COMPLY WITH SAN FRANCISCO PUBLIC WORKS STANDARD ACCESSIBILITY REQUIREMENTS.
5. PAVER SURFACE SHALL HAVE A MINIMUM SURFACE SLOPE OF 0.5% TO ALLOW FOR SURFACE OVERFLOW AND A MAXIMUM SURFACE OF 12 PERCENT SLOPE (OR MAXIMUM SLOPE PER MANUFACTURER'S RECOMMENDATION).
6. SUBSURFACE STORAGE DRAWDOWN TIME (I.E. TIME FOR MAXIMUM SUBSURFACE STORAGE VOLUME TO INFILTRATE INTO SUBGRADE AFTER THE END OF A STORM) SHOULD NOT EXCEED 48 HOURS. DRAWDOWN TIME IS CALCULATED AS THE MAXIMUM SUBSURFACE PONDING DEPTH DIVIDED BY THE NATIVE SOIL DESIGN INFILTRATION RATE.
7. LOCATE ALL KNOWN UTILITY CROSSINGS AND CONFLICTS AND ADJUST DESIGN TO AVOID AS MANY EXISTING UTILITIES AS POSSIBLE. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO SFPUC ASSET PROTECTION STANDARDS.
8. IF AVOIDING UTILITY CROSSINGS ARE INFEASIBLE, REFER TO SFPUC GI TYPICAL DETAILS GC 2.1 THROUGH GC 2.4, GC 2.9 AND GC 2.12. NOTE THAT WATER METERS, WATER VALVES AND SEWER AIR VENTS ARE NOT ALLOWED IN BIORETENTION FACILITIES.
9. PERMEABLE PAVEMENT FACILITIES MUST BE DESIGNED TO PROVIDE SUBSURFACE STORAGE OF STORMWATER TO ALLOW TIME FOR THE WATER TO INFILTRATE INTO THE UNDERLYING SOIL. SLOPED FACILITIES ON POOR SOILS HAVE AN INCREASED POTENTIAL FOR LATERAL FLOWS THROUGH THE STORAGE RESERVOIR COURSE ALONG THE TOP OF THE RELATIVELY IMPERMEABLE SUBGRADE SOIL. THIS REDUCES THE STORAGE AND INFILTRATION CAPACITY OF THE PAVEMENT SYSTEM. SUBSURFACE DETENTION STRUCTURES, OR CHECK DAMS, CAN BE INCORPORATED INTO THE SUBGRADE AND ALIGNED PERPENDICULAR TO THE LONGITUDINAL SUBGRADE SLOPE TO CREATE PONDING IN THE AGGREGATE STORAGE RESERVOIR COURSE TO DETAIN SUBSURFACE FLOW, INCREASE INFILTRATION, AND REDUCE STRUCTURAL PROBLEMS ASSOCIATED WITH SUBGRADE EROSION ON SLOPES. SEE SHEET C2.1 FOR CHECK DAM NOTES.

MAXIMUM RUN-ON RATIO

1. CONTRIBUTING RUN-ON TO PERMEABLE PAVERS IS DISCOURAGED. PERMEABLE PAVERS THAT RECEIVE RUN-ON FROM ADJACENT HARDSCAPES WITHIN THE PARCEL OR FROM THE ROOF MUST MEET THE SETBACK REQUIREMENTS DESCRIBED IN APPENDIX C OF THE SFPUC STORMWATER MANAGEMENT REQUIREMENTS AND DESIGN GUIDELINES.
 - ROOF RUNOFF CAN ONLY BE DIRECTED TO THE PERMEABLE PAVER BMP IF USING A DOWNSPOUT DIVERTER, IN WHICH CASE NO OVERFLOW STRUCTURE FROM THE PERMEABLE PAVER IS REQUIRED. A FULL DOWNSPOUT DISCONNECTION CANNOT DISCHARGE TO THE PERMEABLE PAVER.
2. WHEN DESIGNED TO ACCEPT RUN-ON FROM OTHER CATCHMENT AREAS, THE PERMEABLE PAVEMENT AREAS MUST BE PROTECTED FROM SEDIMENTATION WHICH CAN CAUSE CLOGGING AND DIMINISHED FACILITY PERFORMANCE. THE FOLLOWING REQUIREMENTS APPLY FOR RUN-ON CONTRIBUTIONS:
 - RUN-ON FROM LAWN, LANDSCAPE OR OTHER ERODIBLE SURFACES IS DISCOURAGED. IF MINOR RUN-ON FROM LAWN OR LANDSCAPE AREAS IS UNAVOIDABLE, THOSE ERODIBLE AREAS MUST BE FULLY STABILIZED.
 - CONCENTRATED RUN-ON (E.G., DIRECT DISCHARGE FROM A DOWNSPOUT) SHOULD BE DISPERSED PRIOR TO DISCHARGE TO A PERMEABLE PAVEMENT FACILITY. ACCEPTABLE METHODS INCLUDE SHEET FLOW OR SUBSURFACE DELIVERY TO THE STORAGE RESERVOIR VIA PERFORATED PIPE.

WEARING COURSE	PREFERRED RUN-ON RATIO	MAXIMUM RUN-ON RATIO** (AREA CONTRIBUTING TO THE PAVEMENT: BMP AREA)
PERMEABLE UNIT PAVERS (≥ 1/2" GAPS)*	NONE	3:1
PERMEABLE UNIT PAVERS (≥ 3/8" GAPS)*	NONE	2:1
PERMEABLE UNIT PAVERS (≥ 1/4" GAPS)	NONE	1:1
POROUS PAVERS	NONE	NONE

* PAVERS WITH 3/8 INCH OR 1/2 INCH GAPS SHALL BE PERMEABLE INTERLOCKING CONCRETE PAVERS WITH INTEGRATED PRECAST INTERLOCKING SPACER.

IMPERMEABLE LINER NOTES:

1. IF PAVER SUBGRADE SLOPES TOWARDS A BUILDING/STRUCTURE, INSTALL AN IMPERMEABLE LINER VERTICALLY AT THE DOWNSTREAM SIDE OF THE BMP TO PREVENT RUNOFF TOWARDS THE FOUNDATION/STRUCTURE.
2. LINER SHALL BE HDPE CONFORMING TO GEOSYNTHETIC RESEARCH INSTITUTE (GRI) GM13, CHLOROSULFONATED POLYETHYLENE (CPSE), ETHYLENE PROPYLENE DIENE MONOMER (EPDM) LINER, OR LLDPE CONFORMING TO GRI GM17.
3. LINER SHALL LAY FLUSH WITH GROUND WITH NO AIR VOIDS BELOW THE LINER PRIOR TO BACKFILLING MATERIAL ABOVE THE LINER.
4. ALL SEAMS SHALL BE WELDED PER MANUFACTURER'S RECOMMENDATIONS UNLESS OTHERWISE SPECIFIED. OVERLAP LINER PER MANUFACTURER'S RECOMMENDATIONS.
5. IF ANY UTILITIES NEED TO PASS THROUGH THE LINER, REFER TO THE LINER PENETRATION DETAILS, GC 2.9, WITHIN THE SFPUC GI TYPICAL DETAILS.



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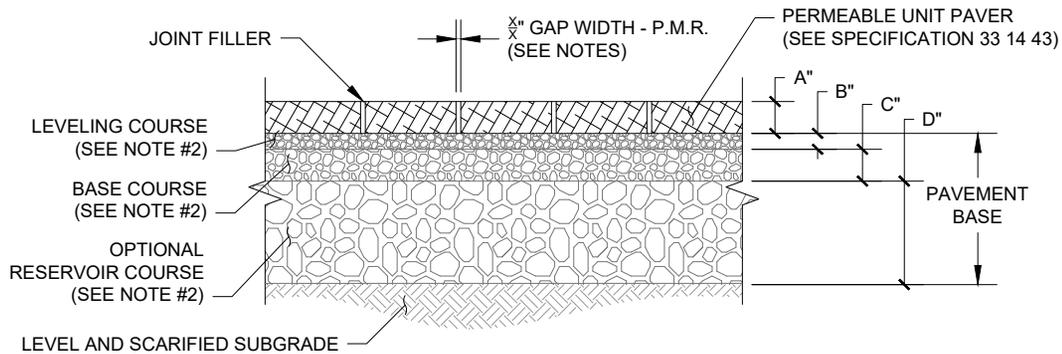
PERMEABLE UNIT PAVER NOTES

RGI 2.0

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

APRIL 2023

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PERMEABLE UNIT PAVER SECTION

NOT TO SCALE

*SEE RDD 2.0 FOR REFERENCED NOTES

MINIMUM MATERIAL THICKNESS (IN):

LAYER	MATERIAL TYPE*	LIGHT VEHICULAR**	PEDESTRIAN**
(A)	PERMEABLE UNIT PAVERS	3 1/8	3 1/8
(B)	LEVELING COURSE (SEE NOTE#2)	2	2
(C)	BASE COURSE (SEE NOTE #2)	6	4
(D)	RESERVOIR COURSE (SEE NOTE #2)	P.M.R.***	P.M.R.***

* MATERIAL FINER THAN NO. 100 SIEVE SHALL NOT EXCEED 2 PERCENT FOR ANY AGGREGATE LAYER.

**THICKNESS SHOWN ARE A MINIMUM, REFER TO MANUFACTURER FOR RECOMMENDED DEPTHS.

*** PER MANUFACTURER RECOMMENDATIONS (P.M.R.)

TYPICAL JOINT FILLER AGGREGATE SIZE:

GAP WIDTH (IN)	JOINT FILLER AGGREGATE*
3/8 OR 1/2	ASTM NO. 8 (OR P.M.R.)
1/4	ASTM NO. 9 OR 89 (OR P.M.R.)
1/8	ASTM NO. 10 ** (OR P.M.R.)

* PROVIDED FOR REFERENCE ONLY, FOLLOW MANUFACTURER'S RECOMMENDATIONS

** FOR POROUS PAVERS ONLY, ASTM NO. 20 SAND NOT ALLOWED PER MANUFACTURERS RECOMMENDATIONS.

*** PER MANUFACTURER RECOMMENDATIONS (P.M.R.)

CHECK DAM NOTES:

CHECK DAMS SHALL BE USED FOR PERMEABLE PAVEMENT SYSTEMS WITH DESIGN INFILTRATION RATES LESS THAN 0.3 INCHES-PER-HOUR AND SUBGRADE SLOPES EXCEEDING 2%. REFER TO GI TYPICAL DETAILS PC 2.1. THROUGH PC 2.2 FOR CHECK DAM DETAILS AND NOTES FOR CHECK DAM SPACING GUIDANCE.

OPTIONAL RESERVOIR COURSE NOTES:

RESERVOIR COURSE IS NOT REQUIRED UNLESS CHECK DAMS ARE USED OR IF REQUIRED BY THE MANUFACTURER.



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PERMEABLE UNIT PAVER SECTION & NOTES

RGI 2.1

RESIDENTIAL GREEN INFRASTRUCTURE TYPICAL DETAILS

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CISTERN NOTES:

1. THE PURPOSE OF THE FOLLOWING RAINWATER HARVESTING CISTERN DETAILS IS TO ASSIST HOMEOWNERS AND CONTRACTORS IN DESIGNING AND INSTALLING A SIMPLE RAINWATER SYSTEM THAT REDIRECTS ROOF DOWNSPOUTS TO AN ABOVE-GROUND CISTERN THAT TEMPORARILY STORES WATER FOR ONSITE IRRIGATION USE ONLY. THESE DETAILS DO NOT COVER LARGER-SCALE COMMERCIAL WATER REUSE SYSTEMS AND/OR GRAYWATER OR BLACKWATER REUSE SYSTEMS. ADDITIONALLY, THESE DETAILS PROVIDE EXAMPLE OF CISTERN CONFIGURATIONS THAT DO NOT INCLUDE A MUNICIPAL WATER MAKE-UP CONNECTION.
2. SEE THE SAN FRANCISCO RAINWATER HARVESTING MANUAL FOR NON-POTABLE RESIDENTIAL USES FOR ADDITIONAL REQUIREMENTS AND DETAILS:
https://sfpuc.org/sites/default/files/learning/RWH_Manual_Final-APR2018.pdf. THIS MANUAL SHOULD BE REVIEWED THOROUGHLY, BUT IN PARTICULAR, IT SHOULD BE REFERENCED FOR THE FOLLOWING KEY GUIDANCE:
 - SUITABLE ROOFING MATERIAL FOR RAINWATER CAPTURE
 - TYPES OF RAINWATER CISTERNS/RAIN BARRELS
3. IF THE PROPOSED RAINWATER HARVESTING SYSTEM IS PART OF A LARGER PROJECT THAT IS SUBJECT TO THE STORMWATER MANAGEMENT REQUIREMENTS (SMR) AND/OR THE NON-POTABLE WATER ORDINANCE (NPO), ADDITIONAL REQUIREMENTS APPLY.
4. PLASTIC CISTERNS MUST BE U.V. STABILIZED, NON-COLLAPSABLE AND WATER TIGHT.
5. ALL CISTERN CONNECTIONS SHALL BE WATER TIGHT.
6. LOCATE CISTERNS SO AS TO NOT OBSTRUCT ACCESS TO WALKWAYS, DOORWAYS, WINDOWS OR OTHER REGULARLY ACCESSED PATHS OR FEATURES.
7. CISTERNS SHALL BE PLACED ON A STABLE AND LEVEL PAD AND ADEQUATELY SECURED TO AN ADJACENT WALL WITH METAL STRAPS OR SOMETHING SIMILAR TO PROVIDE SEISMIC SAFETY. CISTERNS OVER 5,000 GALLONS REQUIRE A LICENSED ENGINEER TO PREPARE THE SYSTEM AND OBTAIN A PERMIT FROM SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION (DBI).
8. THE HOMEOWNER MAY CHOOSE TO INSTALL A LARGER CISTERN THAN THE MINIMUM CISTERN STORAGE VOLUME SIZE TO INCLUDE ADDITIONAL "DEAD STORAGE" BELOW THE FLOW CONTROL ORIFICE. THE "DEAD STORAGE" CAN BE TAPPED WITH A HOSE BIB WITH AN OPERATIONAL VALVE AT LEAST 2 INCHES ABOVE THE BOTTOM OF THE TANK FOR ALL-YEAR USE.

LARGE STORM OVERFLOW NOTES:

1. A LARGE STORM OVERFLOW PIPE IS REQUIRED IF FULLY DISCONNECTING THE DOWNSPOUT TO OVERFLOW RUNOFF FROM STORM EVENTS LARGER THAN THE DESIGN STORM/RUNOFF VOLUME EXCEEDING THE CAPACITY OF THE CISTERN.
 - FOR PROJECTS USING A DOWNSPOUT DIVERTER, THE DIVERTER WILL ACT AS AN OVERFLOW DURING STORM EVENTS, AND NO ADDITIONAL OVERFLOW PIPE IS REQUIRED.
2. THE LARGE FLOW OVERFLOW PIPE SHALL CONNECT TO THE EXISTING SEWER LATERAL WITH A BACKFLOW PREVENTER AIRGAP.
3. THE OVERFLOW PIPE SHALL BE KEPT OUT OF THE PATH OF TRAVEL. CONTRACTOR AND/OR HOMEOWNER MAY CHOOSE TO INCLUDE A BOX AROUND THE OVERFLOW PIPE TO PREVENT DAMAGE/TRIPPING HAZARDS.
4. THE OVERFLOW PIPE DIAMETER SHALL MATCH THE DIAMETER OF THE EXISTING SEWER LATERAL PIPE (VERIFY IN FIELD).

FLOW CONTROL ORIFICE NOTES:

1. THE FLOW CONTROL ORIFICE IS LOCATED AT OR NEAR THE BOTTOM OF THE CISTERN (OR ABOVE THE DEAD STORAGE VOLUME) TO SLOWLY DRAIN THE CISTERN BEFORE THE NEXT STORM. THE ORIFICE SHOULD BE DESIGNED TO RELEASE THE DESIGN STORM VOLUME WITHIN THE CISTERN OVER A MAXIMUM OF 48-HOURS.
2. STANDARD ORIFICE SIZE IS 0.25-INCH DIAMETER.
3. HOMEOWNER/CONTRACTOR MAY INSTALL OPTIONAL HOSEBIB FOR USE DURING NON-RAINY SEASON WITH AN OPERATIONAL VALVE.
4. THE FLOW CONTROL ORIFICE SHALL OUTLET TO ONE OF THE FOLLOWING:
 - RAIN GARDEN.
 - PERMEABLE PAVERS.
 - CONNECT BACK INTO EXISTING DOWNSPOUT/SEWER LATERAL WITH 3" PVC PIPE.
 - APPROVED OUTLET LOCATION, MINIMUM 5-FT FROM THE PROPERTY LINE.



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RAINWATER HARVESTING CISTERN NOTES

RGI 3.0

RESIDENTIAL GREEN
INFRASTRUCTURE TYPICAL DETAILS

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MINIMUM CISTERN STORAGE VOLUME:

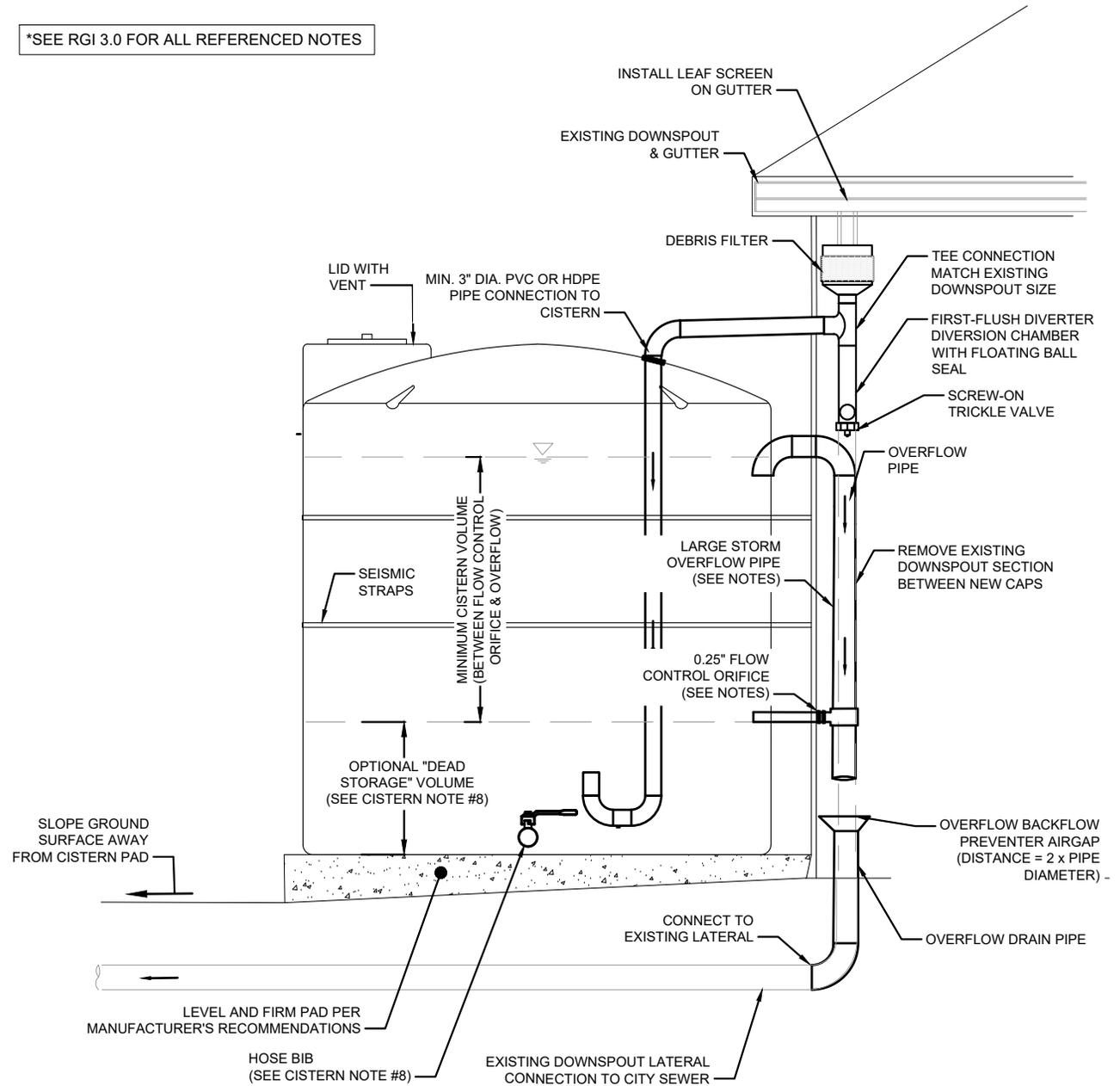
1. THE MINIMUM CISTERN STORAGE VOLUME IS MEASURED AS THE STORAGE VOLUME BETWEEN THE OVERFLOW AND THE FLOW CONTROL ORIFICE (SEE DETAIL).
2. MAXIMUM CISTERN VOLUME IS 5000 GALLONS.

MINIMUM CISTERN VOLUME (GALLONS) CALCULATION

= ROOF AREA [S.F.]
 x CURVE NUMBER
 x DESIGN STORM DEPTH [FT]
 x 7.48

ROOF CURVE NUMBER	0.95
DESIGN STORM	0.0625 - FT
CONVERT C.F. TO GALLONS	7.48

*SEE RGI 3.0 FOR ALL REFERENCED NOTES



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RAINWATER HARVESTING CISTERN W. DOWNSPOUT DISCONNECTION

RGI 3.1

RESIDENTIAL GREEN
 INFRASTRUCTURE TYPICAL DETAILS

APRIL 2023

MINIMUM CISTERN STORAGE VOLUME:

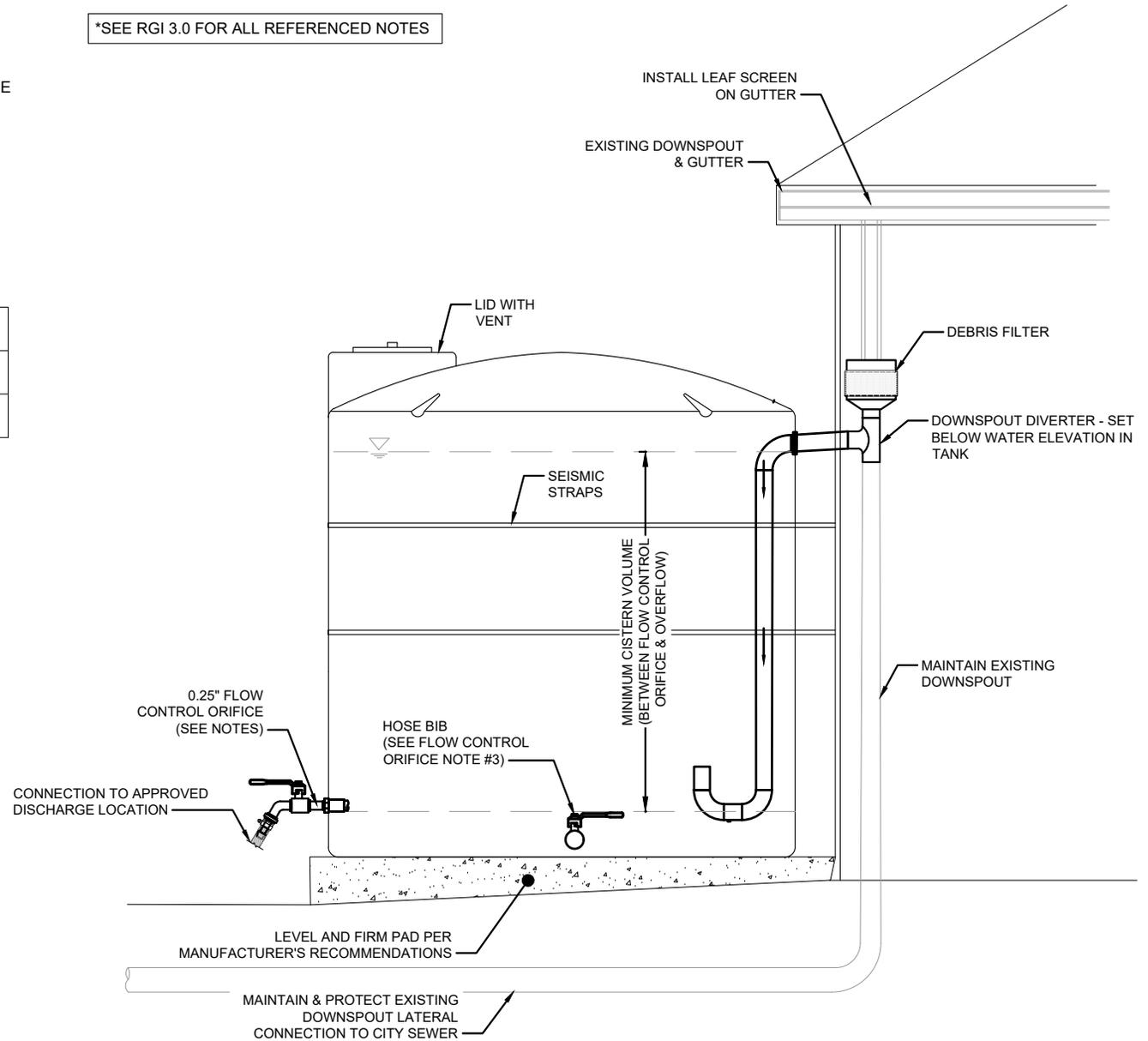
1. THE MINIMUM CISTERN STORAGE VOLUME IS MEASURED AS THE STORAGE VOLUME BETWEEN THE OVERFLOW AND THE FLOW CONTROL ORIFICE (SEE DETAIL).
2. MAXIMUM CISTERN VOLUME IS 5000 GALLONS.

*SEE RGI 3.0 FOR ALL REFERENCED NOTES

MINIMUM CISTERN VOLUME (GALLONS) CALCULATION

= ROOF AREA [S.F.]
 x CURVE NUMBER
 x DESIGN STORM DEPTH [FT]
 x 7.48

ROOF CURVE NUMBER	0.95
DESIGN STORM	0.0625 - FT
CONVERT C.F. TO GALLONS	7.48



NOT FOR CONSTRUCTION - DRAFT



SAN FRANCISCO PUBLIC UTILITIES COMMISSION

**RAINWATER HARVESTING CISTERN
 W. DOWNSPOUT DIVERTER**

**RGI
 3.2**

**RESIDENTIAL GREEN
 INFRASTRUCTURE TYPICAL DETAILS**

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