

## Compliance Checklist – Design Concept

### Job Information

<b>Application No.</b>		<b>Job. No.</b>	
<b>Job Engineer Name</b>		<b>Date</b>	
<b>Job Engineer Signature</b>		<b>Stage Pre-Plan Review (PPR)</b>	<input type="checkbox"/> #1 Concept <input type="checkbox"/> #2 Design & ROW <input type="checkbox"/> #3 Plan Preparation <input type="checkbox"/> _____

### Other Utilities

Utility	Existing Utility ( <input type="checkbox"/> shown on plans)		Proposed Utility ( <input type="checkbox"/> shown on plans)			Not Existing	Not Proposed	TBD Variance Request
	Mandatory by PPR#1		MUST SUBMIT TO ADVANCE!	Variance Request	design approved			
	rec'd record information	location per field markings	not submitted	In design				
<b>water</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>joint trench</b> (with gas, electrical, cable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PGE trans	<input type="checkbox"/>	<input type="checkbox"/>
<b>joint trench</b> (with <b>OUT</b> gas, electrical, cable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PGE trans	<input type="checkbox"/>	<input type="checkbox"/>
<b>storm drain</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
<b>private streetlights</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
<b>recycled water</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
<b>untreated canal water</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
<b>other:</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>

### Compliance with Standard Specifications

Criteria	Standard	Variance Request
<b>General</b>		
<b>Sewer Shed</b>	<input type="checkbox"/> serves ultimate tributary area	<input type="checkbox"/> not consistent with ultimate tributary area
<b>Storm Water Drainage</b>	<input type="checkbox"/> sewers not in storm water drainage ex or new systems (natural or artificial)	<input type="checkbox"/> creeks/swales; <input type="checkbox"/> culverts; <input type="checkbox"/> valley gutter <input type="checkbox"/> engineered bioswales w/ subdrain ("C3")
<b>Hillsides</b>	<input type="checkbox"/> not on hillside; or <input type="checkbox"/> in stable, not steep hillside is stable	<input type="checkbox"/> steep terrain <input type="checkbox"/> unstable or slide areas
<b>Other</b>	<input type="checkbox"/> not applicable	<input type="checkbox"/> suspended or exposed pipe; <input type="checkbox"/> siphon <input type="checkbox"/> railroad xing; <input type="checkbox"/> special utility xing
<b>Point of Connection (§8-06)</b>		
<b>Point of Connection</b>	manhole: <input type="checkbox"/> existing or <input type="checkbox"/> new*; and <input type="checkbox"/> standard or <input type="checkbox"/> trunk (*replace ex Rodding Inlet with new manhole & field verify it was placed at 45° angle)	<input type="checkbox"/> existing/ new shallow manhole <input type="checkbox"/> buried pipe connection <input type="checkbox"/> did not verify if ex RI placed at 45° angle
<b>Invert Verified</b>	<input type="checkbox"/> survey (e.g., pothole or "dip" ex manhole)	<input type="checkbox"/> interpolation of field-survey <input type="checkbox"/> estimated from record drawing
<b>Invert Elevation (IE)</b>	<input type="checkbox"/> If connecting to main (8-12"), then IE ≤0.25' higher than IE of ex main; or <input type="checkbox"/> If connecting to trunk (≥15"), then IE is above crown of ex. trunk	<input type="checkbox"/> If connecting to main (8-12"), IE > 0.25' higher than IE of ex main <input type="checkbox"/> If connecting to trunk, IE to above crown of ex. Trunk

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Criteria	Standard	Variance Request
<b>Sewer Pipe (§8-07)</b>		
<b>Central San STA</b>	<input type="checkbox"/> 0+00 at most downstream POC <input type="checkbox"/> Centerline stationing, no offsets <input type="checkbox"/> moves in upstream direction <input type="checkbox"/> wye STA for laterals match reqmts above	No variances allowed for Central San STA
<b>Location of Sewer</b>	Centerline (CL): <input type="checkbox"/> existing or <input type="checkbox"/> new roadway / driveway <input type="checkbox"/> Not in CL, legal separation from water	<input type="checkbox"/> not in roadway / driveway <input type="checkbox"/> not centerline w/no legal separation from water requirements
<b>Surface Improvement</b>	regular, impervious pavement / concrete: <input type="checkbox"/> AC or <input type="checkbox"/> PCC	<input type="checkbox"/> pervious pavement / pavers, etc. ( <input type="checkbox"/> prepared detailed cross-section) <input type="checkbox"/> stamped/ coloured pavement <input type="checkbox"/> landscaped area or not improved
<b>Pipe Size &amp; Material</b>	<input type="checkbox"/> 8" PVC SDR-26 (preferred). <span style="color: red;">(not allowed for pipe not under impervious surface, slope greater than 20%, or less than std cover.)</span> <input type="checkbox"/> other: complies <a href="#">Table 4 &amp; 6</a> Std Specs	<input type="checkbox"/> does not comply <a href="#">Table 4 &amp; 6</a> Std Specs
<b>Slope</b>	<input type="checkbox"/> for 8" pipes: $0.0077 \leq \text{slope} \leq 0.20$ ; <input type="checkbox"/> for other: complies <a href="#">Table 4 &amp; 6</a> Std Specs	<input type="checkbox"/> slope < 0.0077 <input type="checkbox"/> slope > 0.20
<b>Horizontal Curve</b>	<input type="checkbox"/> Radius, Arc Length, Delta provided <input type="checkbox"/> mathematically correct <input type="checkbox"/> deflection between MHs $\leq 45^\circ$ <input type="checkbox"/> deflection between successive straight segments of pipe $\leq 11-1/4^\circ$ <input type="checkbox"/> deflections at each joint/end of pipe segment complies Approved Materials List	<input type="checkbox"/> deflection between MHs > $45^\circ$ <input type="checkbox"/> deflection between successive straight segments of pipe > $11-1/4^\circ$ <input type="checkbox"/> deflections at each joint/end does not comply
<b>Vertical Curves</b>	<input type="checkbox"/> mathematically correct <input type="checkbox"/> min slopes comply w/ <a href="#">Table 4</a> Std Specs <input type="checkbox"/> max slopes comply w/ <a href="#">Tables 6 &amp; 7</a>	<input type="checkbox"/> slopes do not comply with <a href="#">Tables</a>
<b>Sewer Pipe – clearances (§8-07B)</b>		
<b>Horizontal Clearance</b>	<input type="checkbox"/> $\geq 10'$ from outer potable water pipe <input type="checkbox"/> $\geq 5'$ from edge of pavement, lip of gutter or face of curb if no lip of gutter, valley gutter <input type="checkbox"/> $\geq 5'$ from retaining walls <input type="checkbox"/> $\geq 3'$ from outer pipe (not potable water) <input type="checkbox"/> $\geq 3'$ from outer structure/box/vault	<input type="checkbox"/> < $10'$ from outer potable water pipe ( <input type="checkbox"/> submitted authorization from water agency) <input type="checkbox"/> < from edge of pavement, lip of gutter or face of curb if no lip of gutter, valley gutter <input type="checkbox"/> < $5'$ from retaining walls <input type="checkbox"/> < $3'$ from outer pipe (not potable water) <input type="checkbox"/> < $3'$ from outer structure/box/vault
<b>Xing Angles of Utilities</b>	<input type="checkbox"/> $\geq 30^\circ$ angle	<input type="checkbox"/> $\leq 30^\circ$ angle
<b>Vertical Clearance</b>	<input type="checkbox"/> $\geq 1'$ (12-inches) from other utilities or structures	<input type="checkbox"/> < $1'$ (12-inches) from other utilities or structures

## Compliance Checklist – Design Concept

Manholes (§8-10)							
<b>At required locations</b>	<input type="checkbox"/> 50' < interval < 500'						
	<input type="checkbox"/> change in sewer pipe size						
	<input type="checkbox"/> change in sewer pipe material						
	<input type="checkbox"/> sewer intersections						
	<input type="checkbox"/> sewer grade breaks						
	<input type="checkbox"/> last upstream lateral (no dry pipe)						
	<input type="checkbox"/> Pipe Deflection Angle (PDA) < 90°						
	<input type="checkbox"/> < 50' or > 500'	<input type="checkbox"/> not at change in sewer pipe size	<input type="checkbox"/> not at change in sewer pipe material	<input type="checkbox"/> not at sewer intersections	<input type="checkbox"/> not at sewer grade breaks	<input type="checkbox"/> not at last upstream lateral	<input type="checkbox"/> PDA > 90°
<b>Min/Max Depth</b>	<input type="checkbox"/> 44" < depth* < 20' (*min depth as measured from subgrade to top of pipe)	<input type="checkbox"/> depth ≤ 44"	<input type="checkbox"/> depth ≥ 20' ( <input type="checkbox"/> prepared structural detail & calcs)				
<b>Access to SSMHs</b>	<input type="checkbox"/> All new SSMHs have vehicular access	<input type="checkbox"/> All new SSMHs do not have veh. access					
	<input type="checkbox"/> All existing SSMHs have vehicular access	<input type="checkbox"/> All ex SSMHs do not have veh. Access					
<b>Drop across</b>	<input type="checkbox"/> where through-flow, then no drop	<input type="checkbox"/> where through-flow, drop exists.					
	<input type="checkbox"/> where PDA>30°, then drop is exactly 0.25'	<input type="checkbox"/> where PDA>30°, drop is not exactly 0.25'					
	<input type="checkbox"/> IE in at Trunk MH is 6" above crown	<input type="checkbox"/> IE in at Trunk MH is not 6" above crown					
Wyes Lower Laterals							
<b>Wyes &amp; Lower Laterals</b> (DWG 22-02)	<input type="checkbox"/> for building approved by, or in review with, Building Department	<input type="checkbox"/> for future building. <b>Not approved!</b>					
<b>Connections to Main</b>	<input type="checkbox"/> intersect main at 90°	<input type="checkbox"/> intersect main not at 90°					
	<input type="checkbox"/> enter manhole min 45° apart	<input type="checkbox"/> enter manhole < 45° apart					
<b>Material</b>	<input type="checkbox"/> matches sewer main	<input type="checkbox"/> does not match					
<b>Invert</b>	<input type="checkbox"/> crown of lateral matches crown of main	<input type="checkbox"/> does not match					
Required Exhibits/Reports							
<input type="checkbox"/> Annexation Request & Petition <input type="checkbox"/> Potential Reimbursable Lots <input type="checkbox"/> Ultimate Tributary Service Area <input type="checkbox"/> Capacity Study <input type="checkbox"/> Inside Pipe Video Inspections <input type="checkbox"/> Other:		<input type="checkbox"/> Geotechnical Report <input type="checkbox"/> Arborist Report <input type="checkbox"/> Typical Cross-Sections <input type="checkbox"/> Detail/Specific Cross-Sections <input type="checkbox"/> Real Property Agreement (RPA) Exhibit					
Variances							
Variance ID#	Description	Standard Spec/Dwg #	Submitted? <b>MUST SUBMIT TO ADVANCE!</b>	If Approved: Mitigation Measures / Approval Condition <b>AS DETERMINED BY CENTRAL SAN</b>			

## Compliance Checklist – Design Concept

### Attachment - Design Tables

**Manhole Table**

If required, then provide one Table for each SS Line designation, in format shown below, on most appropriate sheet.

SSMH Table - SS Line Segment X <sup>1</sup> (governs if provided elsewhere)						
SS Sta <sup>2</sup>	SSMH # <sup>3</sup>	Type <sup>4</sup> (Dwg #)	Height <sup>5</sup> (feet)	PDA <sup>6</sup> (deg)	Drops and Flow Direction across SSMHs	
					Delta <sup>7</sup> (feet)	U/S to D/S SSMH# or Terminal <sup>8</sup> SSMH
0+00	ex SSMH 24 (73C3)	19-01	6.0	0	0	#1 to ex SSMH 24 (73C3)
3+00	1	19-01	6.0	90	0.25	#2 to #1

<sup>1</sup> Use separate SSMH table for different SS Line Designations

<sup>2</sup> The most downstream Point of Connection (0+00) shall be 0+00 with no offsets.

<sup>3</sup> Start with #1 for most downstream SSMH. If existing SSMH, use Central San's Tag #.

Example: Ex SSMH 71 (69Es)

<sup>4</sup> For trunk manholes, incoming pipe must be above crown of existing trunk line.

<sup>5</sup> Measured from Rim to lowest Invert Elevation Out. Use shallow SSMH if 44" and less; use trunk SSMH if greater than 20' deep.

<sup>6</sup> Pipe Deflection Angle (PDA) of pipe out versus pipe in for this line designation. Calculated acute angle (cannot be greater than 90°) as measured from upstream to downstream direction. N/A at Terminal SSMHs.

<sup>7</sup> For thru conditions use 0.00'. If PDA is greater than 30°, use 0.25' exactly (between 0.25-1.0, requires Central San approval). See item #4 for connecting to existing trunks. N/A at Terminal SSMHs.

<sup>8</sup> If more than one pipe in, use separate SSMH table as PDA and Deltas could be different.

**Pothole Table**

If applicable, then provide, in format shown below, on most appropriate sheet.

Pothole Table (governs if provided elsewhere)							
Pothole #	Existing Utility		Reason to Pothole				
	Type (Owner)	Size/ Mat'l	Clearances (Relationship to SS) check off and provide measured clearance, or N/A for existing Central San				For SS POC purposes, N/A or SS IE (ft)
			Vertical		Horizontal		
PH1	Water (EBMUD)	6" PVC	<input checked="" type="checkbox"/>	2'	<input checked="" type="checkbox"/>	10'	N/A
PH2	Joint trench	24" wide	<input checked="" type="checkbox"/>	3'	<input checked="" type="checkbox"/>	3'	N/A
PH3	Untreated canal water (Diablo Vista)	4" PVC	<input checked="" type="checkbox"/>	3'	<input checked="" type="checkbox"/>	3'	N/A
PH3	Central San Sewer	8" VCP	<input type="checkbox"/>	N/A	<input type="checkbox"/>	N/A	87.5'

## Compliance Checklist – Design Concept

### Utility Crossing Table

If applicable, then provide one Table for each SS Line designation, in format shown below, on most appropriate sheet.

Utility Crossing Table <sup>1</sup> (governs if provided elsewhere)											
#	Angle Xing <sup>2</sup>	Upper Pipe (bottom)				Lower Pipe (top)				Vertical Clearance	
		Status	Utility	Size/ Mat'l	Invert Elev	Status	Utility	Size/ Mat'l	Top Elev <sup>3</sup>	clear	determined by <sup>4</sup>
X1	90°	new	Water (EBMUD)	6" PVC	97'	new	SS (CCCS)	8" PVC	96'	12"	record dwg
X2	45°	ex	Joint trench	24"	80'	new	SS (CCCS)	8" DIP	85'	5'	potholed

- <sup>1</sup> not required for services
- <sup>2</sup> shall be greater than 30° to the centerline of sewer
- <sup>3</sup> elevation of the top of pipe/utility
- <sup>4</sup> method to determine vertical clearance of existing utilities cannot be by design, instead determine by pothole data, record drawings, interpolations, past practice, etc.

### Horizontal Curve Table

If alignment includes horizontal curves, then provide one Table for each SS Line designation, in format shown below, on most appropriate sheet.

Horizontal Curve <sup>1</sup> Table (governs over Plan View)								
# <sup>2</sup>	D/S MH #	BC Station (D/S) <sup>3</sup>	EC Station (U/S) <sup>3</sup>	Delta (D) (DMS or dec. degrees)	Radius (R) (ft) <sup>4</sup>	Arc Length (ft)	U/S MH #	Cumulative Angle <sup>4</sup> of Pipe Run (degrees) (D/S to U/S MH)
C1	1	13+65.18	15+42.13	33° 47' 42"	300	176.95	2	33° 47' 42"
C2	3	2+00	2+65.15	20° 47' 48"	179.50	65.15	4	20° 47' 48"
C3	3	3+00	3+44.10	16° 27' 37"	153.50	44.10	4	37° 15' 53"

- <sup>1</sup> Verify curve is mathematically correct:  $L / (2 \pi R) = \Delta / 360$
  - <sup>2</sup> Depict Curve ID # on profile
  - <sup>3</sup> Downstream (D/S) and Upstream (U/S)
  - <sup>3</sup> If less than allowable axial bending and/or for DIP (see Dwg 21-01), then provide fitting or straight pipe Deflection Table.
  - <sup>4</sup> Additive of curve angles between downstream and upstream SSMHs.
- Reference:* See [Std Specs](#) Section 8-07.C, Curves – Vertical and Horizontal for design requirements.

### Curve Deflection Table

Where radius is less than the allowable axial bending or for ductile iron (DIP), provide one Table for each Curve, in format shown below, on most appropriate sheet.

Curve Deflection Table (governs over Plan View)							
C2 Curve							
Delta (D) 10°17'39" (10.289 dec. deg.); Radius (R) 260.00' (DIP PIPE); Arc Length (L) 46.71'							
Slope (S) 0.0124							
Deflection <sup>1</sup> @ Each Joint (DJ) 3° 25' 53" (3.426 dec. deg.)							
Laid Length (LL) 15.56' (greater than 5')							
Description	Station	Laid Length (LL) feet	Cumulative Length feet	# Deflection @ Joint (N)	Deflection @ Joint (DJ) <sup>2</sup> dec. deg.	Cumulative Angle <sup>2</sup> dec. deg.	I.E. feet
BC	0+66.85	0	0	none	0	0	760.42
½ Laid Length (B/E)	0+74.60	7.78	7.78	1	3.43	3.43	760.52
	0+90.10	15.56	23.34	2	3.43	6.86	760.71
½ Laid Length (B/E)	1+05.60	15.56	38.90	3	3.43	10.29	760.88
EC	1+13.56	7.78	46.68 = L	none	0	10.29 = D	761.00

<sup>1</sup> deflections at each joint/end of pipe segment to not exceed allowable deflection as shown on latest "Approved Materials List" located <https://www.centernalsan.org/standard-specifications-and-approved-materials>

<sup>2</sup> DMS or decimal degree units.

Guides:

1. Verify curve is mathematically correct:  $L / (2 \pi R) = \Delta / 360$
2. Select LL (greater than 5') and Determine N:  $L / LL$  round down to whole integer
3. Determine Beginning/End (B/E) which is ½ Laid Length:  $(L - ((N-1) \times LL)) / 2$
4. Determine DJ:  $D / N$ . (see footnote 1 regarding max angle)
5. Cumulative Length must = L; Cumulative Angle must = D

## Attachment – Standard Specifications References

**Table 4. Minimum allowable slopes**

Nominal Pipe Size (in)	Minimum Design Flow (cfs)	Maximum Design Flow (cfs)	Minimum Slope (ft/s)
8	0.0	0.81	0.0077
10	0.82	1.28	0.0057
12	1.29	1.57	0.0022
15	1.58	2.45	0.0015
18	2.46	3.53	0.0012
21	3.54	4.81	0.00095
24	4.82	6.28	0.0008
27	6.29	7.95	0.0007
30	7.96	9.81	0.0006
33	9.82	11.87	0.00055
36	11.88	14.13	0.0005

**Table 6. Preferred Material for Main and Trunk Sewers**

If diameter is...	And shall be installed...	Then use...
<12"	with a slope exceeding 20%	ductile iron pipe
	under a roadway with pipe slope less than 20%	PVC SDR-26
	not under a roadway and with pipe slope less than 20%	PVC C900 DR 14
12-15"	with a pipe slope exceeding 20%	ductile iron pipe
	with a pipe slope less than 20%	PVC SDR-26
>15"		PVC C905

**Table 7. Main and Trunk Sewer Pipe Cover Limitations**

Size	Material	Type and Minimum Class	Min- Max Cover in ft		
Main Sewers under Roadway					
8"	VC	-	6	30	
10"				15	
8"-10"	DI	Class 52	1	35	
	PVC	SDR-26	5	24	
		C 900 DR 25			
		C 900 DR 18			4
		C 900 DR 14			3
HDPE	SDR-17	5			
Main Sewer not under Roadway					
8"-10"	DI	Class 52	1	30	
	PVC	C900 DR 14	3	24	
Small Trunk Sewers					
12"	VC	-	6	18	
15"				25	
12-16"	DI	Class 52	1	30	
12"-15"	PVC	SDR-26	6	24	
14"-24"		C905 DR 51			
		C905 DR 41			
		C905 DR 32.5			
		C905 DR 25			
		C905 DR 21			
C 905 DR 18					