



Stormwater Advisory Group Meeting #3

City Hall, Public Works Department, Traffic Control Conference Room

May 8, 2024



Agenda

1. Welcome (5 min)
2. Meeting #2 Recap (30 min)
 - a. Stormwater Design Standards – Appendix 4A (Submittal Requirements)
 - b. Site Assessment & Planning Checklist
3. Revised Definitions (10 min)
4. Stormwater Facilities List (20 min)
5. Facility Sizing and the Simplified Method (for projects <10,000 sq. ft.) (20 min)



Common Acronyms

DEQ	Department of Environmental Quality
FC	Flow Control
GSI	Green Stormwater Infrastructure
LID	Low Impact Development
MEF	Maximum Extent Feasible
MS4	Municipal Separate Storm System
SF	Square Feet
SFR	Single-Family Residential
SRC	Salem Revised Code

1. Welcome

2. Meeting #2 Recap

- a. Stormwater Design Standards – Appendix 4A
(Submittal Requirements)
- b. Site Assessment & Planning Checklist

Follow-up Questions - Summary

- Reduction of 20% (new and replaced impervious) set aside for stormwater management if facility sizing is unavailable at land use.
 - Objective: Obtain design information earlier in the design process and confirm adherence to performance standards; reduce design exceptions.
 - Rationale: Based on typical development applications, range of facility footprints was up to 15%.
- Proposal: Reduction of set aside area from 20% to 15%, which should still allow for adherence to the NSRR/ updated water quality performance standard and separate facility for flow control.
 - Approximate 8% Sizing Factor for retention of NSRR, assuming 0.5"/hr design infiltration rate.
 - Additional footprint area for flow control facility.

Follow-up Questions - Summary

- Increasing the allowable growth media infiltration rate (currently 2 in/hr).
 - Background: The design infiltration rate through the amended soil (growing media) is used to size partial infiltration or lined facilities (if the native soil design infiltration rate is < 0.5 "/hr)
 - Background: The current 2"/hr design infiltration rate for growing media reflects a measured rate of 4" with a FOS of 2 but less than neighboring jurisdictions use.
 - Infiltration rates in growing media are typically higher (~ 20 "/hr) but reduce over time.
 - City of Portland SWMM assumes 6"/hr
 - Corvallis/ Albany assume 3"/hr per study by Greenworks.
 - Proposal: Increase the design infiltration rate through amended soil, based on consistency in growing media specifications.

Recap: Stormwater Design Standards – Appendix 4A (submittal requirements)

- Revisions to Appendix 4A are currently underway
- Divided into 4 Tiers:
 - **Tier 1:** Projects that do not meet any of the thresholds requiring flow control or treatment.
 - **Tier 2:** Projects using the Simplified Method.
 - **Tier 3:** SFR projects $>1,300$ SF or non-SFR $>5,000$ SF using the Engineered Method.
 - **Tier 4:** Projects using the Engineered Method and will require a design exception.

Recap: Stormwater Design Standards – Appendix 4A (submittal requirements)

- Reorganization aligns with Land Use submittal and Final Design Submittal
 - Site Plans
 - Simplified Method Form
 - Stormwater Management Report
 - Additional Submittal Requirements
- Inclusion of Site Assessment Checklist and Simplified Form

Recap: Site Assessment & Planning Checklist

- The checklist is intended to be submitted at Land Use.
- The checklist includes additional site information that will be used to help clarify the rationale for stormwater facility selection and design.
- To be used in conjunction with Appendix 4A.

SITE ASSESSMENT AND PLANNING CHECKLIST		
✓ Information Needed	Attach Supporting Materials as needed	
Site Information		
Contact Information	Point of Contact:	
	Phone Number:	
	Email Address:	
Site Information	Site Address:	
	Site Area (acres/sq.ft):	
	Disturbance Area (acres/sq.ft):	
Proposed Stormwater Design Methodology (check one)	<input type="checkbox"/> Simplified (applicable for sites < 10,000 ft ² new or replaced impervious surface) o For Simplified Method: Attach Simplified Sizing Form	
	<input type="checkbox"/> Engineered (applicable for any site > 1,300 ft ² new or replaced impervious surface) o For Engineered Method: Attach Preliminary Stormwater Management Report	
	<input type="checkbox"/> Area Set Aside (applicable for any site > 1,300 ft ² new or replaced impervious surface that has reserved an area of 20% of the impervious surface for future stormwater facilities) o For Area Set Aside: Attach Preliminary Site Plan showing area reserved	
Site Assessment and Design Considerations (Salem Administrative Rules, Division 004, Section XXX)		
Preliminary Site Plan and Utility Plan	Attach engineered scale Preliminary Site Plan or Preliminary Utility Plan per Section 4A.1. and ensure the following additional information below is included.	
Soils Research and include site hydrologic soil group	Identify NRCS Hydrologic Soil Type (show on Preliminary Site Plan if more than one type is present):	NRCS Soil Group:
Groundwater	Attach Geotechnical Engineering or geologist investigation documenting seasonal high groundwater depth, if available.	
Hydrology – Conditions and Natural Features	Check if the following is present on site:	
	<input type="checkbox"/> Waterway (name):	<input type="checkbox"/> Sensitive natural areas(s) (list):
		<input type="checkbox"/> Floodplain / Floodway
Minimize Site Disturbance	Delineate protection areas on Preliminary Site Plan for areas to remain undisturbed during construction.	

3. Revised Definitions

Revised Definitions

- **Residential Project:** Residential development (to include single family dwellings, townhouses, two family uses, three and four family uses , and/or accessory dwelling units) where the total new pervious surface, new impervious surface, or replaced impervious surface is 1,300 square feet or more, but less than 5,000 square feet.
- **Large Project:** A project including 5,000 square feet or more of new pervious surface, new impervious surface, or replaced impervious surface, individually or combined, on private property; or a project including 5,000 square feet or more of new pervious surface, new impervious surface, or replaced impervious surface, individually or combined, in the public right-of-way.
- **Low Impact Development (LID):** A comprehensive land planning and engineering design approach to stormwater management with a goal of mimicking the pre-development hydrologic regime of urban and developing watersheds.

Revised Definitions

- **Infiltration Facility:** A stormwater facility designed without a liner or underdrain to treat and fully infiltrate a design storm event.
- **Partial Infiltration Facility:** A stormwater facility designed without a liner but with an underdrain to treat and promote infiltration of a design storm event.
- **Filtration Facility:** A stormwater facility designed to exclusively treat stormwater runoff by filtration through media. A filtration facility does not promote infiltration and may be lined.
- **Flow Control Facility:** A stormwater facility designed to control the flow rate, flow volume, or flow duration of drainage water.
- **Green Stormwater Infrastructure (GSI):** A stormwater facility that uses vegetation, soils, or natural processes to promote natural surface hydrologic functions through infiltration or evapotranspiration. Stormwater facilities designed for full infiltration (no underdrain) or partial infiltration (with underdrain) of stormwater runoff are considered GSI.
- **Maximum Extent Feasible (MEF):** The extent to which a requirement or performance standard must be complied with as constrained by the physical limitations of the site, practical considerations of engineering design, and reasonable considerations of financial costs and environmental impacts. For compliance with SRC 71.100, MEF means using green stormwater infrastructure to meet performance standards treatment (SRC 71.100(c)) by infiltrating and treating the water quality design storm.

4. Stormwater Facilities List

Stormwater Facilities List

Facility Type	GSI Facility ^A	Filtration Facility ^B	Design for Full Infiltration	Design for Partial Infiltration	Design for Flow Control	Simplified Method Allowed
Infiltration Stormwater Planters	X		X		X	X
Partial Infiltration Stormwater Planter	X			X	X	X
Lined Stormwater Planter		X			X	X
Infiltration Rain Garden	X		X		X	X
Partial Infiltration Rain Garden	X			X	X	X
Lined Stormwater Raingarden		X			X	X
Flow Dispersion	X		X		X	
Pervious Pavement	X		X		X	
Green Roofs	X			X		

A. Provides treatment and flow control through infiltration or evapotranspiration.

B. Provides treatment but does NOT promote infiltration or evapotranspiration.

Stormwater Facilities List

Facility Type	GSI Facility ^A	Filtration Facility ^B	Design for Full Infiltration	Design for Partial Infiltration	Design for Flow Control	Simplified Method Allowed
Constructed Wetland Treatment Systems	X			X	X	
Vegetated Swales		X				
Vegetated Filter Strips		X				
Drywells	X		X	X	X	
Manufactured Treatment Technology		X				
Dry Detention Ponds					X	
Structural Flow Control Facilities					X	
Soakage Trench/ Leach Lines	X		X	X	X	X
Manufactured Chamber Technologies	X		X	X	X	


A. Provides treatment and flow control through infiltration or evapotranspiration.

B. Provides treatment but does NOT promote infiltration or evapotranspiration.

5. Facility Sizing and the Simplified Method (for projects <10,000 sq. ft.)

Facility Sizing and the Simplified Method

- Simplified Method can be used for projects <10,000 SF of new or replaced impervious surface
 - Stormwater facilities for **SFR Projects** (1,300 to 5,000 SF of new or replaced impervious surface) must be sized for **water quality** at a minimum.
 - Stormwater facilities for **Large Projects** (> 5,000 SF of new or replaced impervious surface) must be sized for **water quality and flow control**.



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SITE ASSESSMENT AND PLANNING CHECKLIST
DEVELOPMENT SERVICES DIVISION
CITY HALL / 555 LIBERTY STREET SE, ROOM 320 / SALEM, OR 97301-3513

OFFICE USE ONLY

DATE RECEIVED: _____

SIMPLIFIED SIZING FORM FOR STORMWATER MANAGEMENT

The City has produced this form to assist with a quick and simple approach to manage stormwater on-site. Facilities sized with this form are presumed to comply with infiltration, treatment, and flow control requirements through the use of GSI or filtration facilities.
 This form is only for sites with a new or replaced impervious area of 10,000 square feet or less.

Instructions	Site Information
Project Category Note: Stormwater management facilities for Single-Family Residential Projects (1,300 to 5,000 square feet of new or replaced impervious surface) must be sized for water quality at a minimum. Stormwater management facilities for Large Projects (> 5,000 square feet of new or replaced impervious surface) must be sized for water quality and flow control.	
Select the type of project: <input type="checkbox"/> Single-Family Residential (SFR) Project <input type="checkbox"/> Large Project	
Site Area (refer to Site Assessment and Planning Checklist)	
1. Enter square footage of new and/or replaced impervious site area.	(1) Total Impervious Area _____ SF (2A) Pervious Pavement Area _____ SF (2B) Green Roof Area _____ SF
3. Subtract (2A and 2B) from (1) to calculate total impervious area requiring stormwater management facilities for treatment. (3) = (1) - (2A + 2B)	(3) Required Impervious Area requiring Treatment _____ SF
4. Subtract (2A) from (1) to calculate total impervious area requiring stormwater management facilities for flow control. (4) = (1) - (2A)	(4) Required Impervious Area requiring Flow Control _____ SF
Stormwater Facilities Select (check box) the desired stormwater facilities from rows (a) through (h) in Column 1, below. Enter the square footage of new/replaced impervious area that will be managed by the respective stormwater management facility type in Column 2. Multiply each impervious area from Column 2 by the corresponding sizing factor (based on the measured infiltration rate) in Column 3 and enter the result in Column 4. This is the facility surface area required.	

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Sizing Factor Overview

5,000 ft² Impervious
Surface

5% Sizing Factor:

250 ft² Stormwater
Facility Footprint

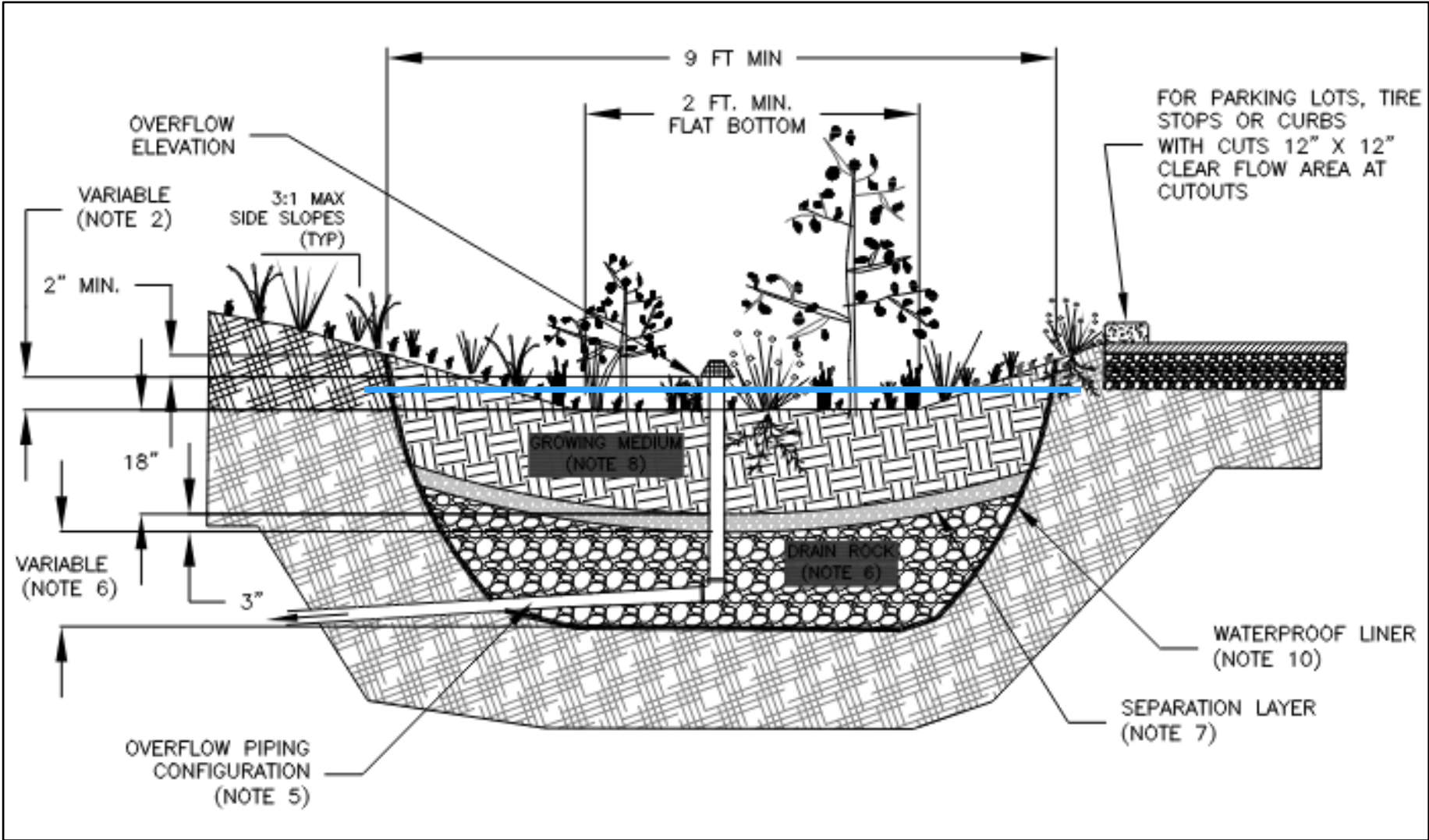
10% Sizing Factor:

500 ft² Stormwater
Facility Footprint

Sizing Factor Development

- City of Albany spreadsheet-based sizing tool (2012), adapted by BC in 2024 for Albany, Corvallis and Salem
 - Maintains background equations and calculations from 2012 tool
 - Uses NRCS unit hydrograph method and Type 1A precipitation distribution to facility sizing based on facility characteristics
 - Freeboard
 - Ponding depth
 - Side Slopes
 - Subsurface layers
 - Drawdown time
 - Can analyze both retention (full infiltration) and flow-through facilities (partial infiltration or lined facilities) based on design infiltration assumptions

Sizing Factor Development



Sizing Factor Assumptions (for use with the Simplified Method)

- Contributing drainage area: 5,000 ft²
- Infiltration:
 - Constant rate: does not vary with depth of water or antecedent moisture conditions
 - Planters: infiltration across bottom of facility
 - Rain Gardens: infiltration across facility's surface area at 75% of the ponding depth
- Subsurface storage:
 - Drain Rock: storage at 40% porosity
 - Growing Medium: assumed fully saturated thus no storage available
- Facility Geometry:
 - Planter/ Leach Line Soakage Trench: rectangular prism
 - Rain Garden: trapezoidal prism
- Drawdown time: maximum of 48 hours

Sizing Factor Tool Interface

Table 1: Storm and Facility Characteristics			
Facility Type:	Retention Planter		
User Inputs:		Target Percent Facility Storage and Drawdown Time	
Facility Width =	2	ft	Size facility to achieve 100% storage.
Infiltration Rate =	0.50	in/hr	and to drawdown in 48 hours.
Growing Media Depth* =	0.0	ft	
Growing Media Porosity* =	25%		
Drain Rock Depth =	0.5	ft	
Drain Rock Porosity =	40%		
<small>* Growing media included for sensitivity analysis only. Standards do not consider storage in growing media for sizing factor calculations.</small>			
Water Quality Design Storm Characteristics		Drainage Area Characteristics	
Duration =	24	hours	Impervious Area = 5000 ft ²
Depth =	1.00	inches	
Calculated Values			
Stormwater Quality Facility Characteristics		Push button to run Solver for Table 1 values.	
Facility Length =	104.1	ft	<input type="button" value="Run Solver"/>
Ponding Depth =	1.00	ft	
Freeboard =	0.167	ft	
Side Slopes =	0	ft : 1 ft	
Facility Storage =	249.9	ft ³	
Percent Facility Storage =	83%		
Facility Sizing Factor = 4.2%		Storage capacity utilized at drawdown time is 0.0%	

Table 2: Summary of Results							
Push Button to Run Solver for Table 2							
Infiltration Rate (in/hr)	Sizing Factor	Facility Length (ft)	Storage Capacity Utilized at 24 hours	Storage Capacity Utilized at 30 hours	Storage Capacity Utilized at 36 hours	Storage Capacity Utilized at 40 hours	Storage Capacity Utilized at 48 hours
0.1	20.8%	520.6	17%	13%	8%	6%	0%
0.2	10.4%	280.3	33%	25%	17%	11%	0%
0.3	6.9%	173.5	50%	38%	25%	17%	0%
0.4	5.2%	130.1	67%	50%	33%	22%	0%
0.5	4.2%	104.1	83%	62%	42%	28%	0%
0.6	3.5%	88.8	100%	75%	50%	33%	0%
0.7	3.2%	80.1	100%	71%	42%	22%	0%
0.8	3.0%	74.4	100%	67%	33%	11%	0%
0.9	2.8%	70.3	98%	60%	23%	0%	0%
1.0	2.7%	66.7	95%	53%	12%	0%	0%
1.1	2.5%	63.4	92%	46%	0%	0%	0%
1.2	2.4%	60.5	89%	39%	0%	0%	0%
1.3	2.3%	57.8	87%	32%	0%	0%	0%
1.4	2.2%	55.6	83%	25%	0%	0%	0%
1.5	2.1%	53.5	79%	17%	0%	0%	0%
1.6	2.1%	51.6	76%	9%	0%	0%	0%
1.7	2.0%	49.9	72%	1%	0%	0%	0%
1.8	1.9%	48.3	68%	0%	0%	0%	0%
1.9	1.9%	46.8	63%	0%	0%	0%	0%
2.0	1.8%	45.5	59%	0%	0%	0%	0%
2.1	1.8%	44.3	54%	0%	0%	0%	0%
2.2	1.7%	43.1	49%	0%	0%	0%	0%
2.3	1.7%	42.0	45%	0%	0%	0%	0%
2.4	1.6%	40.9	40%	0%	0%	0%	0%
2.5	1.6%	39.9	36%	0%	0%	0%	0%
2.6	1.6%	39.0	31%	0%	0%	0%	0%
2.7	1.5%	38.1	26%	0%	0%	0%	0%
2.8	1.5%	37.2	22%	0%	0%	0%	0%
2.9	1.5%	36.4	17%	0%	0%	0%	0%
3.0	1.4%	35.7	12%	0%	0%	0%	0%
Type of Facility:	Retention Planter						
Facility Width (ft):	2.0						
Target Percent Facility Storage:	100%						
Drawdown time (hr):	48						
Ponding Depth (ft):	1.00						
Freeboard (ft):	0.167						
Growing Media Depth (ft):	0.0						
Growing Media Porosity (%):	25%						
Drain Rock Depth (ft):	0.50						
Drain Rock Porosity (%):	40%						
<small>NOTE - Factor of safety will need to be applied to measured infiltration rate in facility design. Sizing Factors calculated using Solver for Storage of up to the target maximum value by varying Facility Length and meeting maximum drawdown time requirement.</small>							

Facility Sizing and the Simplified Method

Stormwater facilities for **Residential Projects** (1,300 to 5,000 SF of new or replaced impervious surface) must be sized for **water quality** at a minimum.

Water Quality Only		
Stormwater Facilities	Design Infiltration Rate (in/hr)	Sizing Factor
Partial Infiltration/Lined Planter	< 0.5	6% with underdrain
Infiltration Planter	0.5 to ≥ 3.0	6% - 2%
Partial Infiltration/Lined Raingarden	< 0.5	8% with underdrain
Infiltration Rain Garden	0.5 to ≥ 3.0	8% - 3%
Soakage Trench/Leach Line (for residential roof runoff only)	0.5 to ≥ 3.0	6% - 2%

Facility Sizing and the Simplified Method

Stormwater facilities for **Large Projects** (> 5,000 SF of new or replaced impervious surface) must be sized for **water quality and flow control**.

Stormwater facilities may be sized using the Simplified Method for water quality and use the Engineered Method for flow control.

Water Quality + Flow Control		
Stormwater Facilities	Design Infiltration Rate (in/hr)	Sizing Factor
Infiltration Planter	0.5 to \geq 3.0	18% - 5%
Infiltration Rain Garden (2' bottom width)	0.5 to \geq 3.0	25% - 9%
Infiltration Rain Garden (4' bottom width)	0.5 to \geq 3.0	24% - 8%

Upcoming Meetings

- SWAG Mtg 4: June 3

Thank you.

Any questions?



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