SCVURPPP GSI Handbook Part 2: Design Details

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EOA / SCVURPPP

November 7, 2019
Outline of Presentation

- GSI Handbook Overview
- Process for Updating Typical Details
- Access to Details
- General Revisions
- Example Details
- Next Steps
Permit Requirements for GSI

- Bay Area Municipal Regional Stormwater Permit
- GSI Plan (September 2019)
  - Mechanism to prioritize and map areas for potential and planned projects (to 2040)
  - Process for tracking and mapping completed projects
  - Design guidelines, details, and specifications
  - Updated planning documents
  - Implementation mechanisms and funding options
GSI Handbook

- September 2019
- Part 1 – General Guidelines
- Part 2 – Details and Specs
- Companion document to SCVURPPP C.3 Stormwater Handbook
  - Regulated Project Guidance
Part 2: GSI Details & Specs

Compilation of available details from:

- San Francisco Public Utilities Commission (2016)
- Central Coast Low Impact Development Initiative (with 2017 CASQA revisions)
- BASMAA “Ultra-Urban GI Guidelines”
- Other jurisdictions:
  - CalTrans (2016)
  - Philadelphia (2011)
  - DeepRoot
  - New York City (2014)
  - Portland, OR (2016)
  - Moreland, Aus. (2013)
Part 2: GSI Details & Specs

- Pervious Pavement
- Bioretention – Planter & Curb Extension
- Tree Well Filter
- Infiltration Facilities (trenches and dry wells)
- General Components
  - Liners
  - Utility Crossings
  - Cleanout
  - Curb
  - Fencing
Part 2 Typical Details

- August 2017 Draft
- Workshops – April 10 & 24, 2018
- Compiled comments submitted by June 30, 2018
- Developed SCVURPPP Typical Details – September 2019
  - Adapted from SFPUC Details
- Webinar – November 7, 2019
SCVURPPP Typical Details

- Phase 1 - September 2019
- Bioretention
  - Bioretention Area (BB 1.1 – 1.2)
  - Bioretention Planter (BP 1.1 – 4.6)
  - Bioretention Components (BC 1.1 – 6.2)
- Pervious Pavement
  - Pervious Pavement (PP 1.1 – 4.1)
  - Pavement Components (PC 1.1 – 3.4)
SCVURPPP Typical Details

- **Phase 2**
  - Subsurface Infiltration Systems (SFPUC SI 1.1 – 3.2)
  - General Components (SFPUC GC 1.1 – 6.2)

- **Phase 3 - Tree Well Filter**

- **Phase 4 – Remaining Details**
SCVURPPP Typical Details

- SCVURPPP Website
  - Elements => Green Stormwater Infrastructure webpage

- Part 2
  - PDF file – click detail name
  - CAD file – click “Yes” in AutoCAD Available column

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<td>Asphalt</td>
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Typical Details

- Typical Details NOT Standard Details
  - Not for construction
  - Not engineered drawings

- Revise to be consistent with your municipal standards
  - Add your logo
  - Change general “municipal standards” statements to refer to specific standards
Typical Details

- General Revisions to SFPUC Details
  - Terminology
  - Reference “municipal standards”
  - Connection to storm instead of sanitary
  - Bioretention standards consistent with SCVURPPP C.3 Stormwater Handbook
    - 3” mulch
    - 12” Caltrans Class 2 permeable aggregate
    - Biotreatment soil mix
    - Energy dissipation
CONSTRUCTION NOTES:

1. CHECK DAMS SHALL BE SPACED TO PROVIDE PONDING PER SITE SPECIFIC DESIGN.
   (IF NEEDED)
2. SLOPE TOP OF PLANTER WALL TO MATCH LONGITUDINAL SLOPE OF ADJACENT SURFACE.
3. LAY OUT DRAINAGE NOTCHES TO PREVENT PONDING BEHIND PLANTER WALL WITH 5' MAXIMUM SPACING BETWEEN NOTCHES.
4. PROVIDE ONE CLEANOUT PER PLANTER (MIN) FOR FACILITIES WITH UNDERDRAINS.
5. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO CURRENT MUNICIPAL STANDARDS OR SEE SFCVU PPP GSI HANDBOOK UTILITY COORDINATION SECTION FOR GUIDANCE. SFU PPP ASSET PROTECTION STANDARDS. COORDINATE WITH ENGINEER IN THE EVENT OF UTILITY CROSSING AND UTILITY CONFLICTS.
Typical Details

- General Revisions to SFPUC Details (cont.)
  - Pervious Pavement
    - Added notes on groundwater and ADA compliance
    - Max 2:1 ratio of area contributing run-on to pervious pavement area
    - Consistent with SCVURPPP C.3 Stormwater Handbook
**MINIMUM MATERIAL THICKNESS (IN) GUIDANCE:**

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* MATERIAL FINE THAN NO. 100 SIEVE SHALL NOT EXCEED 2 PERCENT FOR ANY AGGREGATE LAYER (LICENSED PROFESSIONAL TO SELECT AGGREGATE).

** "GOOD" AND "POOR" SOIL CLASSIFICATIONS BASED ON AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES. SEE DESIGNER NOTES FOR SUBGRADE ASSUMPTIONS. LICENSED PROFESSIONAL MUST CALCULATE REQUIRED DEPTH BASED ON SITE CONDITIONS.

*** FOR HEAVY VEHICLE TRAFFIC LICENSED PROFESSIONAL MUST CALCULATE REQUIRED DEPTH BASED ON EXPECTED LOAD AND SITE CONDITIONS.

**CONSTRUCTION NOTES:**

1. SEE PERVERSOUS CONCRETE SPECIFICATIONS FOR WEARING COURSE, PAVEMENT BASE, SUBGRADE, AND OTHER REQUIREMENTS FOR PERVERSOUS CONCRETE FACILITIES.

2. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO CURRENT SFUC Asset Protection Standards and Other Utility Provider Requirements. Coordinate with Engineer in the Event of Utility Crossings and Utility Conflicts.

3. IF UNDERDRAIN IS REQUIRED, DESIGN AND PLACEMENT IS PER ENGINEER’S RECOMMENDATION. SEE PC 3.1-3.4.

4. SEE PC1.1-1.6 FOR EDGE TREATMENT

**PERVERSOUS CONCRETE**

**PERMEABLE PAVEMENT MATERIAL SECTIONS**

**GREEN INFRASTRUCTURE TYPICAL DETAILS**

**SANTA CLARA VALLEY PUBLIC UTILITIES COMMISSION**

DETAIL ADAPTED FROM SANTA CLARA PUBLIC UTILITIES COMMISSION PP 3.1
EXAMPLE DETAILS
PURPOSE:
BIORETENTION BASINS CAPTURE AND TREAT STORMWATER RUNOFF VIA SURFACE AND SUBSURFACE STORAGE, FILTRATION THROUGH BIOTREATMENT SOIL, AND INFILTRATION INTO NATIVE SOIL WHERE FEASIBLE. BIORETENTION BASINS MAY HAVE UNDERDRAINS AND IMPERMEABLE LINERS ON THE SIDES AND/OR BOTTOM OF FACILITY IF NEEDED, BASED ON SOIL CONDITIONS AND GEOTECHNICAL CONSIDERATIONS.

DESIGNER NOTES & GUIDELINES:
1. THE DESIGNER MUST ADAPT PLAN AND SECTION DRAWINGS TO ADDRESS SITE-SPECIFIC CONDITIONS.
2. FACILITY SURFACE AREA AND PONDING DEPTH MUST BE SIZED TO MEET MRP PROVISION C.3.4 SIZING REQUIREMENTS. CALCIULATE VELOCITY OF RUNOFF TO DETERMINE SIZES AND NUMBERS OF INLET STRUCTURES.
3. FACILITY DRAWDOWN TIME (I.E., TIME FOR SURFACE PONDING TO DRAIN THROUGH THE ENTIRE SECTION INCLUDING AGGREGATE STORAGE AFTER THE END OF A STORM REQUIREMENTS):
   - 48 HOUR (PREFERRED) TO 72 HOUR MAXIMUM FACILITY DRAWDOWN.
4. AN AGGREGATE COURSE IS REQUIRED UNDER THE BIOTREATMENT SOIL. AGGREGATE SHALL BE CULTRAN CLASS 2 PERMEABLE MATERIAL.
5. CHECK DAMS MAY BE USED TO TERRACE FACILITIES TO PROVIDE SUFFICIENT PONDING FOR HIGHER-SLOPED INSTALLATIONS. DESIGNER MUST SPECIFY CHECK DAM HEIGHT AND SPACING. REFER TO BC 6.1 AND BC 6.2 FOR GUIDANCE ON CHECK DAM DESIGN.
6. THE FOLLOWING GUIDELINES APPLY TO RIGHT-OF-WAY APPLICATIONS:
   - BULBOUT CURB TRANSITIONS SHALL CONFORM TO MUNICIPAL STANDARDS.
   - WHEN FACILITY CONSTRUCTION IMPACTS EXISTING SIDEWALKS, ALL SAW CUTS MUST ADHERE TO MUNICIPAL REQUIREMENTS. SAW CUTS SHOULD BE ALONG SCORE LINES AND ANY DISTURBED SIDEWALK FLAGS SHOULD BE REPLACED IN THEIR ENTRETI.
   - DESIGNER TO SPECIFY TRANSITION OF BIORETENTION AREA TO TOP OF CURB ELEVATION BETWEEN CURB CUTS OR CONTINUOUS 6 INCH REVEAL AT CURB EDGE.
7. UP TO TWO BIORETENTION AREAS MAY BE CONNECTED IN SERIES. IN LIEU OF MULTIPLE INLETS, PROVIDED THE CONNECTION IS A TRENCH DRAIN OR EQUAL SURFACE CONVEYANCE AND IS ADEQUATELY SIZED TO CONVEY FLOWS
8. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO CURRENT MUNICIPAL ASSET PROTECTION STANDARDS. IN THE ABSENCE OF THESE STANDARDS, THE DESIGNER SHALL REFER TO SCVURPPP GSI HANDBOOK UTILITY COORDINATION SECTION. SEE UTILITY CROSSINGS (GC 2.1, GC 2.12) AND UTILITY CONFLICTS (GC 3.1, GC 3.3).
9. FREEBOARD REQUIREMENTS SHOWN SHOULD BE USED AS GUIDELINES BUT THE DESIGNER SHALL CHECK WITH MUNICIPALITY FOR LOCAL REQUIREMENTS.
10. BIORETENTION AREA VEGETATION MUST BE SPECIFIED BY DESIGN PROFESSIONAL PER MUNICIPAL VEGETATION PALLET OR SCVURPPP C.3 HANDBOOK APPENDIX D PLANT LIST.

RELATED COMPONENTS

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DESIGNER CHECKLIST (MUST SPECIFY, AS APPLICABLE):

- FACILITY WIDTH, LENGTH, SLOPES (INCLUDING SIDE, CROSS, AND LONGITUDINAL), AND SHAPE
- DEPTH OF BIOTREATMENT SOIL
- DEPTH AND TYPE OF GRAVEL STORAGE, IF ANY
- BIORETENTION AREA SURFACE ELEVATION (TOP OF BIOTREATMENT SOIL) AT UPSLOPE AND DOWNSLOPE ENDS OF FACILITY
- CONTROL POINTS AT EVERY CORNER OF FACILITY AND POINT OF TANGENCY
- DIMENSIONS AND DISTANCE TO EVERY INLET, OUTLET, CHECK DAM, SIDEWALK NOTCH, ETC.
- ELEVATIONS OF EVERY INLET, OUTLET, STRUCTURE RIM AND INVERT, CHECK DAM, AND SIDEWALK NOTCH
- TYPE AND DESIGN OF FACILITY COMPONENTS (E.G., EDGE TREATMENTS, INLETS/GUTTER MODIFICATIONS, UTILITY CROSSINGS, LINER, AND PLANTING DETAILS)

LAYOUT REQUIREMENTS:

1. FOR RIGHT-OF-WAY APPLICATIONS, REFER TO THE MUNICIPAL STANDARD ACCESSIBILITY REQUIREMENTS DRAWINGS AND SPECIFICATIONS FOR CONSTRUCTION FOR STEP OUT ZONE, PEDESTRIAN ZONE, PARKING SPACE AND ACCESSIBLE PATH REQUIREMENTS.
2. LOCATE CURB CUTS AND GUTTER MODIFICATIONS TO AVOID CONFLICTS WITH ACCESSIBILITY REQUIREMENTS (E.G., LOCATE OUTSIDE OF CROSSWALKS).

GREEN INFRASTRUCTURE TYPICAL DETAILS

NOT FOR CONSTRUCTION: NEED TO ADJUST SLIDE

DETAIL ADAPTED FROM SAN FRANCISCO PUBLIC UTILITIES COMMISSION BB 1.1

Santa Clara Valley
Urban Runoff
Pollution Prevention Program
CONSTRUCTION NOTES:
1. CHECK DAMS (IF NEEDED) SHALL BE SPACED TO PROVIDE PONDING PER SITE SPECIFIC DESIGN.
2. SLOPE TOP OF PLANTER WALL TO MATCH LONGITUDINAL SLOPE OF ADJACENT SURFACE.
3. LAY OUT DRAINAGE NOTCHES TO PREVENT PONDING BEHIND PLANTER WALL WITH 5 MAXIMUM SPACING BETWEEN NOTCHES.
4. PROVIDE ONE CLEANOUT PER PLANTER (MIN) FOR FACILITIES WITH UNDERDRAINS.
5. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO CURRENT MUNICIPAL STANDARDS OR SEE SCCURPPP GSI HANDBOOK UTILITY COORDINATION SECTION FOR GUIDANCE, COORDINATE WITH ENGINEER IN THE EVENT OF UTILITY CROSSING AND UTILITY CONFLICTS.
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GREEN INFRASTRUCTURE
TYPICAL DETAILS

DETAIL ADAPTED FROM SAN FRANCISCO PUBLIC UTILITIES COMMISSION BP 4.4

BIORETENTION PLANTER
STORMWATER CURB EXTENSION
ALTERNATIVE 4

BP 4.4
CONSTRUCTION NOTES:
1. ALL MATERIAL AND WORKMANSHIP FOR CURB CUTS SHALL CONFORM TO MUNICIPAL STANDARD SPECIFICATIONS AND APPLICABLE CODES.
2. BOND NEW CURB AND GUTTER TO EXISTING CURB AND GUTTER WITH EPOXY AND DOWEL CONNECTION.
3. INLET CURB CUT WIDTH MAY BE INCREASED ON STEEPER GUTTER SLOPES, DESIGNER TO SPECIFY,
4. CHAMFERED OR FILLET EDGES AT CURB CUTS MAY BE REQUIRED - CHECK WITH MUNICIPALITY.

INLET - CURB CUT TYPE 1 -

BIORETENTION COMPONENTS
INLETS CURB CUT WITH GUTTER MODIFICATION

BC 2.2
LAYOUT REQUIREMENTS:

1. ALL PERVERIOUS PAVEMENT DESIGN MUST COMPLY WITH MUNICIPAL STANDARD ACCESSIBILITY/ADA REQUIREMENTS.

2. THE ALLOWABLE CATCHMENT AREA CONTRIBUTING RUN-ON TO A PERVERVIOUS PAVEMENT FACILITY IS A MAXIMUM OF 2:1 RATIO OF AREA CONTRIBUTING RUN-ON TO PERVERVIOUS PAVEMENT AREA. THE DESIGNER SHOULD CONSIDER THE INCREASED MAINTENANCE REQUIREMENTS ASSOCIATED WITH HIGHER RUN-ON RATIOS WHEN DESIGNING THE FACILITY.

3. WHEN DESIGNED TO ACCEPT RUN-ON FROM OTHER CATCHMENT AREAS, PERVERVIOUS 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 PERVERVIOUS PAVEMENT FACILITY. ACCEPTABLE METHODS INCLUDE SHEET FLOW OR SUBSURFACE DELIVERY TO THE STORAGE RESERVOIR. IF SUBSURFACE DELIVERY IS USED, PRIMARY SETTLING IS REQUIRED (E.G., VIA SAND TRAP) FOLLOWED BY DISTRIBUTION TO STORAGE RESERVOIR (E.G., VIA PERFORATED PIPE).

4. WEARING COURSE FOR PAVERS SHALL BE SET 1 INCH HIGHER THAN FINAL ELEVATION TO ALLOW FOR SETTLING AFTER CONSTRUCTION.

5. WEARING COURSE SHALL HAVE A MINIMUM SURFACE SLOPE OF 0.5% TO ALLOW FOR SURFACE OVERFLOW AND A MAXIMUM SURFACE SLOPE AS LISTED BELOW:
   a. POROUS ASPHALT SURFACE: 5 PERCENT SLOPE
   b. PERVIOUS CONCRETE SURFACE: 10 PERCENT SLOPE
   c. PERMEABLE PAVERS OR PERMEABLE INTERLOCKING PAVERS: 12 PERCENT SLOPE (PER MANUFACTURER'S RECOMMENDATION)
   d. SLOPES EXCEEDING 2% TYPICALLY REQUIRE SUBSURFACE CHECKDAMS.

6. WHILE THERE IS NO MAXIMUM SLOPE FOR THE SUBGRADE UNDER THE PERVERVIOUS PAVEMENT COURSES, THERE MAY BE ENGINEERING CHALLENGES ASSOCIATED WITH SUBSURFACE CHECK DAM REQUIREMENTS ON SUBGRADE SLOPES EXCEEDING 5%. SEE SUBSURFACE CHECK DAMS (PC 2.1 AND PC 2.2).

DESIGNER CHECKLIST (MUST SPECIFY, AS APPLICABLE):

- PERVERVIOUS PAVEMENT SPECIFICATIONS AND/OR PAVER TYPE AND GAP WIDTH
- PERVERVIOUS PAVEMENT WIDTH AND LENGTH
- ELEVATIONS AND CONTROL POINTS AT EVERY CORNER OR POINT OF TANGENCY
- THICKNESS OF EACH LAYER IN THE PAVEMENT SECTION
- JOINT SPACING AND TYPE
- SUBGRADE SLOPE
- SUBSURFACE CHECK DAM SPACING, HEIGHT, AND TYPE
- ELEVATIONS OF EACH PIPE INLET AND OUTLET INVERT
- TYPE AND DESIGN OF PERVERVIOUS PAVEMENT COMPONENTS (E.G., EDGE TREATMENTS, OUTLETS, UNDERDRAINS, etc.)
### Minimum Material Thickness (in) Guidance:

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** Material finer than No. 100 sieve shall not exceed 2 percent for any aggregate layer (licensed professional to select aggregate).  
** Good” and “Poor” soil classifications based on AASHTO guide for design of pavement structures.  
** Licensed professional must calculate required depth based on site conditions.  
*** For heavy vehicle traffic, licensed professional must calculate required depth based on expected loads and site conditions.

### Typical Joint Filler Aggregate Size:

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<td>ASTM No. 10 **</td>
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* Provided for reference only, follow manufacturer's recommendations.  
** For permeable pavers only, ASTM No. 20 sand not allowed per manufacturer's recommendations. Permeable pavers refer to pavers that allow water to flow through actual unit paver while permeable interlocking concrete pavers refer to paver systems that only allow water to pass through joints.

### Construction Notes:

1. See permeable interlocking concrete paver specifications for wearing course, pavement base, subgrade, and other requirements for permeable interlocking concrete paver facilities.
2. Minimum utility setbacks and protection measures must conform to municipal utility standards and other utility provider requirements, coordinate with engineer in the event of utility crossings and utility conflicts.
3. If underdrain is required, design and placement is per engineer's recommendation. See PC 3.1-3.4.
4. See PC 1.1-1.6 for edge treatment.
**Construction Notes:**

1. All material reinforcement, and workmanship for edge treatments, shall conform to municipal standard specifications and applicable codes.

2. Liner shall be HDPE conforming to Geosynthetic Research Institute (GRI) GM13 or LDPE conforming to GRI GM 17.

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**Edge Treatments**

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**Subsurface Check Dams**

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**Subsurface Outlets**

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**Green Infrastructure Typical Details**

Detail adapted from San Francisco Public Utilities Commission PC 1.3

**Vehicular Applications**

PC 1.3
Next Steps

- AHTG review SCVURPPP Typical Details
  - Discuss comments at November 18\textsuperscript{th} AHTG meeting
  - Submit comments to Program staff by December 18\textsuperscript{th}
- Develop Phase 2 SCVURPPP Typical Details
Contact Information

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kakerr@eoainc.com
510-832-2852 x122