



Standard Specifications

for Design & Construction

2022 Edition



Revisions

Users of Central San's Standard Specifications for Design and Construction, Standard Drawings, and Approved Materials List shall be responsible to confirm they are using the most recent versions. To confirm the most recent versions, please visit <https://www centralsan.org/standard-specifications>.

REV NO.	SECTION OR DWG NO.	DESCRIPTION
1	Cover	New
2	2-01	Clarified basic sewer service policy requirements
3	2-03	Revised per Code update 2010
4	2-04	Moved from Section 17
5	2-04.A	Added precedence: District Code, then Specs and Plans
6	2-04.B.1	Added order of precedence for Mainline plans
7	3-01.B.2.a.i	Clarified location of cap
8		General updates to include recycled water (e.g., sewer/recycled water work)
9	3-01.B.2.a.iv	Clarified that portion of lateral (lower only) that may be permitted with sewer extension
10	3-01.B.2.a.vii	Moved pump review item from C.7
11	3-01.C	Added title, added subsections for Service Requests and Building Permit Review and Encroachment Verification (to match revised application title and Applicant's Guide)
12	3-02	Expanded expirations to applications and plans, by type. Clarified requirements to re-start after close.
13	3-05	License classifications updated to match District Code, to include B and C47.
14	3-06	Insurance updated to match District Code
15	4-01.F.2	Changed from variance to exception for dedicated side sewer under house
16	4-02.A.3	Added requirement to properly handle slurry from HDD operations
17	4-02.C.2	Reordered pipe material by preference; relocated removal of internal bead to Tech Specs
18	4-02.D	Corrected auto-number of paragraphs
19	4-05.E	Expanded to include multi-family residential and mixed use
20	4-07	Updated and clarified minimum horizontal clearances for building sewers
21	4-08.C	Clarified that portion of lateral (lower only) that may be permitted with sewer extension
22	4-09.A	Clarified requirement for direction and accessibility of cleanouts; required at transition from pressure to gravity
23	5	General correction to internal reference of subsection 5-02a throughout section
24	5-04.E	RV/Trailer Holding Tank Dump Stations – permissible in commercial applications only

REV NO.	SECTION OR DWG NO.	DESCRIPTION
25	5-06	Added new section for pet waste disposal
26	6-02.B	Added clarification for land-rights when parcels have same owner
27	7-03	Added California Plumbing Code reference
28	8-01	Added clarification for prohibition of ratepayer funds to install new infrastructure,
29	8-01.B	Moved from former section 10-01 to aid Engineers at start of design
30	8-01.C	Moved from former section 12-01 to aid Engineers at start of design
31	8-01.D	Added reference to District Code §7.15.020, that public facilities can only be installed in easements as last resort
32	8-01.E	Clarified demonstration for entity to be responsible for private system
33	8-01.G	Relocated "note" to appropriate paragraph
34	8-02	Moved from former section 10-05 to aid Engineers at start of design
35	8-02.B	Moved from former section 10-04.A.9 to aid Engineers at start of design
36	8-03.A.2	Reordered pipe material by preference; relocated removal of internal bead to Tech Specs
37	8-03	Removed CIPP, as this is not a method of a Sewer Main extension
38	8-05.A	Added to reiterate District Code requirement to design for ultimate tributary area; and mitigate impact of development on existing downstream system
39	8-06.B	Added to mitigate impact of development on existing downstream system
40	8-06.C	Added to reiterate existing Standard Drawing 21-02 for configuration at trunk manhole connection
41	8-07.A	Added reference to District Code §7.15.020, that public facilities can only be installed in easements as last resort, basis for variance consideration, and minimum maintenance and operation requirements
42	8-07.B	Clarified minimum clearance from pipe by removing "and structures"
43	8-10.A & B	Reinforced requirement for access to structures
44	8.10.C.2	Clarified minimum clearance for manholes
45	8.10.C.3	Clarified configuration at trunk manhole connection per Standard Drawing 21-02
46	8.10.C.4	Provided example
47	8.10.C.8	Removed manhole protection wall item since manholes should be placed in location accessible to maintenance vehicles

REV NO.	SECTION OR DWG NO.	DESCRIPTION
48	8-11	Added reference to Tech Specs for proper abandonment of facilities
49	9-01.A	Added reference to District Code §7.15.020, that public facilities can only be installed in easements as last resort
50	9 through 12	Eliminated references to alignment review stage, preliminary review stage, etc. Review process will be explained in Guidance documents per consultant recommendation.
51	9-04, 9-06.A.2	Updated preference for stand-alone land rights to promote timely contribution of assets and reduce administrative burden
52	9-07.B	Clarified Central San's infrastructure responsibility for sewers but not roadways
53	10-01	Relocated design criteria to appropriate section (8)
54	10-02	Relocated from former section 11-03
55	10-03	Relocated from former section 11-05.B
56	10-04	Relocated from former section 11-06.B
57	10-05	Relocated from former section 10-02; and eliminated former Sections 10 & 11, moved into Guidance documents per consultant recommendation.
58	11	Created new section, Permitting for Construction, to clarify plan review process from permitting requirements. Relocated and reordered former sections 11-06, 11-07, 11-08, 11-09, 12-02, and 12-03. Separated into administrative and pre-construction submittals.
59	11-02.A	Updated to reflect electronic submittals only
60	11-02.C	Re-worded project cost estimate for clarity
61	11-02.D	Re-worded project security for clarity; reordered by order of preference and most common type of security; clarified additional review fees required for less common types
62	11-03.A.3	Relocated from former section 12 to aid applicant's during submittal process
63	12	Not Used; former section relocated to aid applicant's during submittal process
64	17-05.D & E	Former sections relocated to Section 2-04 since this is an administrative requirement; not an inspection duty
65	33 05 33.13 Part 2.3	Relocated item B (remove internal bead from HDPE) from design criteria to tech spec
66	19-01	New manhole cover design
67	19-02	New manhole cover design
68	19-08	New manhole cover design
69	19-09	New manhole cover design
70	19-11	New manhole cover design

Table of Contents

Part I. General Requirements.....	1
Section 1. Introduction, Authority, and Compliance with Law	1
1-01 Purpose and Scope	1
1-02 Authority of Central San.....	1
1-03 Central Contra Costa Sanitary District Code (District Code).....	1
1-04 Enforcement	1
1-05 Regulation of Private Sewage Disposal Systems	2
1-06 Licenses and Permits	2
1-07 Laws to be Observed.....	3
1-08 Protection of Survey Monuments.....	3
Section 2. Policies and Programs.....	4
2-01 Basic Sewer Service Policy	4
2-02 Service Area	4
2-03 Payment of Fees and Charges	4
2-04 Order of Precedence for District Code, Plans, and Specifications.....	5
Section 3. Permits, Contractor's Licenses, Insurance.....	7
3-01 Central San Permits and Applications	7
3-02 Effective Period of Applications, Plans, Permits	9
3-03 Unpermitted Work.....	10
3-04 Emergency Work.....	10
3-05 Contractor's Licenses	11
3-06 Insurance.....	11
3-07 Indemnification	12
3-08 Personal Liability	12
3-09 Other Required Permits	12
Part II. Private Sewage Disposal Systems	15
Section 4. Design Criteria	15
4-01 General.....	15
4-02 Installation Method	15
4-03 Minimum Pipe Sizes and Standards	17
4-04 Design Capacity	17
4-05 Point-of-Connection to Mainlines.....	17
4-06 Alignment.....	18

4-07	Pipe Clearances	18
4-08	Material Selection	18
4-09	Structures	19
Section 5.	Environmental Compliance	21
5-01	Grease, Oil and/or Solids Removal Devices.....	21
5-02	Sampling Structures	25
5-03	Parking Structures	26
5-04	Sewer Connections in Outdoor Areas	26
5-05	Swimming Pools, Spas and Fountains	27
5-06	Pet Waste	28
Section 6.	Property Rights	29
6-01	General.....	29
6-02	Acceptable Documents to Convey Property Rights	29
Section 7.	Submittal Requirements	30
7-01	General.....	30
7-02	Application	30
7-03	Requirements for Demolition and Reconnection	30
7-04	Requirements for New Building Connections	30
Part III.	Public Sewer Collection Systems	33
Section 8.	Design Criteria	33
8-01	General.....	33
8-02	Requirements for Computer Aided Design (CAD)	34
8-03	Installation Method	34
8-04	Minimum Pipe Sizes and Standards	35
8-05	Design Capacity	35
8-06	Point-of-Connection to Existing System.....	38
8-07	Pipe Alignment	38
8-08	Material Selection	41
8-09	Hillside and Creek Area	42
8-10	Structures	44
8-11	Abandonment	46
8-12	All-Weather Access Roads.....	47
Section 9.	Property Rights	48
9-01	General.....	48
9-02	Required width of Central San Easement.....	48
9-03	Improvements Allowed within Central San Easement	48

9-04	Documents Used to Convey Property Rights for Central San Facilities	49
9-05	Irrevocable Offers of Dedication by Separate Instrument	49
9-06	Irrevocable Offers of Dedication on Subdivision Maps	51
9-07	Appurtenant Easements	51
Section 10.	Submittal Requirements	55
10-01	General.....	55
10-02	Application	55
10-03	Supplemental Reports (if required).....	55
10-04	Additional Submittals (if applicable).....	55
10-05	Design Submittal(s)	56
Section 11.	Permitting for Construction	57
11-01	General.....	57
11-02	Administrative Submittals	57
11-03	Pre-Construction Submittals.....	58
11-04	Permit Issuance.....	60
Section 12.	(Not Used)	62
Part IV.	Recycled Water Distribution System.....	63
Section 13.	Design Criteria	63
13-01	General.....	63
Section 14.	Property Rights.....	64
14-01	General.....	64
Section 15.	Submittal Requirements	65
15-01	General.....	65
Section 16.	Permitting for Construction	66
16-01	General.....	66
Part V.	Construction Requirements.....	67
Section 17.	Control of the Work.....	67
17-01	Authority of the Central San Inspector.....	67
17-02	Inspection	67
17-03	Superintendence	68
17-04	Safety	68
17-05	Plans.....	69
17-06	Lines and Grades	70
17-07	Workers	71
17-08	Equipment	71
17-09	Notice to Adjacent Property Owners and Residents.....	71

17-10	Public Convenience	71
17-11	Maintenance of Access and Detours	73
17-12	Cleanliness of Jobsite.....	73
17-13	Construction Sequencing.....	74
17-14	Temporary Storm Water Pollution Control	74
17-15	Bypassing Wastewater	75
17-16	Disruption of Services.....	75
17-17	Final Inspection of the Work	75
17-18	Warranty of Proposed Public Facilities	76
17-19	Acceptance of Proposed Public Facilities	76
Section 18.	Control of Material	77
18-01	Contractor Furnished Materials	77
18-02	Source of Supply and Quality of Materials.....	77
18-03	Acquisition of Materials.....	77
18-04	Storage of Materials	77
18-05	Defective Materials	77
18-06	Trade Names and Alternatives.....	77
18-07	Testing Materials	78
18-08	Inspection at Source of Supply	78
18-09	Certificates of Compliance.....	79
Part VI.	Technical Specifications.....	81
Section 03 20 00 -	Concrete Reinforcing	82
Part 1 -	General.....	82
Part 2 -	Products	82
Part 3 -	Execution.....	83
Section 03 30 00 -	Cast-In-Place Concrete	87
Part 1 -	General.....	87
Part 2 -	Products	88
Part 3 -	Execution.....	90
Section 03 34 13 -	Controlled Low-Strength Material (CLSM).....	94
Part 1 -	General.....	94
Part 2 -	Products	94
Part 3 -	Execution.....	95
Section 03 40 00 -	Precast Concrete	97
Part 1 -	General.....	97
Part 2 -	Products	97

Part 3 - Execution.....	97
Section 03 60 00 - Grout.....	99
Part 1 - General.....	99
Part 2 - Products	100
Part 3 - Execution.....	102
Section 05 50 00 - Miscellaneous Metal Work.....	104
Part 1 - General.....	104
Part 2 - Products	104
Part 3 - Execution.....	106
Section 09 90 00 - Painting and Coating	108
Part 1 - General.....	108
Part 2 - Products	109
Part 3 - Execution.....	110
Section 22 05 29 - Hangers and Supports for Piping.....	114
Part 1 - General.....	114
Part 2 – Products	114
Part 3 – Execution.....	118
Section 31 05 19 - Geosynthetics for Earthwork.....	119
Part 1 - General.....	119
Part 2 – Products	119
Part 3 – Execution.....	120
Section 31 23 16 - Excavation, Bedding and Backfill.....	123
Part 1 - General.....	123
Part 2 – Products	124
Part 3 – Execution.....	127
Section 32 12 16 - Asphalt Paving.....	134
Part 1 - General.....	134
Part 2 - Products	134
Part 3 - Execution.....	135
Section 32 15 60 - All-Weather Access Roads	140
Part 1 - General.....	140
Part 2 - Products	140
Part 3 - Execution.....	140
Section 33 01 30.11 - Inspection of Sewers	142
Part 1 - General.....	142
Part 2 - Products	142
Part 3 - Execution.....	143

Section 33 05 13 - Manholes and Structures.....	148
Part 1 - General.....	148
Part 2 - Products	148
Part 3 - Execution.....	149
Section 33 05 16 - Cast-Iron Pipe (CIP)	155
Part 1 – General.....	155
Part 2 – Products	155
Part 3 – Execution.....	156
Section 33 05 19 - Ductile Iron Pipe (DIP).....	157
Part 1 – General.....	157
Part 2 – Products	157
Part 3 – Execution.....	158
Section 33 05 24 - Steel Pipe	160
Part 1 – General.....	160
Part 2 – Products	161
Part 3 – Execution.....	162
Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe.....	163
Part 1 – General.....	163
Part 2 – Products	164
Part 3 – Execution.....	165
Section 33 05 31.33 - Acrylonitrile Butadiene Styrene (ABS) Pipe.....	166
Part 1 – General.....	166
Part 2 – Products	166
Part 3 – Execution.....	167
Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe	168
Part 1 – General.....	168
Part 2 – Products	169
Part 3 – Execution.....	171
Section 33 05 39.41 - Reinforced Concrete Pipe (RCP).....	173
Part 1 – General.....	173
Part 2 – Products	174
Part 3 – Execution.....	177
Section 33 05 41 - Vitrified Clay Pipe (VCP).....	179
Part 1 – General.....	179
Part 2 – Products	180
Part 3 – Execution.....	180
Section 33 31 00 - Sanitary Sewerage Piping	182

Part 1 - General.....	182
Part 2 - Products	183
Part 3 - Execution.....	183
Section 33 31 16 - Sanitary Sewer Gravity Service Laterals	189
Part 1 - General.....	189
Part 2 - Products	190
Part 3 - Execution.....	190
Section 33 31 26 - Multiple-User Low Pressure Sewer Systems (MULPSS)	196
Part 1 - General.....	196
Part 2 - Products	197
Part 3 - Execution.....	198
Section 33 32 26 - Individual Lot Pumping Systems.....	200
Part 1 - General.....	200
Part 2 - Products	201
Part 3 - Execution.....	203
Part VII. Standard Drawings.....	207
Section 19. Manholes and Structures.....	208
19-01 Standard Main Manhole.....	208
19-02 Standard Trunk Manhole	209
19-03 Special Trunk Manhole.....	210
19-04 Shallow Manhole: Type 1 & 2	211
19-05 Manhole Base: Pipe Joint Requirements for through Pipes.....	212
19-06 Manhole Base: Special Detail.....	213
19-07 Manhole Base: Future Connection	214
19-08 Standard Manhole Frame & Cover	215
19-09 Bolt-Down Manhole Frame & Cover	216
19-10 Manhole Adjustment to Finish Grade	217
19-11 Manhole Protection Wall & Top Block	218
19-12 Temporary: Manhole Cover	219
19-13 Temporary: Manhole False Bottom	220
19-14 Rodding Inlet	221
19-15 Rodding Inlet Frame & Cover	222
19-16 Temporary: Access Structure	223
Section 20. Earthwork and Trenching.....	224
20-01 Trench Structural Detail 1 for existing paved streets & parking areas	224
20-02 Trench Structural Detail 2 for unpaved areas	225

20-03	Standard Trunk Sewer Trench Details.....	226
20-04	Shared Trench Detail for Side Sewers	227
20-05	Trench Dams	228
20-06	Joint Utility Trench Separation Detail.....	229
20-07	Criteria for the Separation of Water Main and Sanitary Sewers	230
20-08	All-Weather Access Road Turnarounds	231
Section 21. Mainline Sewers		232
21-01	Layout of Curved Alignment	232
21-02	Main Sewer Connection to Trunk Sewers.....	233
21-03	Pipe Anchor Detail.....	234
21-04	Junction Support.....	235
21-05	Concrete Pier Support.....	236
21-06	Pipe Saddle	237
21-07	Guard Fence for Creek Crossing.....	238
21-08	Debris Trap.....	239
Section 22. Side Sewers.....		240
22-01	Side Sewer Layout to Existing Main	240
22-02	Side Sewer Layout to New Main.....	241
22-03	Tap and Wye Connection to Existing Main	242
22-04	Minimum Layout of Wyes along Main	243
22-05	Overflow Protection Devices.....	244
22-06	Clean Check Protection Devices	245
22-07	Cleanout Risers	246
22-08	Side Sewer Repairs	247
22-09	Cleanout Modification for 8" Lateral.....	248
22-10	Side Sewer Tap to RCP Trunk Sewer	249
Section 23. Side Sewers - Commercial		250
23-01	RV/Trailer Holding Tank Disposal Facility.....	250
23-02	Grease Interceptor.....	251
23-03	Sand-Oil Interceptor	252
23-04	Concrete Traffic Slabs for Grease Interceptors or Sand-Oil Interceptors	253
23-05	Precast Sampling Structures	254
23-06	Trash Enclosure Detail	255
Section 24. Mulpss and Individual Lot Pumping System		256
24-01	Individual Lot Pumping System	256

24-02	Multiple-User, Low-Pressure Sewer System Manhole.....	257
24-03	Multiple-User, Low-Pressure Sewer System Flushing Inlet	258
24-04	Multiple-User, Low-Pressure Sewer System Connection at Gravity Manhole 259	
24-05	Multiple-User, Low-Pressure Sewer System Miscellaneous Details	260
Part VIII. Glossary		261
Section 25. Acronyms, Abbreviations and Terms		261
25-01	Acronyms and Abbreviations	261
25-02	Terms	263
Part IX. Index		269

draft

Part I. General Requirements

Section 1. Introduction, Authority, and Compliance with Law

1-01 Purpose and Scope

The Standard Specifications for Design and Construction shall govern sewer design and construction work by private individuals, public agencies, and businesses within the boundaries of the Central Contra Costa Sanitary District (Central San). The jurisdiction of Central San includes the entire sewerage system and its appurtenances from the point-of-connection with each building's plumbing (defined by the side sewer beginning 2 feet outside the building wall or foundation) to the discharge terminus of the treatment plant outfall. The [District Code](#) and all uncodified ordinances of Central San shall be considered a part of these Specifications and all Plans, profiles, cut sheets, right-of-way documents, and specifications shall conform to the standards and requirements herein established.

Addenda to these Specifications may be issued periodically and will be available at www.centralsan.org and at Central San's Permit Counter.

1-02 Authority of Central San

The authority of Central San to establish and enforce these Specifications is provided in Division 6, Part 1, of the Health and Safety Code of the state of California, and the [District Code](#).

When reference is made to another code, then the reference applies to the specific portion cited; and should the language in that code conflict with these Specifications, then these Specifications shall prevail.

1-03 Central Contra Costa Sanitary District Code (District Code)

The [District Code](#) provides the authority of the (Central San) Engineer; states that only contractors licensed in the state of California (and Property Owners in particular cases) may perform work on private or public sewers, requires contractor registration; and provides for permits and licenses, fees and charges, real property and improvements, sewers, source control (pretreatment), and recycled water.

1-04 Enforcement

Subject to due process, Central San may impose fines, disconnect sewers, pursue other enforcement provided by [District Code §1.08 Enforcement and Penalties](#), [§5.10 Permit Enforcement Provisions and Remedies](#), and [§5.12 Suspension or Revocation of Sewer Work Permits and Suspension of Contractor Registrations](#) and/or take legal action against any person(s) who violates the provisions. Central San may take the following actions including, but not limited to:

- A. Central San may serve a person who violates this code, the terms of any Central San permit, the requirements of these Standard Specifications, or other rule,

order, or regulation of Central San with written notice of the violation. Upon receipt of the notice, the person shall cease the violation and correct the defect within the time stated in the notice.

- B. When a sewer work permit is not obtained, Central San may order the person in violation of the permit requirement to comply with the permit procedure; to desist from further work; to remove existing work; to disconnect from the Central San collection system any sewer line constructed, excavated, repaired, rebuilt, altered, or reconstructed without the necessary permit; and/or to expose completed work for inspection.
- C. If the work performed or activity conducted under any sewer work permit violates any term of that permit or does not conform to pertinent District Code sections, rules, orders, regulations or specifications, or if the permit holder does not arrange for required Central San inspections, then Central San may refuse to sign off on the work and may order the permit holder and/or the current owner of the property where the sewer which is the object of the work is located, or both, to desist from further work, remove existing work, disconnect from the Central San collection system any sewer line constructed, excavated, repaired, rebuilt, altered or reconstructed, expose completed work for inspection.
- D. Central San may suspend or revoke any sewer work permit if the permit holder fails or refuses to comply with each provision of the permit, pertinent provisions of this code, the specifications, rules and regulations of Central San, the orders of Central San staff, or pertinent rules and regulations of a federal or state agency or to pay any sewer work permit-related fee, charge, or financial obligation (e.g., inspection fees).
- E. Central San may also suspend a contractor's Central San registration preventing the issuance of future sewer work permits during the period of suspension of the contractor's registration. The duration of a suspension of a Central San registration shall not exceed two years. Reinstatement of a contractor's registration shall at minimum be contingent upon verification of correction of all substandard work, the payment of any outstanding fees, penalties, costs of corrections and other costs imposed under the District Code.

1-05 Regulation of Private Sewage Disposal Systems

The design, construction, and maintenance of private sewage disposal systems including septic tanks and leach fields, and methods of sewage disposal other than Central San's public sewer system are governed by the statutes, ordinances, rules, and regulations of Contra Costa County and the State of California. See also [District Code §9.04.](#)

1-06 Licenses and Permits

Contractors doing sewer work within Central San boundaries shall be properly licensed in accordance with the provisions of Division 3, Chapter 9, Business and Professions Code, of the State of California, as amended; as required in [District Code §5.04.015,](#) and in 2-04.

Prior to beginning any work, the Contractor shall obtain all permits and licenses, pay all inspection charges and permit fees, and give all notices necessary for compliance with applicable federal, state, county, district, municipal and local laws, ordinances, orders and regulations.

A person who employs others and applies for a sewer work permit shall obtain and maintain a trench and/or excavation permit issued by the Division of Occupational Safety and Health, state of California (Cal OSHA). The Contractor shall submit a copy of its current annual Cal OSHA Excavation Permit to the Central San Permit Counter. No Central San permits will be issued to a contractor unless a current Cal OSHA Excavation Permit is on file.

1-07 Laws to be Observed

The Contractor shall comply with federal, state, county, district, municipal and local laws, ordinances, orders, and regulations, which in any manner affect the work and/or those engaged or employed in the work.

1-08 Protection of Survey Monuments

A Contractor issued a Central San Permit shall protect survey monuments within their work area. If survey monuments are disturbed or destroyed without having first been referenced, the Contractor shall engage a Land Surveyor to reset the monuments and file a Corner Record or Record of Survey as required by law. Monuments shall be replaced in accordance with the standards of the agency (city or county) having jurisdiction.

Reference: State of California Business & Professions Code §8771 and §8725, Penal Code §605, and Government Code §27581.

Section 2. Policies and Programs

2-01 Basic Sewer Service Policy

Each property having a separate Assessor's Parcel Number shall have:

- a public sewer extended to it; and
- one connection to the public sewer.

Exception: Central San may allow an exception to this policy if a property:

- is the last lot on either side of the road; and
- reasonably can be served from a public sewer via a private side sewer that serves only the excepted property; and
- installed within a recorded easement across a single intervening property adjacent to the public sewer or within public right-of-way with explicit permission from the local jurisdiction.

Additionally, when a parcel is subdivided (e.g., a lot split) any buildings sharing a side sewer to the public main shall be separated to comply with this policy and these Standard Specifications (e.g., reservation or granting of a private sanitary sewer easement).

Public sewers are owned, operated, and maintained by Central San.

Private sewers shall be owned, operated, and maintained by the Property Owner.

2-02 Service Area

Only properties annexed within the boundaries of Central San may receive sewer service through Central San public sewer facilities and those properties that have current "out-of-agency service agreements" approved by the Contra Costa Local Agency Formation Commission. Annexation charges shall comply with [District Code §6.08](#).

2-03 Payment of Fees and Charges

- A. Fees are due at the time of application for the service or permit to be provided and Central San may not issue the permit or provide the service until the applicant pays the fee.
- B. Annexation Charges: For large annexations or reorganizations, the annexation charge shall be due when a petition to annex the parcel(s) is submitted to Central San. For standard annexations, Central San shall collect annexation charges at the time a permit to connect to the public sewer is issued. For additional information, see [District Code §6.08, Annexation Charges](#).
- C. Capacity Fees: Payment of capacity fees shall be due and made prior to the time of imposition of any added burden. Payment of Capacity Fees will be due and made at the time Central San approves building plans. If an added burden occurs without payment of capacity fees, payment shall be due at the time of Central San's discovery of the added burden. For additional information, see [District Code §6.12, Capacity Fee Program](#).

- D. Sewer Service Charge: The initial payment of sewer service charges shall be made at the time of Central San's collection of capacity fees. For additional information, see [District Code §6.24, Sewer Service Charge](#).

2-04 Order of Precedence for District Code, Plans, and Specifications

A. District Code

1. If there is any conflict between these Specifications, Plans, or District Code, then [District Code](#) governs.
2. When reference is made to another code, then the reference applies to the specific portion cited; and should the language in that code conflict with these Specifications, then these Specifications shall prevail.

B. Coordination of Plans and Specifications

1. For *Sewer Main Extension* plans, the order of precedence is:
 - a) approved variance(s)
 - b) tabular sewer information, not including material tables
 - c) profile view
 - d) right-of-way map
 - e) plan view
 - f) coversheet
2. These Specifications, the Plans, and all required supplementary documents are essential to the permit or agreement, and a requirement cited in one is as binding as though cited in all. Each document is intended to be coordinated with the others, and to describe and provide for properly completed improvements.
3. The requirements of these Specifications shall govern over citations on the Plans unless deviation from the Specifications is specifically authorized by Central San in writing.

C. Interpretation of Plans and Specifications

1. If the Contractor finds any discrepancy or inconsistency between information included in the Plans, or these Specifications and any law, ordinance, regulation, or order, it shall promptly notify Central San.
2. The Contractor shall request clarification, additional information, or direction from Central San if it believes that the work to be done is not sufficiently clear, detailed or explained in the Plans and/or these Specifications. Upon receipt of such a request, Central San will render a determination as expeditiously as is practical, and the determination made shall be final.

3. In the event of a discrepancy between the graphical representation and the words or figures written on a drawing, the words and figures shall be taken as correct.

draft

Section 3. Permits, Contractor's Licenses, Insurance

3-01 Central San Permits and Applications

Within the annexed boundaries of Central San, a person shall pay the required fees and obtain a permit from Central San before undertaking sewer work or recycled water work. The Contractor or Property Owner shall have a valid Central San permit at the jobsite and available for review by the Inspector during prosecution of the work. Such permits shall fall into the following classifications:

A. Permit classifications

1. **Contractor's Permit** - With the exception of property owners, as described in subsection (A)(2) below, all persons proposing to perform any construction, excavation, repair, rebuilding, alteration, or reconstruction of any public or private sewer, or recycled water pipe, or proposing to connect any private system to a public sewer/recycled water facility must be a contractor licensed in the state of California and shall also obtain a *Contractor's Permit* from Central San.
2. **Property Owner's Permit** - An owner of real property for sewer work located on his or her property may obtain a *Property Owner's Permit*. All work under a property owner's permit shall be personally performed by the owner. A *Property Owner's Permit* shall not be issued for work in a public street or for connection of a private sewer to a Central San public sewer facility as such work must be performed by a licensed contractor having obtained a *Contractor's Permit*.

B. Standard Permits

1. **New Connections**
 - a) **Description:** For connection of buildings to existing or proposed side sewers.
2. **Sewer Repair/Alteration**
 - a) **Description:** Building additions or site improvement work may require the alteration of an existing side sewer such as:
 - (i) **Abandonment/Capping** - To abandon side sewers at the public main or to install a temporary cap on the lateral. When a building connected to Central San public sewer is to be demolished, an abandonment permit shall be obtained and the side sewer serving the building shall be temporarily disconnected and capped within 5 feet of the property or easement boundary to ensure that debris will not enter the sewer (reference: California Plumbing Code §722.1). This is required prior to obtaining a demolition permit from your local building department. A Central San Inspector will verify that the lateral is properly capped. The lateral can be temporarily capped or permanently abandoned. If the Applicant requests to reuse the existing lateral, the Applicant will be

required to televise it and verify, to the satisfaction of the Central San Inspector, that the condition of the lateral is acceptable before re-connecting. If not, replacement will be required.

- (ii) Repairs and Alterations - For work on existing side sewers, which includes, but is not limited to: repairs, alignment modifications, installations of new branch side sewers and/or cleanouts.
 - (iii) Extension - For extension of a side sewer to accommodate site construction prior to the connection of a building/structure, a *Special Approval* shall be requested, authorized, and all applicable connection fees paid prior to issuance of a side sewer extension permit.
 - (iv) Tap and Lateral - For the installation of taps, tees or wyes at the main sewer and private lateral sewers. Exception: if new building connection will immediately follow the sewer extension job, then the lateral sewer(s) may be constructed under the *Sewer Extension Permit*
 - (v) Grease and/or Sand-Oil Interceptor - For construction of outdoor grease interceptor and/or sand-oil interceptors.
 - (vi) Trash Enclosure - For connection of a trash enclosure with or without a grease trap to the sanitary sewer system.
 - (vii) System Compatibility Review for Pump - When a private sanitary sewer pump (outside of the building envelope) is proposed, an application is required to demonstrate that the pump will not negatively impact the public sewer system.
3. Manhole Only (Public)
- a) Description: manholes are required at the point-of-connection with side sewer when the proposed side sewer is:
 - (i) to connect to a trunk sewer (e.g., over 12" in diameter); or
 - (ii) greater than 6" in diameter; or
 - (iii) as determined by Central San based on the sewer and site conditions.
4. Sewer Main Extensions (Public or Private)
- a) Description: required for construction of main and trunk sewers, manholes, special structures and lateral sewer(s) installed as part of the *Sewer Extension Permit*.
5. Recycled Water Main Extensions
- a) Description: required to extend the recycled water distribution system

6. Recycled Water Connections Only

- a) Description: required for construction of a service lateral and meter installation to connect to the recycled water distribution system

C. Applications that may not result in sewer-work permits

1. Service Request Applications: applications are required for the following service requests that do not generate a permit. If additional work is necessary after the service request is completed, the appropriate application will be required to generate a permit.
 - a) Dye Test - To determine whether buildings on a particular property are connected to the public main sewer.
 - b) Air Test Inspection- To determine the condition of existing side sewers.
 - c) Public Sewer Locating - To determine the approximate location of Central San sewers on a parcel.
 - d) Right-of-Way - Examples include real property agreements, quitclaims, right-of-entry, encroachment permits, etc.
 - e) Surveying - Typically an at-cost service as an add-on to other service requests.
2. Building Permit Plan Review and Encroachment Verification - Central San reviews building permit plans to determine if there is any potential conflict with existing Central San easements on the property or impact to the sewer system, which may generate a sewer-work permit listed above.

3-02 Effective Period of Applications, Plans, Permits

- A. Applications: Applications without activity, as listed below, will be deemed to be abandoned and will be administratively closed, unless an extension has been authorized by Central San.

Application Type	Expiration Period (months)
Service Requests	6
Residential	6
Commercial	18
Mainline Extensions	12

The extension shall be requested in writing, prior to its expiration, with justifiable cause demonstrated including a planned construction schedule. Central San may extend the time for action by the Applicant for up to 2 additional 6-month periods. An application may not be extended if these Specifications or any other pertinent codes, laws or ordinances have been amended after the date of application.

To re-start after an application is closed, the Applicant shall submit a new application, required submittals, and pay applicable fee(s).

- B. Plans (Sewer Main Extension): See *Subsection 11-04*.
- C. Permits: As provided by [District Code §5.04.060](#), Central San permits are effective for a period of 6 months from the date it is issued, unless stated otherwise on the permit. Central San may specify the effective period for any other permit issued by Central San. The expiration date of a permit will be shown on the permit. Central San permits may be renewed in writing, upon submission of a written request and payment of any applicable fees and charges, for up to 2 additional 6-month terms.

3-03 Unpermitted Work

Performance of sewer/recycled water work without a permit is a violation of District Code. Central San may employ any enforcement mechanism set forth in [District Code §5.10.020](#) or as otherwise provided by District Code or law against those persons responsible for the unpermitted sewer or recycled water work. The person committing the violation may be subject to a fine or imprisonment as set forth in [District Code §1.08.060](#).

Unpermitted work shall be subject to an administrative fee in addition to all other applicable fees and charges. At the sole discretion of the Inspector, the Contractor or Property Owner may be required to uncover work for inspection and/or conduct CCTV inspection of the work to demonstrate that it meets the requirements of these Specifications. Where work is found to be out of compliance with the requirements of these Specifications, the Contractor or Property Owner shall correct all deficiencies, or shall remove the nonconforming work and replace it with work that complies in all respects with the requirements.

3-04 Emergency Work

- A. When a Contractor is contacted by one of its customers for immediate response to repair a sewer/recycled water service line at any time outside of Central San regular inspection hours (see below), the work may be done as an “emergency” response only to the extent required to restore sewer/recycled water service and shall comply with the following:
 - 1. The Contractor may proceed with emergency work only after leaving a message stating the location and scope of the work required on Central San’s Inspection voicemail.
 - 2. Excavations for repair work shall not be backfilled until favorable Central San inspection is received; however, excavations shall be properly protected with 4’ x 8’ sheets of 1-1/8” thick plywood in non-traffic areas or with trench plates in traffic areas, to ensure public safety whenever work is not in progress.
 - 3. The Contractor shall apply for a Central San permit for the work at 8 a.m. on the next Central San business day following any emergency response and shall obtain the permit prior to requesting inspection of the work.

3-05 Contractor's Licenses

- A. All contractors doing sewer/recycled water work within the Central San service area must be registered with Central San and shall be properly and actively licensed with the state of California Contractors License Law and the California Contractors State License Board rules and regulations. Contractors shall present evidence of licensing to Central San upon registration as required by [District Code §5.12.030](#), including submitting the names of its authorized representative(s), business address and telephone number(s). Delivery of correspondence or notices to this address by hand delivery, courier service, express carrier or U.S. Mail shall be deemed sufficient service.
- B. License classifications required for sewer-work permits are listed in [District Code §5.04.15, Properly Licensed Contractors](#). If there is a conflict between these Standard Specifications and District Code, then District Code will prevail.
1. Acceptable license classifications for work on public sewer/recycled water mains are:
 - a) A - General Engineering Contractor;
 - b) C-34 - Pipeline; and
 - c) C-42 - Sanitation Systems.
 2. Acceptable license classifications for work on private services are:
 - a) B – General Building Contractor
 - b) C-36 - Plumbing Contractor
 - c) C-47 - General Manufactured Housing Contractor

The sewer/recycled water work which contractors with B, C-36, or C-47 licenses may perform is restricted to private services from public mains to buildings, excluding connections to the public main.

A "B"—General Building Contractor shall not only be issued a sewer work permit related to a larger project that requires at least two unrelated building trades or crafts other than framing or carpentry, or unless the general building contractor holds the appropriate license classification or subcontracts with an appropriately licensed specialty contractor to perform the work, unless he or she also holds one of the required specialty licenses.

A "c-47"—General Manufactured Housing Contractor shall only be issued a sewer work permit to provide sewer service on a single-family individual site placement of a manufactured home.

3-06 Insurance

Contractors registered with Central San shall obtain and maintain workers' compensation insurance as required by California law, and general liability insurance,

as set forth in [District Code §5.08](#). Neither this section, nor [District Code §5.08](#), nor any predecessor section is or was intended to create or impose any responsibility upon Central San to ensure that the Contractor obtains and maintains this insurance, such responsibility being solely that of the Contractor. Central San may, however, investigate a contractor's insurance coverage at any time. Failure of a contractor to obtain and maintain required insurance may cause the denial, suspension and/or revocation of permits, at the sole discretion of Central San.

3-07 Indemnification

The Contractor shall defend, protect, indemnify, and hold Central San, and all of Central San's officers, directors, employees, and agents free and harmless from and against claim, loss and/or liability, including attorneys' fees arising from or based on the violation of any such law, ordinance, regulation, or order, whether by the Contractor or its employees, subcontractors, or agents.

The Contractor shall be solely responsible for providing uninterrupted sewer service to all connected properties affected by its work. The Contractor shall defend, protect, indemnify, and hold Central San, its officers, directors, agents, and employees free and harmless against any loss, claim, or liability, including attorneys' fees, arising from, or based on failure to provide such continuous service.

3-08 Personal Liability

No Central San director, officer, employee, or agent shall be personally responsible for any liability arising under or by virtue of the performance of the work. (Reference: California Government Code, Title 1, Division 3.6, Part 2, Chapter 1, Article 2, §815)

3-09 Other Required Permits

- A. Cal OSHA Excavation Permit: A person who employs others and applies for a sewer work permit shall obtain and maintain a trench and/or excavation permit issued by the Division of Occupational Safety and Health, state of California. The Cal OSHA Excavation Permit shall be on file with Central San prior to applying for a permit where the depth of excavation will be 5 feet or greater or where soil conditions in the field may pose a hazard of cave-in for shallower excavations.
- B. Encroachment Permits: Whenever performing sewer work within a public street or right-of-way, the Contractor shall obtain an encroachment permit from the local public works jurisdiction (County, City or Town), and have a copy of the permit available at the jobsite for review by the Inspector at all times while performing work.
- C. When the use of explosives is necessary for the performance of the sewer work, the Contractor shall ensure that it has the proper Cal/OSHA license to handle and use explosives for such work. The Contractor shall ensure that all explosives shall be stored in accordance with the provisions of Division XI of the Health and Safety Code. The Contractor shall take utmost care to avoid danger or damage to life and property. The Contractor shall obtain a permit for blasting from the local Fire Marshal. Central San may inspect blasting licenses and/or permits at

any time. The Contractor shall notify Cal/OSHA and Central San Inspection regarding the time and place of the Contractor's use of explosives.

draft

Part II. Private Sewage Disposal Systems

Section 4. Design Criteria

4-01 General

- A. Joint use of a Side Sewer to serve more than one property shall not be permitted. For additional information, see *Subsection 2-01*.
- B. All Side Sewers shall be equipped with an approved Overflow Protection Device.
- C. The construction of a new building normally requires a connection to the Central San sewer system. Central San has developed procedures to approve the connection, collect applicable fees, and inspect the construction of any sewer facilities.
- D. Central San staff reviews building plans for any construction project for possible encroachments into existing public easements or conflicts with existing Central San facilities. If encroachments exist, plans shall be revised to meet Central San requirements. Central San staff will also determine the availability of public sewers in the area to serve any proposed building, as well as the plumbing for a proposed connection.
- E. Side sewers shall be connected by gravity to the mainline. If there is not a feasible gravity sewer alternative, then Individual Lot Pumping Systems will be allowed. If a sewage pumping system is proposed, the Contractor shall comply with the requirements of *Section 33 32 26 - Individual Lot Pumping Systems*.
- F. Independent Systems
 - 1. The drainage system of each new building and of new work installed in an existing building shall be separate and independent from that of any other building, and, where available, every building shall have an independent connection with a public or private sewer. (*Reference: [California Plumbing Code, §311.](#)*)
 - 2. An exception may be requested to construct a dedicated side sewer from the rear building underneath the front building if it is not feasible to construct that side sewer through an adjoining court, yard, or driveway.
 - 3. Side sewers from rear buildings shall be connected downstream of the front building's clean out and each building shall be equipped with an Overflow Protection Device.

4-02 Installation Method

Unless otherwise approved on the Permit, pipes shall be installed by the open-cut method in compliance with *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

Alternate methods of installation may be proposed during the application process subject to the following:

A. Horizontal Directional Drilling (HDD)

1. The minimum design slope for pipelines proposed for installation by horizontal directional drilling (HDD) be 3% ($S = 0.0300$).
2. Pipe material shall be restrained-joint Ductile Iron Pipe, restrained-joint or thermo-fusion welded PVC Pipe as specified, or thermo-fusion welded High Density Polyethylene Pipe as specified in *Part V Technical Specifications*.
3. Mud/slurry from drilling operation shall be properly captured and disposed of; storm drain systems, creeks and waterways shall be protected.

B. Boring and Jacking

1. The minimum interior diameter of metal castings shall be 8" greater than the maximum outside diameter of the sewer pipe barrel to be installed, not including bells.
2. Casings shall be welded steel pipe no less than the minimum diameter and thickness shown on the Plans and shall comply with *Section 33 05 24 - Steel Pipe*.
3. The annular space between the carrier pipe and the casing shall be filled with grout or silica sand.

C. Pipe Bursting

1. Side sewers will be acceptable for pipe bursting if the following is met during the pre-installation CCTV inspection:
 - a) Existing pipe material is vitrified clay or a similar material that can be fractured by pipe bursting.
 - b) No sags (standing water); sags shall be repaired prior to pipe bursting
2. Pipe material shall be thermo-fusion welded HDPE pipe (minimum SDR-17), or restrained-joint or thermo-fusion welded PVC pipe as specified in *Part V Technical Specifications*.

D. Cured-In-Place Pipe (CIPP)

1. Side sewers will be acceptable for CIPP repair if the following is met during the pre-installation CCTV inspection:
 - a) Pipe shall be free of debris and root intrusion, and thoroughly cleaned
 - b) No sags (standing water); sags shall be repaired prior to installation
 - c) No joint offset > 1/4 inch

2. The Contractor shall obtain a *CCCSD Special Discharge Permit* if it proposes to discharge CIPP process water to the public sewer system. Process water shall not be discharged to storm drains, gutters watercourses, swales, impoundments or onto the ground.

4-03 Minimum Pipe Sizes and Standards

A. Size and Slope

1. Minimum and maximum sizes and slopes are shown in *Table 1* below:

Table 1. Minimum and Maximum Allowable Slope for Side Sewers

Description	Gravity			Pressurized**
	Nominal Pipe Size (in)	Slope (%)		Nominal Pipe Size (in)
	min	min	max	
Residential, Homes (up to 4.0 RUE)	4	2.0*	150	**
Trash Enclosures, Drinking Fountains, Eyewash Stations, Bathrooms				
All Other Uses	6	1.1		**

2. The size of the side sewer shall not be smaller than the size of the building waste plumbing at its connection to the side sewer.
3. *Applicant may request a *Variance* if a 4" side sewer cannot meet the minimum slope required for a 4" pipe but can meet the minimum of a 6" pipe.
4. **Applicant shall demonstrate compliance with *Subsection 4-01* Item E to Central San's satisfaction before proceeding. Applicant shall submit hydraulic calculations to determine size of lateral while demonstrating the discharge flow meets *Subsection 4-05* for the point-of-connection with the public sewer system.

4-04 Design Capacity

- A. Discharge Flow - The discharge from any side sewer at its point-of-connection to the main sewer shall not exceed 100 gpm.
- B. Fixture Units - The fixture unit equivalents for plumbing fixtures shall be based on the tables of the Uniform Plumbing Code, latest edition.

4-05 Point-of-Connection to Mainlines

- A. The crown of the side sewer shall match the crown of the public main sewer it connects to.
- B. Side Sewers shall connect to public sewers at manholes or by installation of approved taps, wyes or sanitary tees.
- C. Side Sewer connections to public sewers over 12" in diameter shall be made at manholes unless *Special Approval* is authorized for installation of a tap.
- D. Side sewers equal in size to the main sewer shall be connected at a manhole, unless a *Variance* is authorized.

- E. Multi-Family Residential, Mixed Use, or Commercial Side Sewer connections to an 8" main sewer may require a manhole if required by Central San at the time of Application.
- F. Side sewer connections shall be made with fittings or adapters recommended by the manufacturer for use with the particular pipe and as listed on the *Approved Materials List*.
- G. Side sewer or lateral connections to new or existing manholes shall conform to *DWG 19-01* through *19-07*. If connecting to a main sewer along a horizontal curve, the lateral shall be radial/perpendicular.
- H. Connection and side sewer details shall conform to *DWG 22-01* through *22-10*.

4-06 Alignment

- A. Lateral sewers shall have an alignment that provides an angle of intersection with the downstream section of main sewer of no less than 90°. The maximum allowable deflection at any point in a side sewer shall be 90°. Consecutive bends shall be separated by a straight pipe segment at least 2 feet in length.

4-07 Pipe Clearances

- A. Side sewer pipes and structures shall be designed and constructed with a minimum wall-to-wall clearance of 12" vertical and 12" horizontal from other utilities and improvements, unless a greater clearance is required by the utility or local jurisdiction, as shown in *DWG 20-06*.
- B. Side sewers shall have a minimum horizontal clearance of 2 feet from any building or structure (such as porches and steps, whether covered or uncovered; breezeways; roofed porte cochere; roofed patios; carports; covered walks; covered driveways; and similar structures or appurtenances).
- C. It is recommended, but not required, that side sewers have adequate clearance from trees and C3 stormwater improvements.

4-08 Material Selection

- A. Side sewers installed by open-cut shall be PVC SDR-26, unless site conditions do not meet cover or other requirements, then alternative materials shall be used in compliance with *Table 2*, subject to approval by the Central San Inspector. Side sewers installed by pipe bursting shall be HDPE.
- B. During installation, if any portion of a Job does not meet the minimum cover or clearance requirements shown on the Plans, then *Special Approval* by the Inspector is required before proceeding with the work.
- C. Lateral sewers installed concurrently with a *Sewer Extension Permit* shall be of the same material and class as the main sewer.
- D. At the point-of-connection to the building waste plumbing, minimum cover for side sewers shall be 18".

- E. The following minimum and maximum allowable pipe cover shall be achieved in design and construction of sanitary sewers:

Table 2.Side Sewer Pipe Cover Limitations

Size	Material	Type and Minimum Class	Min- Max Cover in ft	
Building Sewers				
4"-6"	DI	Class 52	1	30
	CI	Soil Pipe	1.5	
	VC	-	2.5	
	ABS	Schedule 40		24
	PVC	SDR-26		
		Schedule 40		
HDPE	SDR-17			
Lateral Sewers				
4"-6"	DI	Class 52	1	30
	CI	Soil Pipe	1.5	
	PVC	C900 DR 14	3	24
		C900 DR 18	4	
		SDR-26	5	
		C900 DR 25		
		Schedule 40		
	HDPE	SDR-17		
	ABS	Schedule 40		
4"	VC	-		30
6"				20

4-09 Structures

A. Cleanouts

- Shall be installed so that it opens to allow cleaning in the direction of flow (Reference: per California Plumbing Code §719.4)
- Shall be accessible at all times (Reference: California Plumbing Code §719.3 and §719.5)
- Shall conform to *DWG 22-07* and be provided in the side sewer at the following locations:
 - point-of-connection to the building drain, within 2 feet of building foundation
 - any single bend greater than 45°
 - aggregate horizontal change in direction exceeds 90°
 - intervals not to exceed 100 feet (Reference: [California Plumbing Code §719.1](#))
 - at the transition between pressurized and gravity flow on a side sewer

B. Overflow Protection Devices

1. Requirement: All Property Owners shall install and maintain an OPD on any side sewer that is connected, or is intended for connection to, the Central San sewer system (see also [District Code §9.15](#)).
 2. Location: Where reasonably possible, OPDs shall not be in areas with vehicular and foot traffic, nor be obstructed (e.g. nothing on, over, adjacent to the OPD that would restrict observation of, or access for cleaning up, an overflow). If an OPD will be located in an area which will have concrete or asphalt paving, such as a driveway or sidewalk, the device shall be installed in a Central San-approved reinforced concrete utility box fitted with a metal lid. Where the sewage cannot overflow on the area surrounding an overflow protection device without damage to property, a Central San-approved check valve shall be installed.
 3. Elevation Requirements: OPDs shall be installed at an elevation that protects the property from damage. The Property Owner is responsible to either (1) confirm that the backwater overflow prevention device is at the proper elevation; or (2) to obtain competent assistance from a licensed plumber or contractor to confirm its proper elevation. If any subsequent modification of the property results in the OPD being at an improper elevation, the Property Owner or Contractor shall adjust the OPD to the proper elevation.
 4. For additional specifications, see *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- C. Other Structures
1. Other structures, such as pretreatment devices or sampling structures, may be required. For additional requirements, see *Section 5 Environmental Compliance*.

Section 5. Environmental Compliance

5-01 Grease, Oil and/or Solids Removal Devices

Central San may require any non-domestic user to install a grease, oil and/or solids removal device according to guidelines set forth below and [District Code §10](#) in order to prevent grease, sand, flammable liquids, and other substances which are likely to restrict the flow or create a hazard from entering the sanitary sewer system.

A. Food Service Facilities

Any commercial establishment with common food preparation facilities shall have a grease interceptor⁽⁰⁰³⁾ and/or grease trap(s) installed, as specified by Central San. The size of all grease interceptors and/or grease traps will be determined by Central San on a case by case basis using objective criteria, that may include, but is not limited to the size and type of facility, volume of business or operation, plumbing fixtures, and cooking fixtures, drainage fixture units and estimated flow rate (*reference*: Uniform Plumbing Code, latest edition). Standards for grease traps and grease interceptors for food service facilities are presented below.

1. Grease Interceptors (Gravity Grease Interceptors per UPC)

- a) The term "grease interceptor" shall mean a prefabricated or precast grease interceptor with a minimum capacity of 1,000 gallons conforming to current American National Standards Institute (ANSI) standards for Prefabricated Gravity Grease Interceptors (ANSI Z1001-2016), and DWG 23-02 with a maximum depth of 5' to the top of the inlet pipe. All piping and connections shall be non-corrosive (e.g., no steel, cast iron, etc.).
- b) All grease interceptors shall be installed in accordance with *Section 03 40 00 - Precast Concrete* and the manufacturer's specifications.
- c) All non-domestic drain inlets including, but not limited to, floor drains, floor sinks, sinks, mop sinks and drains serving dishwashers, wash areas, trash enclosures and/or trash compactors, shall be plumbed to the grease interceptor. A *Variance* may be requested for non-domestic drain inlets outside the kitchen that will not produce grease.
- d) All domestic waste inlets shall be plumbed separately from non-domestic waste inlets and connected either to the building side sewer downstream of the grease interceptor or directly to the main sewer.
- e) Systems to add enzymes, microbes, or other materials intended to remove grease from a grease interceptor are prohibited.
- f) The grease interceptor shall be installed in a location that is readily accessible for periodic cleaning, inspection, and/or sampling. Typical installations of grease interceptors are outside of the building. Proposals for installations within the interior of the building will be considered on a case-by-case basis subject to the approval of the Contra Costa County Health Services Department.

- g) If the grease interceptor is located in an area subject to vehicle traffic, the grease interceptor shall be designed with a minimum of an H-20 traffic rating with a monolithic pour for the concrete cap. Alternatively, an appropriately designed traffic cover shall be installed over the grease interceptor in accordance with *DWG 23-04*.
 - h) A sampling structure shall be installed per *Subsection 5-02*.
 - i) Grease interceptors shall be filled with clean water after installation.
2. Grease Traps (Hydromechanical Grease Interceptors (HGI) per UPC)
- a) The term "grease trap" shall mean a rust/corrosion resistant grease removal device conforming to current American Society of Mechanical Engineers (ASME) standards for Hydromechanical Grease Interceptors (A112.14.3) or Grease Removal Devices (A112.14.4).
 - b) Grease traps shall be installed in accordance with the manufacturer's specifications with a minimum flow rating of 20 gpm and a minimum grease containment capacity of 40 pounds.
 - c) The grease trap shall be connected to specific plumbing fixtures or drains as required by Central San.
 - d) The grease trap shall not be connected to:
 - (i) Dishwashers shall not be plumbed to a grease trap. A *Variance* may be considered where an existing installation of a dishwasher is connected to a dedicated grease trap.
 - (ii) Garbage disposals/grinders shall not be plumbed to a grease trap and are prohibited in any commercial establishment with common food preparation in which the kitchen plumbing is not served by a grease interceptor.
 - (iii) Domestic waste shall not be plumbed to a grease trap.
 - e) The inlet pipe to the grease trap shall be equipped with a flow control fitting. The flow control fitting shall be designed so that the flow through the fitting does not exceed the designed input rate of the grease trap. The flow control fitting shall be installed to be readily accessible for inspection, cleaning and maintenance. A flow control fitting that has adjustable or removable parts is prohibited.
 - f) Systems to add enzymes, microbes, or other materials intended to remove grease from a grease trap are prohibited.
 - g) The grease trap shall be installed in a location that is readily accessible for periodic cleaning according to manufacturer's recommendation, inspection, and/or sampling.

- h) When the grease trap is installed in-ground, the grease trap lid shall be flush with the floor; risers provided by the manufacturer shall be used when needed.

3. Automated Grease Traps (Grease Removal Devices (GRD) per UPC)

- a) The term “automated grease trap” shall mean a device that is designed to remove grease from wastewater using mechanisms that do not rely on gravity to achieve the separation. The requirements specified above for grease traps shall apply to automated grease traps.
- b) The installation of an automated grease trap requires a *Variance* to be authorized by Central San’s Environmental Compliance Section.

B. Other Commercial Businesses

Any commercial establishment that has the potential to discharge waste and/or wastewater which may contain oil, grease, and/or prohibited solids (e.g., vehicle service, heavy or light industrial, car washes, engine washings, etc.) shall have a sand-oil interceptor and/or separator(s) installed, as specified by Central San. Standards for sand-oil interceptors and separators are presented below.

1. Sand-Oil Interceptors:

- a) The term “sand-oil interceptor” shall mean a prefabricated or precast grease, oil, and/or solids removal device with a minimum capacity of 320 gallons as shown on DWG 23-02 and 23-03. All piping and connections shall be non-corrosive (e.g., no steel, cast iron, etc.).
- b) The sand-oil interceptor shall be designed in accordance with the following performance-based standards:
 - (i) The interceptor shall have the capacity for a 30-minute retention time, based on the maximum influent flow rate.
 - (ii) The interceptor shall be designed to reduce turbulence of the flow through the unit.
- c) The interceptor shall provide for the removal of floatables and settleables from the wastewater to the maximum extent practicable using multiple sedimentation chambers, pipe elbows installed between chambers, and/or other pretreatment design elements.
- d) Alternative designs of sand-oil interceptors may be submitted to Central San for consideration. The specifications, operation, and effectiveness for the proposed application of the alternative design shall be certified by a licensed Professional Engineer prior to approval by Central San.
- e) All plumbing fixtures which may discharge wastewater containing oil, grease, and/or solids to the sanitary sewer system including, but not limited to, floor drains, service sinks, mop sinks, and drains serving wash

areas and/or trash enclosures shall be connected to the sand-oil interceptor.

- f) All domestic waste inlets shall be plumbed separately from non-domestic waste inlets and connected either to the building side sewer downstream of the sand-oil interceptor or directly to the main sewer.
- g) Systems to add enzymes, microbes, or other materials intended to remove grease or oil from a sand-oil interceptor are prohibited without a *Variance* authorized by Central San's Environmental Compliance Section.
- h) The sand-oil interceptor shall be installed in a location that is readily accessible for periodic cleaning by a vacuum truck, inspection, and/or sampling.
- i) If the sand-oil interceptor is located in an area subject to vehicular traffic, the sand-oil interceptor shall be designed with a minimum of an H-20 traffic rating. Alternatively, an appropriately designed traffic cover shall be installed over the sand-oil interceptor in accordance with *DWG 23-04*.
- j) A sampling structure shall be installed per *Subsection 5-02*.

2. Separators

- a) The term "separator" shall mean a rust/corrosion resistant grease, oil, and/or solids separation device, with a minimum flow rating of 20 gpm.
- b) The design, specifications, operation, and effectiveness of the separator for the proposed application shall be certified by a licensed Professional Engineer prior to approval by Central San.
- c) The separator shall be connected to specific plumbing fixtures or drains as required by Central San.
- d) Domestic waste shall not be plumbed to a separator.
- e) The inlet pipe to the separator shall be equipped with a flow control fitting. The flow control fitting shall be designed so that the flow through the fitting does not exceed the designed input rate of the separator. The flow control fitting shall be installed to be readily accessible for inspection, cleaning and maintenance. A flow control fitting that has adjustable or removable parts is prohibited.
- f) Systems to add enzymes, microbes, or other materials intended to remove grease or oil from a separator are prohibited.
- g) The separator shall be installed in a location that is readily accessible for periodic cleaning according to manufacturer's recommendation, inspection, and/or sampling.
- h) A sampling structure may be required per *Subsection 5-02*.

3. Hair/Fiber/Lint Traps

Barbershops, beauty salons, pet groomers, animal care facilities, and any other commercial facility that discharges wastewater containing significant amounts of hair/fiber/lint shall install a “hair trap” or other pretreatment device as specified by Central San.

4. Clay/Ceramic/Granite/Marble/Solids Traps

Classrooms, manufacturing, or any other commercial facilities that discharge wastewater containing significant amounts of clay, ceramic, granite, marble, solids, or other similar material residuals shall install a trap or other pretreatment device as specified by Central San.

5. Dental Practices

a) Amalgam Separators - Dental practices that generate amalgam wastes shall install an amalgam separator on the vacuum system(s) serving the facility, prior to discharge to the sanitary sewer. The amalgam separator shall meet the ISO 11143 standards that are effective at the time of installation. Separator shall be sized according to manufacturer's recommendation to serve the number of operatories and chairs. A sampling structure may be required per Subsection a).

b) Plaster Traps - Dental practices that discharge wastewater containing plaster residuals shall install a plaster trap.

6. Other Pretreatment Devices

a) Other pretreatment devices will be considered on a case-by-case basis to treat specific pollutants.

5-02 Sampling Structures

A. Sampling structures shall be installed immediately downstream of grease interceptors, sand-oil interceptors, separators, and other pretreatment devices as specified in this Section and in accordance with DWG 23-05, except if the interceptor only services the area drains of a parking garage or a trash enclosure.

B. Sampling structures may also be required by Central San on a case-by-case basis for the following additional applications:

1. Process waste lines and/or immediately downstream of any pretreatment units (e.g., silver recovery system, pH adjustment system).
2. Sanitary sewer laterals serving a shell building constructed in an area zoned for light or heavy industrial use.
3. A business operation classified by Central San as a Permitted Industrial User (see [District Code §10](#)). Contact Central San's Environmental Compliance Section for specific requirements.

5-03 Parking Structures

Standards for the connection of parking structures to the sanitary sewer system are as follows:

- A. Drainage from uncovered areas that are exposed to rainwater and/or storm water run-off shall be directed into the storm drainage system. This includes, but is not limited to, trench drains placed at the entrance and/or exit of parking structures.
- B. All interior floor drains and/or catch basins which are plumbed to the sanitary sewer shall be connected to an appropriately designed and sized (excluding flows from fire suppression system) sand-oil interceptor as specified by Central San.
- C. Sand-oil interceptors for parking structures shall be filled with clean water after installation.

5-04 Sewer Connections in Outdoor Areas

A. General Requirements

To avoid dedicating wastewater collection and treatment capacity to handling of clean water, [District Code §10](#) prohibits the discharge of unpolluted water, including, but not limited to rainwater and storm water run-off to sanitary sewers. Standards for the connection of outdoor areas to the sanitary sewer are as follows:

- 1. The outdoor area shall be bermed, raised, and/or sloped to prevent the introduction of storm water and roofed or equipped with a cover to prevent rainwater from entering the sanitary sewer system. Roof leaders shall not discharge to the sanitary sewer.
 - 2. Central San may consider an alternative positive storm water control method in lieu of a fixed roof or cover for an outdoor area on a case-by-case basis. The business shall provide Central San with detailed design drawings, equipment specifications, and operation descriptions, including standard operation and maintenance procedures, for the proposed alternative positive storm water control method. In all cases, Central San has the authority to either approve or disapprove a proposed alternative positive storm water control method.
 - 3. The installation of a positive storm water control method other than a fixed roof/cover or a complete wastewater recycling system may subject the business operation to the monitoring and reporting requirements of an *Industrial User Permit*, including the payment of permit fees and additional oversight by Central San.
- B. Surface area drains for stormwater shall not discharge to the sanitary sewer.

- C. Wash Areas – Shall comply with Subsection A above and additionally:
1. Outdoor wash areas shall be adequately sized to capture the wastewater generated by the washing operations performed in that area.
 2. All sanitary sewer drains in the outdoor wash area shall discharge to an appropriately designed and sized pretreatment device as specified by Central San.
- D. Trash Enclosures – Shall comply with Subsection A above and additionally:
1. If a sanitary sewer drain is required in an outdoor trash enclosure located on property zoned and/or used for food service facilities, then it shall discharge to a grease interceptor or grease trap as specified by Central San and as shown on *DWG 23-06*.
 2. If a sanitary sewer drain is required in an outdoor trash enclosure located on property zoned for light/heavy industrial use, vehicle service, or used by any facility that may generate wastes containing oil, grease, flammable liquids, or other restricted materials, then it shall discharge to an appropriately designed and sized grease, oil, and/or solids removal device as specified by Central San.
- E. RV/Trailer Holding Tank Dump Station
1. These types of connections are permissible in commercial applications only.
 2. The installation of a centralized RV/Trailer holding tank dump station at a commercial location may subject the business to the assessment of additional Central San Sewer Service Charges and to the monitoring and reporting requirements of an *Industrial User Permit*, including the payment of fees and additional oversight by Central San.
 3. The RV/Trailer holding tank dump station drain shall be installed per *DWG 23-01* and be capped at all times unless being used for the disposal of RV/Trailer holding tank waste. No other types of waste shall be discharged to the drain.
- F. Outside Utility Equipment Areas
1. All discharges of polluted water from outside utility equipment areas (roof ventilation systems, boiler blowdown, etc.) shall be discharged to a raised floor sink or similarly raised floor drain to prohibit the discharge of unpolluted water (rainwater, storm water run-off) to the sanitary sewer.
 2. The discharge of condensate from exterior air conditioning units to the sanitary sewer is prohibited.

5-05 Swimming Pools, Spas and Fountains

A swimming pool or spa connected to the public sewer shall be equipped with a 2" maximum diameter discharge pipe.

The draining of water from swimming pools, spas and/or fountains to the sanitary sewer shall only be conducted under a *Special Discharge Permit* issued by Central San. The discharge shall be controlled with a valve and/or the use of an approved temporary connection.

- A. The drain valve for connections to the sanitary sewer shall always be kept in the closed position unless a permit is obtained to discharge the water.
- B. A flow restrictor or valve shall be installed on the discharge piping of the system to maintain the approved flow rate.
- C. Passive overflow drains shall not be connected to the sanitary sewer system.
- D. Outdoor Pool Deck Drains shall not be connected to the sanitary sewer system.
- E. Filter Backwash - All filter backwash media shall be prevented from entering the sanitary sewer system.
 - 1. Diatomaceous Earth (DE) Filters - Wastewater from the backwash of DE filters shall pass through a solids separation/filtration system approved by Central San prior to discharge to the sanitary sewer system.
 - 2. Sand Filters - Wastewater from the backwash of sand filters shall pass through a sump or similar device approved by Central San to capture any sand prior to the discharge to the sanitary sewer system.
- F. Outdoor Shower Areas
 - 1. Any outdoor shower area with a drain to the sanitary sewer shall be bermed, raised and/or sloped to prevent the introduction of storm water.
 - 2. The outdoor shower area shall be roofed or equipped with a cover to prevent rainwater from entering the sanitary sewer system.

5-06 Pet Waste

- A. These types of connections are permissible in commercial applications only.
- B. Cat waste is prohibited from disposal into the sanitary sewer.
- C. Dog waste is permitted as follows:
 - 1. Liquid waste collection area shall:
 - a) include a p-trap; and
 - b) comply with Section 5-04A, if proposed in an outdoor area.
 - 2. Solid waste disposal device shall:
 - a) include a cover, similar to the Drain Hole Cover Detail shown in *DWG 23-01*; and
 - b) be protected from incidental debris entering the sanitary sewer (e.g. landscape materials, rocks, plastics, etc.).

Section 6. Property Rights

6-01 General

When a permit application is submitted for a private sewage disposal system on property that is not owned by the Applicant, the Applicant shall provide documentation demonstrating their right to install/ operate/ maintain/ access the proposed property.

Nothing in these Specifications shall be construed as allowing the Applicant/Contractor to install/ operate/ maintain/ access property not owned by the Applicant without agreement by the underlying property owner.

6-02 Acceptable Documents to Convey Property Rights

- A. The following recorded documents are generally acceptable for establishing the required property rights:
 - 1. Grant of Private Sanitary Sewer Easement to the property
 - 2. Existing private access and/or utility easement appurtenant to a property that specifically cites uses of "sewers" and/or "utilities"
 - 3. Deed Reservation reserving sewer and/or utility easements on or across a property
- B. Where a grant of easement cannot be recorded due to both parcels being owned by the same Owner, then Central San may accept a recorded Notice of Intent to preserve an interest in real property to ensure that these private sanitary sewer easements shall be established and granted when either of the Owners' parcels is sold to someone other than the Owner.

Section 7. Submittal Requirements

7-01 General

Any sanitary sewer work done outside of the building walls requires a Central San permit and will be inspected by Central San. Permits will only be issued by Central San's Permit Counter.

Issuance of the permit is required prior to starting any of sewer work, including trenching/excavating for the sewer line. Any side sewer work performed without a valid Central San permit will be subject to removal, reconstruction, and additional fees.

Generally, detailed plans are not needed, however, a completed application with a sketch of the proposed work is required. All side sewer repair work done outside of the building will be inspected by Central San inspectors. A permit shall be pulled by the person doing the work either the property owner or a properly licensed contractor at least 1 business day prior to starting any of the sewer work, including trenching.

The work may be performed by the property owner or by a properly licensed contractor who is registered with Central San. The property owner may only repair the house sewer portion of the side sewer if the repair work does not require digging deeper than 5 feet at any point.

Any work within a Central San easement or public right-of-way shall be performed by a properly licensed contractor.

7-02 Application

Obtain an application from www.centrlsan.org/permitting or by emailing permits@centrlsan.org.

7-03 Requirements for Demolition and Reconnection

If the roof is removed from a structure or the remodel makes the building uninhabitable, Central San requires the side sewer to be capped prior to demolition (reference: California Plumbing Code §722.1).

Before issuing a reconnection permit, in compliance with *Subsection 7-04* below, Central San requires a CCTV inspection to verify the condition of the existing side sewer. The Central San Inspector will determine if the existing side sewer may be re-used or if replacement or repair is required prior to reconnection of the buildings.

7-04 Requirements for New Building Connections

A. A Building Connection Permit will not be issued until:

1. the main sewer is completed and accepted by Central San;
2. the building rough plumbing system, including the installation of permanent vents through the roof, has been inspected and signed off by the local building code enforcement agency; and
3. applicable connection fees and charges shall be paid prior to the issuance of a Building Connection Permit.

- B. New Residential Connection Requirement: A 4" residential building connection may be issued prior to roof completion and rough plumbing if the Applicant requests and complies with the following requirements:
1. The Applicant shall pay all applicable Central San fees and secure Central San and City/County permit(s) required for the connection of the building(s).
 2. The Contractor shall be responsible for the placement of plugs in all manholes downstream of the building connection(s). Plugs may not be removed without approval of the Central San Inspector.
 3. All rough sewer piping within each building pad shall be capped to prevent debris and rainwater from entering the sanitary sewer system. The sewer caps may be removed only to complete the rough plumbing through the roof.
 4. The entire sanitary sewer system for this main sewer extension, including laterals stubs to the property line, shall be ball and flushed prior to Central San acceptance of the new main sewer. A second CCTV inspection and/or air test may also be required by Central San inspection at the Applicant's expense.

draft

Part III. Public Sewer Collection Systems

Section 8. Design Criteria

8-01 General

- A. Central San is prohibited from using existing ratepayer funds to install infrastructure to serve new customers (reference: Health and Safety Code §5471 and §6520.5). A property owner, such as a developer, seeking to install new public sewer facilities to serve his or her property must fund, design, construct and provide appropriate land-rights for the proposed public sewer facilities in compliance with District Code and Standard Specifications.
- B. In accordance with the Business and Professions Code, Professional Engineers Act, §6735, all civil engineering Plans, specifications, and reports submitted to Central San shall be prepared by a licensed civil engineer or by a subordinate under his or her direction, and shall be signed by him or her to indicate his or her responsibility for them. In addition to the signature, all final civil engineering Plans, specifications, and reports shall bear the stamp of the registrant, and the expiration date of the certificate or authority.
- C. The Job Engineer or Surveyor shall notify affected property owners when they plan to conduct surveys on private property and, if possible, obtain permission to enter onto the property. However, it is noted under State Law that licensed Surveyors may enter upon private property pursuant to Section 8774 Business & Professions Code, as authorized by Section 846.5 of the Civil Code.
- D. Where Central San facilities are installed in roadways or all-weather access roads, Central San is not responsible for maintaining the improvement.
- E. Private Main Sewer System design and plan review shall be the same as for proposed public main sewer extensions. Additionally, Applicant shall state the entity that will be responsible for the ownership and maintenance of the private system and demonstrate that entity is capable of that responsibility before Central San will approve a private system. Proposed private main sewer systems shall be connected to the public sewer system at a standard manhole.
- F. For additional requirements, see *Part V Technical Specifications*.
- G. Exceptions:
 - 1. Variance Request: Where it is not feasible to meet a requirement, the Applicant may request a variance by demonstrating why the requirement cannot be met and explaining what mitigations were taken. Requests shall be made during the Plan Review Process and approval is at Central San's sole discretion. Approved *Variances* shall be noted on the Plans at each location.

2. Special Approval: During installation, if any portion of a Job does not meet the minimum cover or clearance requirements shown on the Plans, then Special Approval by the Inspector is required before proceeding with the work. Note: Special pipe, bedding, and/or backfill may be directed by Central San.

8-02 Requirements for Computer Aided Design (CAD)

- A. Prior to permit issuance, the Final Plans shall be submitted and approved in AutoCAD file (i.e. .dwg) which shall be tied to the California State Plane Coordinate System, Zone 3, NAD 83.
- B. NAVD88 is the official Central San vertical datum. Where the NGVD29 datum is used for design, Central San will accept benchmark elevations transformed to NAVD88 elevations by use of a web-based program such as "Vertcon."
- C. The following information shall be provided on different layers and shall not be combined with other data:

Table 3. CAD Layers

Layer Description	Preferred Layer Name	Line type	Line weight	Color	Plot Color
Existing sanitary sewer pipes	C-PLAN-SSWR-E	Dashed	0.5	green	Black
New sanitary sewer pipes	C-PLAN-SSWR-N	Continuous			
Existing sanitary sewer structures	C-PLAN-SSWR-STRC-E	Dashed	0.4		
New sanitary sewer structures	C-PLAN-SSWR-STRC-N	Continuous			
Existing right-of-way lines	C-ESMT-E	Dashed	0.16	cyan	
New right-of-way lines	C-ESMT-N	Dashed	0.28		

8-03 Installation Method

Unless otherwise indicated on the Plans, pipes shall be installed by the open-cut method in compliance with *Section 33 31 00 - Sanitary Sewerage Piping*. Alternate methods of installation may be proposed by the Job Engineer during the Plan Review process subject to the following:

- A. Horizontal Directional Drilling (HDD)
 1. The minimum design slope for pipelines proposed for installation by horizontal directional drilling (HDD) be 3% ($S = 0.0300$).
 2. Pipe material shall be thermo-fusion welded HDPE, restrained-joint Ductile Iron Pipe, restrained joint or thermo-fusion welded PVC Pipe as specified in *Part V Technical Specifications*.

3. Mud/slurry from drilling operation shall be properly captured and disposed of; storm drain systems, creeks and waterways shall be protected.

8-04 Minimum Pipe Sizes and Standards

- A. Size - The minimum nominal size of a proposed public gravity sewer shall be 8" in diameter; the size of a new public pressurized sewer shall be submitted for approval by Central San.
- B. Pipe Selection - Pipe cover and trench configuration requirements for allowable pipe materials are specified in *DWG 20-01* through *20-06*. The Job Engineer shall select pipe material and the strength or thickness class for each reach to be installed under the Job, subject to Central San review. Pipe to be installed between successive structures shall be of the same size, material, strength or thickness class and manufacturer unless otherwise approved by Central San.
- C. Minimum Acceptable Slope - The minimum allowable slope and corresponding minimum/maximum design flows is shown in *Table 4*.

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

8-05 Design Capacity

- A. General
 1. All sewage facilities proposed to be connected to the Central San system shall be designed and constructed in a manner consistent with service to the ultimate tributary service area in compliance with [District Code §9.08.020](#). Central San shall review plans to verify the service requirements for the ultimate tributary service area.
 2. If a proposed connection shall exceed the available downstream system's capacity, the Applicant will be required to upsize the downstream system to provide sufficient capacity, per *Section 4-04*.
- B. Capacity Study

When the estimated average base wastewater flow for the job exceeds 45,000 gpd (gallons per day), or additional flow carrying capacity may be required for existing or future connections upstream of the job, the Job Engineer shall provide a capacity study report when Plans are submitted for preliminary review. The

capacity study report shall include a table that presents the: proposed pipe diameter, slope, length, Manning's roughness coefficient, full pipe capacity, design capacity and the percentage of design capacity utilized for each proposed sewer reach. The percentage of design capacity utilized shall be calculated by dividing the design flow by the design capacity and multiplying by one hundred (100).

C. Design Flow

1. Equations:

$$\text{Design Flow} = (\text{ABWF} * \text{PF}) + (\text{GWI} * \text{Acres})$$

$$\% \text{ Design Capacity Utilized} = \text{Design Flow} / \text{Design Capacity} * 100$$

2. Definitions:

- a) Peaking Factor (PF) - The peaking factor for the above equation shall be obtained from *Figure 1*, which was derived from the maximum peak flows observed (based on 15-minute flow readings) during a two-week dry period in late January and early February 1985.
- b) Average Base Wastewater - see unit flow factors in *Table 5* below

Table 5. Average Base Wastewater Unit Flow Factors

Land Use Category	Units	Unit Flow Factor (gpd/Unit)
Residential, Single Family	Residential Unit	195
Residential, Multiple Family	Residential Unit	105
Commercial, Industrial, Institutional (Government, Schools, Churches, etc.)	1,000 square feet	100

- c) Groundwater Infiltration (GWI) - The GWI rate for use in the above "Design Flow" equation shall be 170 gpd/acre unless Central San provides the Job Engineer with an area-specific rate. This rate is an average for summertime GWI following wet weather seasons with higher-than-average rainfall in sewers constructed in Central San after 1985.

D. Design Criteria for Gravity Sewers

1. Design Capacity - Main and trunk sewers shall be designed per *Figure 1* with the design capacity based on pipes flowing for:
 - a) main sewer is 2/3 full ($d/D \leq 0.67$); and
 - b) trunk sewer is full without surcharging ($d/D \leq 1.0$).

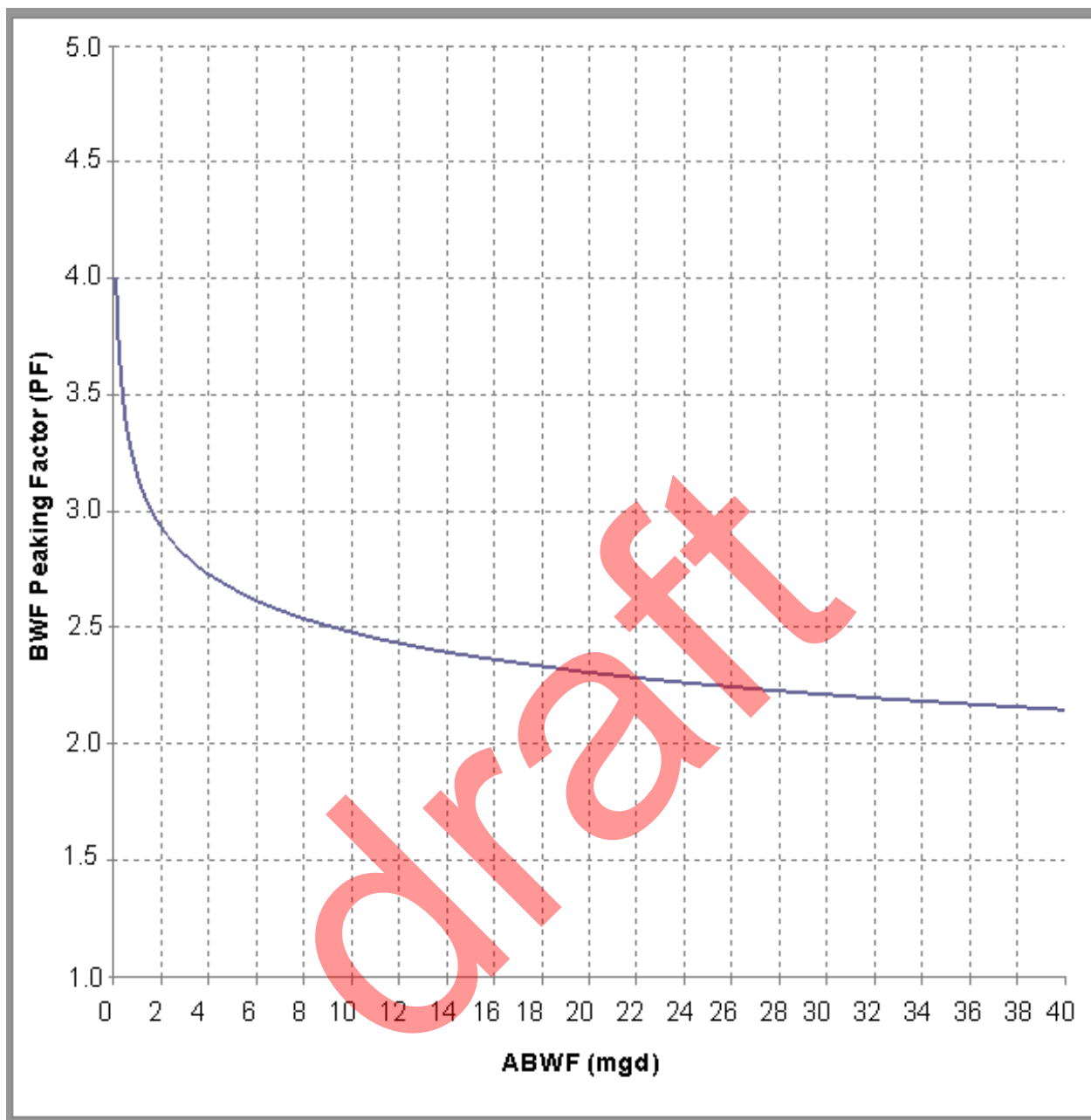


Figure 1. Peak Flow Curve

2. Velocity and Slope: The minimum acceptable slope for sewer pipe is based upon a velocity when flowing full for:
 - a) main sewer is 3 ft/s; and
 - b) trunk sewer is 2 ft/s.

The minimum and maximum design flows for each pipe size at the minimum acceptable slope is provided in *Subsection 8-04*. However, Central San may allow a lesser slope and/or a larger pipe size on a case-by-case basis where the elevation of the existing system constrains the available elevation drop.

3. Pipe Diameter: Diameter of gravity sewers shall be determined by Manning's pipe friction formula, using a roughness coefficient, "n," of 0.013 or the pipe manufacturer's recommendation, whichever is greater.
4. Pipe Cover and Clearance: Shall comply with *Subsections B* and *8-08*.

8-06 Point-of-Connection to Existing System

- A. The point-of-connection (POC) of new sewers to the existing sewer system shall be made at existing manholes or by constructing a new manhole.
- B. If existing facilities shall be impacted by construction of new sewers, then those facilities shall be replaced and brought up to current Central San standards. The extent of the impact shall be determined by Central San.
- C. If POC is at a trunk sewer, then refer to *DWG 21-02* for configuration of pipe inverts.

8-07 Pipe Alignment

A. General Requirements

1. Locate sewers in paved roadways (private or public)
 - a) Unpaved easements shall be avoided where a reasonable alternate solution exists.
 - b) Unless there are physical limitations, sanitary sewers facilities shall be installed within roadways, per [District Code §7.15.020](#).
 - c) If this is not feasible, the Applicant may request a *Variance* during the Plan Review process to allow the sewer to be located within an easement.
2. Locate the centerline of the sewer in the center of the roadway
 - a) If this is not feasible, the next order of preference is the center of lane, then at least 5 feet from face of curb; both are subject to approval by the Central San Engineer during the Plan Review process.
 - b) Where easements are approved, locate pipe in centerline of easement and there shall be careful consideration of how the sewer will be maintained and/or replaced, if necessary, including all-weather access roads to structures.
3. Facilities shall not be located:
 - (i) in creek beds
 - (ii) in bottom of swales
 - (iii) near encroachments (as defined by District Code) including, but not limited to:
 - below pervious pavement / concrete / pavers

- within C3 stormwater improvements
- (iv) unrepaired slide areas will not be allowed. However, if the only feasible gravity route is through a slide area, a Geotechnical Engineer shall a complete study and propose a slide repair acceptable to Central San.
- (v) See *Subsection 8-08* for additional alignment requirements within hillside or creek areas.

B. Clearance Requirements

1. Public Water Utilities

Sewers shall be designed and constructed to provide wall-to-wall pipeline separation (not including bells) in conformance with *DWG 20-07*. Sewers shall not be designed in the “Special Permission” zone unless specific written approval of the water utility is provided during the Alignment Review Stage.

2. Other Utilities

- a) Other utilities shall not be installed directly over sanitary sewers or with crossings at angles less than 30° to the centerline of the sewer.
- b) Sewer pipes shall be designed and constructed with a minimum 3 feet wall-to-wall horizontal clearance from all utilities, except public potable water utilities as noted above.
- c) Sewer pipes shall be designed and constructed with a minimum 12” wall-to-wall vertical clearance from all utilities, except public potable water utilities as noted above.
- d) If sewers shall be installed parallel with other utilities, then the Job Engineer shall design the vertical alignment of the sewer so that future side or main sewer connections can be installed without conflict with parallel utilities or abrupt changes in the alignment of the main or side sewers.

3. Structures and Other Improvements

- a) Sewer pipes shall be designed and constructed with a minimum 5-feet clearance (subsurface, surface, and aerial) from all improvements that could reasonably impede the operation, maintenance, and reconstruction of sewers, including but are not limited to: building and retaining wall footings, walls, building overhangs, solar canopies, etc.

C. Curves – Vertical and Horizontal

Directional changes to the pipe alignment cannot use angle points and may be accomplished by using horizontal and vertical curves that comply with the following requirements:

1. Curves are not permitted if:
 - a) there is a combination of horizontal and vertical curve between sewer structures
 - b) reverse and nonsymmetrical through sewer structures
 - c) sum of the deflections of curves between consecutive structures exceeds 45°
2. Forced bending of the pipe is permitted if the radius of the curvature is greater than the minimum allowable radius as specified the pipe manufacturer's published literature and the pipe material is not ductile iron pipe.
3. Additional requirements for horizontal curves:
 - a) Provide the mathematically correct curve data [Ratio of radius (R), deflection/delta angle (D), and arc length (L)]
 - b) If the radius is less than the minimum allowable radius as specified the pipe manufacturer's published literature, except for DIP, the use of straight pipe segments may be permitted if the following conditions are met:
 - (i) The use of minimum length specified in the applicable section of these Specifications for the pipe material being used, joined with fittings, couplings or bell and spigot joints installed as detailed on *DWG 21-01*.
 - (ii) Straight pipe length not to vary in length, except beginning and end of pipe segment
 - (iii) The beginning and end pipe segments shall be pipe length divided by 2 for even length of pipe.
 - (iv) The joint deflection between any two successive pipe segments shall not exceed the maximum deflection as specified the manufacturer's published literature for the fitting or coupling (see *Approved Materials List*).
 - (v) The maximum deflection between successive straight segments of pipe shall not exceed $11\text{-}1/4^{\circ}$.
2. Additional requirements for vertical curves:
 - a) Provide mathematically correct curve data (slopes, length, and invert elevation)
 - b) Slopes in and out of vertical curve shall not be less than minimum slopes as specified in *Table 3. Minimum allowable slopes*.
- D. Sewer Pipe Plugs: Plugs shall be designed and installed in all manholes from which future sewer line extensions are anticipated.

- E. Sewer Line Extensions: The sewer extension shall terminate with the proper structure, which will minimize the amount of pavement to be disturbed by future sewer extensions.
- F. Railroad and Special Utility Crossings: Where sewers are to be constructed across or within utility or railroad rights of way requiring tunnels, bores, and/or special pipe, the tunnel, bore or special pipe shall extend the full length of the sewer line within the right-of-way. The minimum interior diameter of metal casings, when required, shall be 8" greater than the maximum outside diameter of the pipe barrel (excepting bells).
- G. Suspended Pipes and Independent Exposed Sewers: The Job Engineer shall address the following for pipes suspended from bridges or crossings:
1. Vertical design for dead and live loads
 2. Lateral loads
 3. Seismic loads in any direction at 1g

8-08 Material Selection

- A. Material shall be selected in compliance with *Table 6* below. However, if the pipe cover does not meet the limitations of *Table 7*, then Applicant shall propose an alternative material listed in *Table 7* for approval during the Alignment Review stage.

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

- B. No sewer work shall begin in roadways that are scheduled for major improvement until it has been graded to within 6" to the bottom of the subbase.

If a sewer is proposed to be installed in...	Then the pipe cover shall be measured from the...
existing roadway that is not expected to receive major grade/surface changes	existing road surface to the top of pipe
new roadways	lower surface of the road structural section (bottom of the subbase) to the top of pipe
areas expected to become roadway	
existing roadways that are intended to receive major grade/surface changes	

C. The following minimum and maximum allowable pipe cover shall be achieved:

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					

8-09 Hillside and Creek Area

A. Provide a geotechnical report when sewers are proposed to be installed:

1. in easement locations where the existing or proposed cross-slope grade exceeds 25%
2. within 25 feet of the top of a creek bank or 50 feet of the centerline (flowline) of a creek
3. in historical slide locations or within the area of influence of a potentially unstable hillside
4. determined by Central San to be necessary due to site conditions

B. The geotechnical evaluation and report shall address the following:

1. Geological setting, general soils, and bedrock conditions along the proposed sewer alignment, and recommended setbacks from slides and creeks.
2. Slope instability or other geotechnical hazards in the vicinity of the proposed sewer alignment.
3. Potential groundwater issues.
4. The effect of trenching and sewer installation on slope stability.

5. Recommended requirements for trenching, bedding, backfill, or special supports that may be recommended.
 6. Erosion potential of soils around sewer near water courses.
 7. Recommended corrective work if geotechnical hazards are identified.
- C. If it is not feasible to locate gravity sewers on the downslope side of homes while maintaining a safe distance from drainage ways, an alternative utilizing sewage pumping shall be considered.
- D. Sewer crossings at creeks or swales shall be as nearly perpendicular to the centerline (flowline) of the drainage way as feasible, and in no case at an angle less than 45° to the centerline (flowline) of the creek or swale.
1. A Geotechnical Engineer shall evaluate the need for bank and bottom protection. If protection is recommended, then the protection shall be included on the Plans.
 2. The Job Engineer shall design support foundations with protection.
 3. For spans greater than 18 feet, steel pipe is required per Section 33 05 24 - *Steel Pipe*.
 4. The following design standards shall be used by the Job Engineer when designing sewers in hillside and/or creek areas.
 - a) Sewers to be installed in easements and private streets which are located in hillside and/or creek areas shall be restrained joint ductile iron pipe when the soil in which the sewer will be installed is fine grained, such as clay.
 - b) Pipe material other than DIP may be used for sewers to be installed in easements and private streets which are located in hillside and/or creek areas when the soil in which the sewer will be located is coarse grained (including unfractured bedrock).
 - c) Pipe material other than ductile iron may be used for sewers to be installed in public streets which are in hillside and/or creek areas.
 - d) If groundwater is present in the trench area, sewers shall be ductile iron (no bedding) regardless of the type of soil.
 - e) Subdrains may be installed to convey underground water from its source to a storm drain or channel. These subdrains shall be maintained perpetually by a permanent entity other than Central San.
 - f) For sewers proposed parallel to existing swales or creeks, the sewer shall be located at least 50 feet from the centerline (flowline) of the creek or swale, and at least 25 feet from the top of the bank if the bank is defined, to minimize the potential slope failure in the vicinity of the sewer resulting from undercutting at the toe. A Geotechnical Engineer shall review the

proposed alignment and furnish recommendations regarding long-term erosion and slope stability potential.

- g) Manholes to be installed at creek crossings shall be located at least 50 feet from the centerline of the creek, and at least 25 feet from the top of the creek bank if the creek bank is defined.

8-10 Structures

- A. All manholes within easements shall be accessible by conventional maintenance vehicles traveling over paved roads or driveways unless specifically approved. Thus, manholes within private property are discouraged and subject to approval during Plan Review.
- B. If access to existing facilities shall be impacted by the proposed site development plans, then access to those facilities shall be brought up to current Central San standards. The extent of the impact shall be determined by Central San.

C. Manholes

1. Location requirements:

- a) intervals not greater than 500 feet
- b) intervals not less than 50 feet, where practical
- c) changes in sewer pipe size
- d) sewer intersections
- e) sewer grade breaks
- f) last upstream lateral (to avoid dry sewer pipe)

2. Access, operation, and maintenance requirements

- a) within paved roadway or an all-weather access road outside of parking stalls
- b) outside of valley gutters or low spots that may accumulate water
- c) at center of street, traveled lanes, road intersections
- d) minimum 12" wall-to-wall clearance to other utilities or improvements (e.g., footings, foundations, etc.)
- e) within one surface type (e.g., not at the transition between different surfaces such as concrete and asphalt)

- 3. Drop Across Structures - Where the horizontal deflection angle between an incoming sewer and outgoing sewer at a structure will be more than 30°, the vertical drop across the structure from the inlet to outlet shall be 0.25 feet. A *Variance* may be requested for a maximum drop of 1' during the Alignment Review Stage. Drops exceeding 1' are not allowed. Drop manholes, where the sewer invert is higher than the top of the shelf, are not allowed. Exception:

Where the point-of-connection will be made to a trunk sewer, the drop from the proposed main into the existing system shall comply with *DWG 21-02*.

4. Deflection at Structures – At the manhole, the horizontal angle of deflection between incoming and outgoing main sewers shall be less than or equal to 90° (e.g., sewers should flow in the same general direction, no adverse flows).
5. Connections to Existing Structures - Connections of proposed sewers at existing manholes shall conform to the requirements shown in *DWG 19-01* through *DWG 19-07*. If the proposed sewer will connect to an existing manhole, then core-drilling at the existing base is required per *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals* Item 3.4B.
6. Cul-de-sac Requirements - A special cul-de-sac manhole conforming to *DWG 19-06* shall be located at the end of any main sewer terminating within a cul-de-sac or court.
7. Deep Manholes: If the manhole will be greater than 20' but less than 30' deep, then a trunk manhole per *DWG 19-02* is required regardless of the pipe size.
8. Stationing and Elevations - For calculation purposes, the stationing of a manhole and the "thru" elevation of a manhole shall be considered as being located in the center of the manhole.
9. Bases – Precast manhole bases are required on installation of new manholes, except over existing sewers or otherwise approved during Plan Review.

D. Rodding Inlets

Rodding inlets are typically not approved because they are considered temporary terminal structures and limit inspection access to the sanitary sewer system.

E. Structures for Multiple-User Low-Pressure Sewer Systems (MULPSS)

1. Manholes - MULPSS manholes conforming to *DWG 24-02* shall be installed at each private pressure lateral service connection, point of intersection of branch main sewers and at any other location indicated on the Plans or required by Central San.
2. Flushing Inlets - Flushing Inlets conforming to *DWG 24-03* shall be installed at intervals not to exceed 1,000 feet, at the terminus of each MULPSS main sewer, and at any other location indicated on the Plans or required by Central San.

F. Test-Fittings

All test-fittings, unless otherwise approved, shall be wye or tee branches of the same size, material and strength, pressure and/or thickness class as the line in which they are being installed.

G. Bolt-Down Manhole Frames and Covers

Where drainage conditions may cause storm waters to inundate sewer structures, or other locations required by Central San, bolt-down (watertight) manhole frames and covers conforming to *DWG 19-09* shall be installed.

H. Check Dams

For trenches located in swales to limit erosion of soil over the pipeline, Check Dams shall be installed at intervals not exceeding 20 feet, or at the locations and intervals otherwise indicated on the Plans or as directed by Central San.

I. Trench Dams

Trench Dams conforming to *DWG 20-05* shall be installed at the locations and at the intervals indicated on the Plans, or as directed by Central San, to prevent the migration of groundwater through the pipe zone.

J. Pipe Anchors

For trenches where the slope of the sewer exceeds 30%, Pipe Anchors in conformance with *DWG 21-04* shall be installed at intervals not exceeding 40 feet, or at the locations and intervals otherwise indicated on the Plans or as directed by Central San.

K. Special Structures

Approval is required during design review for all above ground wastewater facilities and other unusual structures or features:

- manholes proposed for trunk sewers 45" in diameter or larger
- manholes greater than 30' deep
- metering manholes
- siphons
- sewage pumping systems
- vehicle/equipment wash racks
- trailer/RV dump stations

8-11 Abandonment

All existing main sewers or structures that are to be abandoned shall be indicated on the Plans. In general, abandoned lines that are in service will be replaced with a parallel line of equal or larger size, and the Applicant's Engineer shall indicate on the plans how active sewer facilities on or adjacent to the construction area are to be protected. The Applicant's Engineer shall demonstrate in any case that the abandonment does not adversely affect the sewer systems. Once inactivated, the abandoned main sewer shall be filled with controlled low strength material, in compliance with *Section 03 34 13 - Controlled Low-Strength Material (CLSM)*.

8-12 All-Weather Access Roads

- A. All-weather access roads shall be provided for permanent maintenance access to all sewer structures (i.e., manholes and structures) and shall be designed and constructed per *Section 32 15 60 - All-Weather Access Roads*.

draft

Section 9. Property Rights

9-01 General

- A. Per [District Code §7.15.020](#), proposed Central San facilities will be located in and on lands owned by Central San, in public lands to which Central San has largely unrestricted access or in public streets, roads, highways, or other public rights-of-way in which, by law, Central San is entitled to construct, install, operate, and maintain its facilities; facilities may only be installed in easements where the aforementioned would be impracticable, technically less suitable, difficult to maintain or would be unduly burdensome on Central San. Central San will consider easements if the proposed sewer is located within a paved (private) roadway; however, Applicants shall avoid locating proposed sewers within unpaved easements.
- B. [District Code §7](#) defines and establishes the property rights needed for Central San facilities. When public facilities (sewer or recycled water) are proposed, the Owner shall obtain, on behalf of Central San, the property rights sufficient to enable Central San to construct, reconstruct, renew, alter, operate, maintain, inspect, repair and replace its facilities as may be needed without excessive cost or other undue difficulty in accordance with the requirements of this Section.
- C. Property rights for existing facilities will be reviewed for compliance with current requirements and any deficiencies may require upgrades as part of the Job.
- D. Nothing in these Specifications shall be construed as allowing the Contractor to make any arrangements with any person or entity to permit occupancy or use of any land, structure, or building within the work zone for any purpose whatsoever, either with or without compensation, in conflict with any agreement between Central San and any Owner, former Owner, or tenant of such land, structure, or building.

9-02 Required width of Central San Easement

The required width of the Central San Easement is determined by the pipe diameter and depth to the pipe, as shown in the table below.

Table 8. Required Easement Width

Pipe Diameter (in)	Or	Depth (feet, surface to invert)	Easement Width (feet)
≤10		≤9	15
≥12		>9	20

If the proposed easement conflicts with existing improvements, then Central San may reduce the easement width at its sole discretion, but in no case shall the width be less than 10 feet.

9-03 Improvements Allowed within Central San Easement

- A. All Central San structures within easements shall always remain exposed and accessible via all-weather access roadways for routine and/or emergency maintenance.

- B. Owner shall limit surface improvements in easements to paving and modest landscaping in compliance with [District Code §7.15.060](#). Neither trees nor stormwater improvements (e.g., NPDES Provision C.3 requirements) will be allowed within the easement. Additional examples of prohibited improvements are listed in [District Code §7.15.010](#).
- C. With Central San's written approval, the following encroachments may be authorized within the easement: utilities, fences, or retaining walls that cross at angles between 45° and 90° to the centerline of the easement and at elevations that will not conflict with the use of, or access to, Central San's facilities.

9-04 Documents Used to Convey Property Rights for Central San Facilities

The following documents are generally acceptable for establishing the required property rights outside of existing public right-of-way:

- Grant Deed conveying fee ownership of a property to Central San
- Easement dedicated on filed subdivision map to Central San or as a "Sanitary Sewer Easement" (SSE)
- Grant of Easement to Central San
- Easement offered to Central San by an Irrevocable Offer of Dedication (IOD)
- Existing private access and/or utility easement appurtenant to a property that specifically cites uses of "sewers" and/or "utilities"
- Deed Reservation reserving sewer and/or utility easements on or across a property
- Final Order of Possession or Final Order of Condemnation that conveys the needed property rights
- Covenants, Conditions, and Restrictions recorded against a property
- A License and Lease granting use of a property to Central San

9-05 Irrevocable Offers of Dedication by Separate Instrument

When an IOD by separate instrument (not granted on a subdivision map) is proposed to establish the property rights for proposed Central San facilities, then the following shall apply:

A. Submittals

The Job Engineer shall submit two copies of a legal description and "Right-of-Way Map for Sewer" (Plat) for each easement, and a copy of the complete recording or filing information for any lot, parcel or map mentioned in the description.

The Job Engineer shall address any revision required by Central San, then submit original wet-stamped and signed legal descriptions and plat maps. Central San will prepare and send an IOD to the Property Owner. The Property Owner shall return the signed and notarized document(s), ready for recording, before Central San will issuance a *Sewer Extension Permit*.

B. Legal Descriptions

The Job's Land Surveyor shall submit a legal description for each proposed easement in the form shown on *Figure 2* for review. The legal description shall follow these guidelines:

- Include Title: Exhibit A - Sanitary Sewer Easement
- Generally, easements are described by centerline, sideline, or perimeter metes and bounds description, as appropriate
- Description tied to at least two found survey monuments of record
- Character of survey monuments and references to recorded information if applicable
- All easement lines having a relationship to other boundary lines are qualified as such
- Central San job number, Easement Central San-assigned parcel number and the Assessor's Parcel Number (APN) in the upper right-hand corner
- A basis of bearing statement may be included as appropriate
- Area of description
- Reference to accompanying plat (Exhibit B), by which reference made part of the Legal Description
- Wet stamp or seal with signature and date by the Job's Land Surveyor
- Sheet Number and Number of Sheets

C. Right-of-Way Map for Sewer (Plat)

The Job's Land Surveyor shall submit a Right-of-Way Map for Sewer (e.g., Plat) for each proposed easement in the form shown in *Figure 3* for review. The plat shall follow these guidelines:

- Use Central San Plat Template
- Plat shall be titled: Exhibit B – Central San Right-of-Way Map for Sewer
- The grantor's name(s), recording information and Assessor's Parcel Number (APN)
- Ties to two found survey monuments of record and basis of bearing, as appropriate
- When possible, adjacent roads are shown
- Scale of map and orientation arrow pointing toward top of the sheet
- Central San job number and easement parcel number

D. Closure Report

The Job's Land Surveyor shall provide a mathematical closure report for the description or alignment with closure error, if required.

E. After the job passes inspection by Central San, then the Board of Directors will consider formally accepting the IOD(s), per [District Code §7.02](#).

9-06 Irrevocable Offers of Dedication on Subdivision Maps

When public streets or easements are proposed to be dedicated on a subdivision map, the following shall apply:

A. Certificate Sheet Required for final Subdivision Maps

1. Public Sewers in Easement

When easements are offered for dedication to Central San on a recorded map, the Owner's Statement shall include the latest Sanitary Sewer Easement (SSE) offer language and the map shall correctly delineate the SSE limits so that the public sewers, as shown on the corresponding sewer extension Plans, are located within the centerline of the SSE or in the location approved on the Plans

2. Public Sewers in Public Lands / Roads

When public lands/ roads are offered for dedication to the Local Agency, the Owner's Statement shall include this offer language and the map shall correctly delineate the public land/ road limits so that the public sewers, as shown on the corresponding sewer extension Plans, are located within the centerline of the public lands/ roads or in the location approved on the Plans.

B. Submittals

Prior to issuance of a *Sewer Extension Permit*, the Job Engineer shall submit a copy of the filed subdivision map and Certificate Sheet.

If the subdivision map cannot be filed prior to commencement of sewer construction, then Central San may grant permission to begin the sewer construction and will require that the subdivision map be filed, recorded and submitted to Central San prior to the acceptance of the proposed public sewer.

C. After the job passes inspection by Central San, then the Board of Directors will consider formally accepting Offers of Dedication, per [District Code §7.02](#)

9-07 Appurtenant Easements

When existing private access and/or utility easements appurtenant to the property of the Owner are proposed for the installation of Central San facilities, then the following procedures shall apply:

A. Submittals

The Job Engineer shall submit copies of all deeds demonstrating that each property has an appurtenant right for the Central San facilities with a summary document and map delineating the location of each Owner's property and its appurtenant rights.

B. Road Maintenance and Access (RMAs)

For Central San facilities proposed within private or proposed public roadways where appurtenant access and utility easements are used to establish the property rights, the Owner shall execute a road maintenance and access document that identifies the responsible party (not Central San) for maintaining the road to meet Central San access requirements. The document shall be noted on the Right-of-Way Log and may need to be recorded prior to Central San's issuance of a *Sewer Extension Permit*.

draft

EXHIBIT A

CCCSD Job No. 4950B

PERMANENT EASEMENT

Parcel 1

REAL PROPERTY in city of Martinez, county of Contra Costa, state of California, described as follows:

Portion of Lot 284 as shown upon LaSalle Heights — Unit No. 8 filed on November 16, 1949 in Book 38 of Maps at Page 31, Contra Costa County records (38 M 31) being also the parcel of land described in the Grant Deed to John Smith and Jane Smith, husband and wife, and to Elizabeth A. Jones, a married woman as her sole and separate property, all as Joint Tenants, recorded on July 16, 2000 as Recorder's Document 2006-0300449, said county records described as follows:

Commencing at a found railroad spike stamped "LS 3874" as said spike is shown upon the Record of Survey filed on November 15, 1999 in Book 96 of Land Surveyors Maps at Page 41, said county records (96 LSM 41) thence south $52^{\circ} 56' 30''$ west 97.15 feet (96.68 feet per 96 LSM 41) along the centerline of Harbor View Drive to a found railroad spike stamped "LS 3874" as shown upon said map; thence leaving said centerline north $08^{\circ} 41' 57''$ west 146.57 feet to a point on the northwesterly line of a 5' Sanitary Easement the southeasterly line of which is coincident with the southeasterly line of herein above referenced Lot 284, said point being the POINT OF BEGINNING, said POINT OF BEGINNING bears north $58^{\circ} 11' 12''$ east 50 feet from the westerly corner of said easement; thence from said POINT OF BEGINNING north $45^{\circ} 46' 31''$ east 45.01 feet; thence north $65^{\circ} 20' 47''$ west 67.34 feet to the northwest line of said Lot; thence along said line north $43^{\circ} 13' 41''$ east 10.55 feet; thence south $65^{\circ} 20' 47''$ east 69.69 feet; thence north $69^{\circ} 06' 51''$ east 54.97 feet to the northerly corner of said 5' Sanitary Easement; thence south $58^{\circ} 11' 12''$ west 109.43 feet along the northwesterly line of said easement to the POINT OF BEGINNING.

Containing an area of 1,294 square feet, more or less.

Attached hereto is a plat entitles Exhibit B and by this reference made a part hereof.



DP 4950B pcl 1
Page 1 of 1 9/13/2007

APN 374-171-008

Figure 2. Sample Legal Description for Exhibit A

EXHIBIT "B"
CENTRAL CONTRA COSTA SANITARY DISTRICT
RIGHT OF WAY MAP for SEWER

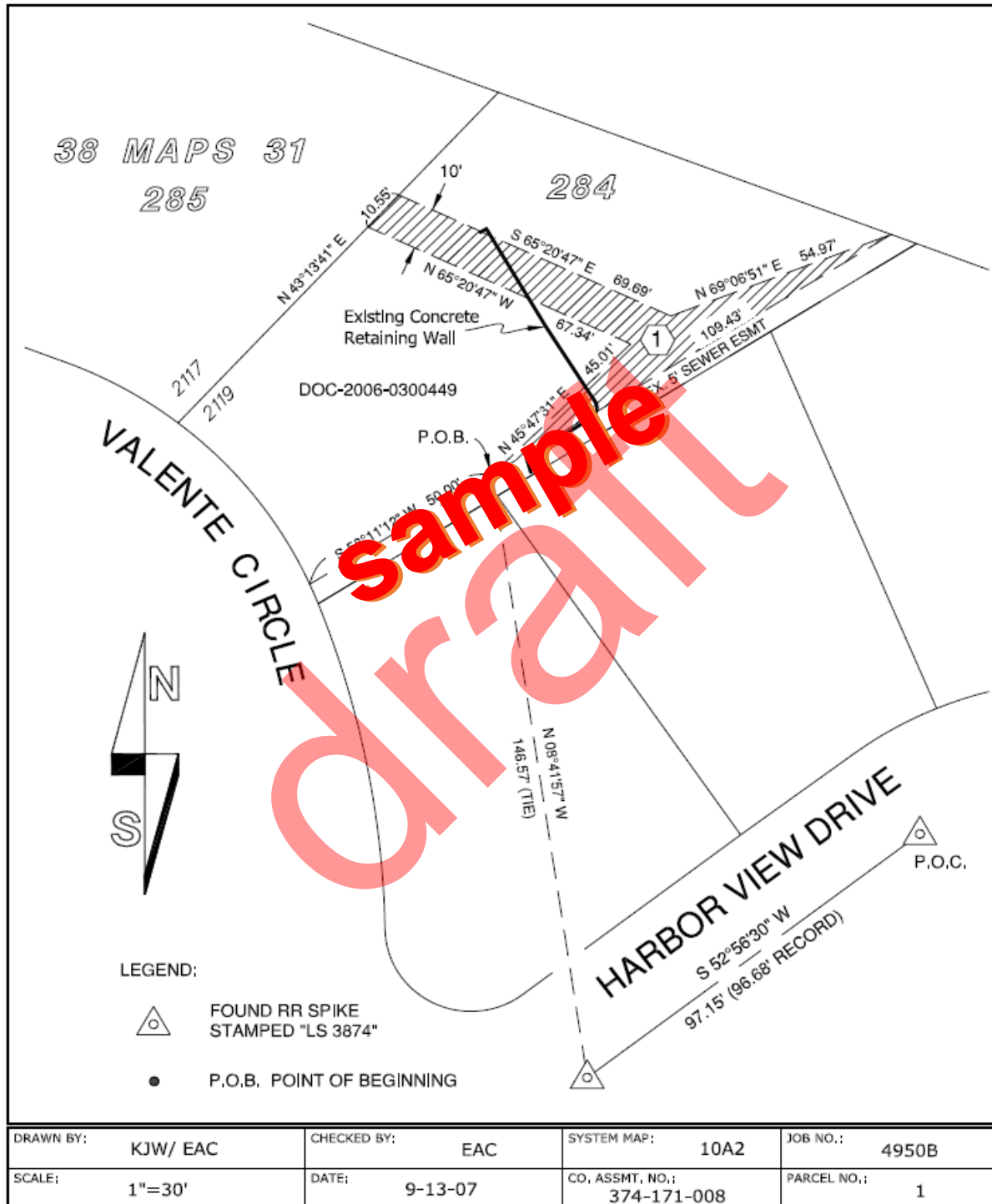


Figure 3. Sample Plat (Right-of-Way) Map for Exhibit B

Section 10. Submittal Requirements

10-01 General

Plans shall be submitted to Central San for proposed public/private main sewer extensions or relocations.

In accordance with the Business and Professions Code, Professional Engineers Act, §6735, all civil engineering Plans, specifications, and reports submitted to Central San shall be prepared by a licensed civil engineer or by a subordinate under his or her direction, and shall be signed by him or her to indicate his or her responsibility for them. In addition to the signature, all final civil engineering Plans, specifications, and reports shall bear the stamp of the registrant, and the expiration date of the certificate or authority.

10-02 Application

Apply for a *Sewer Extension* to Central San's Permit Counter and pay applicable fees. Additional fees will be due prior to the issuance of the *Sewer Extension Permit*.

10-03 Supplemental Reports (if required)

- A. Capacity Study: see *Subsection 8-05*
- B. Geotechnical Report: see *Subsection 8-09*
- C. Arborist Report: Where sewers are proposed to cross the existing drip lines of large, established trees, such as heritage oak trees, Central San may require an evaluation by a certified arborist which includes:
 - 1. probable nature, extent, and depth of the existing root system,
 - 2. impact of sewer trenching on the existing roots,
 - 3. necessary precautions and procedures to minimize impacts of sewer construction,
 - 4. any realignment of the sewer proposed to avoid damage,
 - 5. alternative trenching methods,
 - 6. special backfill requirements, and
 - 7. post-construction actions needed.

10-04 Additional Submittals (if applicable)

- A. Annexation Request and Petition: If a property to be served by the job is not within Central San's service area, then submit an *Annexation Request and Petition*.
- B. Right-of-Way: Submit Irrevocable Offer of Dedication, Grant of Easement, Subdivision Map, and/or appurtenant easements in compliance with *Section 9*.

10-05 Design Submittal(s)

Once the design concept is approved, the Job Engineer will be notified when to submit the proposed sewer design plans. Job Engineer shall refer to the appropriate guidance document for the sewer design and plan preparation.

1. All submittals shall be made electronically as a 300 dpi, PDF or TIF format; except for project security bonds or right-of-way instruments that will be recorded.
2. Typical design submittals shall include the following plan sheets:
 - a) Cover Sheet
 - b) Abbreviations/Notes/Legend sheet
 - c) Plan & Profile Sheet

draft

Section 11. Permitting for Construction

11-01 General

After Central San approves the sewer design plans for a Sewer Main Extension, the Applicant will be notified that they may proceed to the permitting stage.

11-02 Administrative Submittals

- A. Final Plans: Complete set of approved sewer design plans (24" x 36"), electronically as a 300 dpi, PDF or TIF format, wet-signed and stamped by the Professional Engineer
- B. Fees: Payment of any remaining fees, including inspection fees
- C. Project Cost Estimate: Submit the project cost estimate for approval prior to submitting the Project Security Deposit. The estimate shall be for the public sewer facilities only and must be itemized on a unit basis (e.g., no lump sum estimates).
- D. Project Security Deposit:
 - 1. Project security deposit shall be 100% of the approved cost estimate and shall be submitted to Central San prior to issuance of a construction permit and remain in full force and effect until the project is accepted by Central San. Note: Upon Central San authorization, the project security may be reduced to 10% for the warranty period.
 - 2. Project Security shall be submitted by the Applicant/Owner in one of the following forms:
 - a) Surety Bond: A Corporate Surety Bond issued by a surety acceptable to Central San and authorized to issue such surety bonds in California.
 - b) Cashier's Check: Shall be made payable to Central San.
 - c) Certificates of Deposit: 2 Certificates of Deposit (CDs), payable to Central San, the first for 90% and the second for 10% of the project security deposit. The first CD (90%) shall mature upon passing the Final Inspection; the second CD (10%) shall mature after the warranty period. Interest earned by both CDs shall be payable to the Owner. Note: Additional fees shall be paid for legal review to ensure compliance of the proposed CDs.
 - d) Letter of Credit: An irrevocable letter of credit or "set-aside" letter from an established financial institution and in a form acceptable to Central San. Note: Additional fees shall be paid for legal review to ensure compliance of the proposed Letter of Credit.
- E. Owner's Sewer/Recycled Water Improvement Agreement:

The property owner proposing to install new public sewer/recycled water facilities, or his or her properly authorized agent, shall execute an Owner's

Sewer/Recycled Water Improvement Agreement to provide appropriate assurance that the work is diligently pursued to completion and in accordance with Plans and specifications for the work as reviewed by Central San (Reference: [District Code §5.16](#)).

11-03 Pre-Construction Submittals

A. Prior to the issuance of the permit, submit the following:

1. Phasing Plan (if applicable)

If job will be constructed in phases, the Final Plans shall delineate a phasing plan on the Sanitary Sewer System Map on the Cover Sheet that shall be approved by Central San. Prior to the construction of each section or phase, the Job Engineer or Contractor shall submit the Cover Sheet with the portion of work to be constructed under the particular section or phase “highlighted” on the 1” =100’ scale Sanitary Sewer System Map, cut sheets for the particular phase, and applicable fees.

1. Shop Drawings (if required)

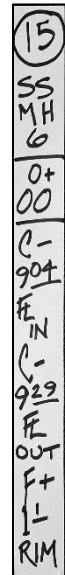
Submit site-specific shop drawings for material submittals. If submittals are required for precast concrete bases, then the shop drawings shall show the inverts, channeling, and angle of sewer pipes in and out at each location.

2. Bypass Plans (if applicable)

3. Cut Sheets & Field Stakes

- a) Vertical control and protection of the new sewer during construction are critical to operational success of gravity sewer systems. The integrity of the sewer pipe is most vulnerable during construction, therefore cut stakes and cut sheets shall be submitted after grading of roadway subgrade and pad elevations are complete. Central San review is required prior to issuance of the Central San permit for construction.
- b) After grading of roadway subgrade and pad elevations are complete, the Job Engineer or Surveyor shall conduct a field survey. Place offset cut stakes at the following design locations:
 - (i) For the main sewer at:
 - SS Station 0+00 at the downstream point-of-connection with Central San’s existing system
 - manholes and structures (e.g., manholes)
 - wyes and taps for laterals at the main

- joints, couplings, or fittings where pipe deflection will exceed three degrees (3°)
 - beginning and end of horizontal and vertical curves (BC and EC, BVC and EVC)
- (ii) For the lateral (see *DWG 22-01* through *22-04* for layout requirements) at:
- 45° fitting
 - 5 feet beyond property or easement line
- (iii) As shown in *Figure 5. Sample Cut Stake*, each cut stake shall be marked with the following:
- offset distance from centerline of the sewer
 - sanitary sewer stationing
 - depth of cut (surface to invert elevation)
 - structure type and number (if applicable)
- (iv) The maximum intervals for placement of cut stakes shall be:



**Figure 4.
Sample Cut
Stake**

Table 9. Required Intervals for Cut Stakes

Type of Alignment		Maximum Interval (ft)
Straight horizontal	Constant slope $\leq 20\%$	50
	Constant slope $>20\%$	25
Horizontal curves	Radius ≤ 500 ft	25
	Radius > 500 ft	50
Vertical Curves		25, minimum of 5 stations

- c) After cut stakes have been placed, the Job Engineer or Surveyor shall submit complete Cut Sheets for gravity sewers.

The Cut Sheet shall use form shown in *Figure 6. Cut Sheet for Sewer*. A sample form is available from Central San. To verify that new pipe will be adequately protected during construction, Cut Sheets shall include:

- ground elevation: at the centerline of the new pipe
 - depth of cover: from the bottom of the subgrade to the top of pipe at the centerline for each station (see *Table 7*)
- d) If any cut stakes are removed, damaged, and/or relocated before they have been used to set the grade of the sewer, then the Job Engineer or Surveyor shall replace the stakes prior to the installation of the sewer.

4. Pre-Construction Meeting (if required)



CENTRAL CONTRA COSTA SANITARY DISTRICT

CUT SHEET FOR SEWER

FOR JOB ENGINEER'S USE					DISTRICT DATA		
PREPARED BY:	KED	SHEET:	1 of 1		JOB #	2005	
OWNER:	MJP Developers	CONTRACTOR:	Jones & Co., Inc		REVIEWED BY	JMM	
DATE:	08/05/2010	ENGR JOB#	Engr 05-00026	SUB #	5125	DATE:	8/12/2010

LINE						STATION 0 + 00 to 4 + 23				
STATION	PIPE DIAMETER (in.)	STRUCTURE	SEWER SLOPE (ft/ft)	OFF SET	OFF SET STAKE ELEV.	FIL ELEV (invert)	OFF SET CUT	REMARKS	* C/L GROUND ELEV.	* C/L COVER
0 + 00.00	8.00	Ex. MH		8' LT	108.00	100.00	8.00	Start	104.33	5.00
			0.0077							
0 + 25.00	8.00			8' LT	107.36	100.19	7.17		105.00	5.47
			0.0077							
0 + 50.00	8.00			8' LT	107.22	100.9	6.84		105.21	5.49
			0.0077							
0 + 65.70	8.00	Lat. Rt.		8' LT	107.22	100.9	6.79		105.33	5.49
			0.0077							
0 + 75.00	8.00			8' LT	107.22	100.58	6.66		105.65	5.74
			0.0077							
1 + 00.00	8.00	MH # 1		8' LT	107.4	100.77	6.64		105.99	5.89
1 + 25.00	8.00			8' LT	108.71	101.07	7.64		106.39	5.99
1 + 48.40	8.00			8' LT	109.03	101.35	7.68	BC	106.68	6.00
			0.012							
1 + 57.40	8.00	11 1/4" Coupling		8' LT	109.15	101.46	7.69		107.13	6.34
			0.012							
1 + 62.00	8.00	Lat. Rt.		8' LT	109.15	101.51	7.64		107.19	6.34
			0.012							
1 + 75.40	8.00	11 1/4" Coupling		8' LT	109.22	101.67	7.55		107.31	6.30
			0.012							
1 + 93.40	8.00	11 1/4" Coupling		8' LT	109.43	101.89	7.54		107.43	6.21
			0.012							
2 + 11.40	8.00	11 1/4" Coupling		8' LT	109.65	102.11	7.54		107.55	6.11
			0.012							
2 + 29.40	8.00	11 1/4" Coupling		8' LT	109.87	102.32	7.55		107.89	6.23
			0.012							
2 + 38.40	8.00			8' LT	108.97	102.43	6.54	EC	108.15	6.39
			0.012							
2 + 50.00	8.00			8' LT	109.33	102.57	6.76		108.39	6.49
			0.012							
2 + 75.00	8.00			8' LT	109.43	102.87	6.56		109.39	7.19
			0.012							
3 + 00.00	8.00			8' LT	110.03	103.17	6.86		109.99	7.49
			0.012							
3 + 25.00	8.00			8' LT	110.36	103.47	6.89		110.49	7.69
			0.012							
3 + 50.00	8.00			8' LT	110.48	103.77	6.71		110.89	7.79
			0.012							
3 + 75.00	8.00			8' LT	110.75	104.07	6.68		110.99	7.59
			0.012							
4 + 00.00	8.00			8' LT	111.15	104.37	6.78		111.49	7.79
			0.012							
4 + 23.00	8.00	MH # 2		8' LT	112.27	104.65	7.62	End	111.97	7.99

Figure 5. Cut Sheet for Sewer

11-04 Permit Issuance

- A. Permit will be issued after a favorable review of submittals.

- B. Expiration of Plans: Plans signed and stamped “Final Review for Construction” shall expire 3 months from the date on the stamp unless work has commenced on the project.
- C. Changes after Final Plans are Issued: When any change(s) to Plans are proposed after the Final Review for Construction, or are required due to field conditions being different from those indicated in the final construction plans, (including, but not limited to, changes of pipe type, class, grade, cover, quantities or any other details that may affect the sanitary sewer installation), the work subject to change will be suspended until the change(s) have received favorable review by Central San through the above described process.

draft

draft

Part IV. Recycled Water Distribution System

Section 13. Design Criteria

13-01 General

- A. Part IV is a placeholder while Central San develops detailed Standard Specifications for Recycled Water. In the interim, design, property rights, submittal requirements, and plan review shall follow *Part II Private Sewage Disposal Systems* and *Part III Public Sewer Collection Systems* as applicable. Contact permits@centralsan.org for more information.
- B. All recycled water facilities to be connected to the Central San system shall be designed and constructed in a manner consistent with service to the ultimate distribution area in compliance with [District Code §9.08.020](#). Central San shall review Plans submitted for construction of new or modified facilities to evaluate the service requirements for the ultimate distribution area.
- C. Private recycled water systems (e.g. typically landscape irrigation plans) connecting to Central San's public facilities shall be reviewed, approved, inspected and tested by Central San.

Section 14. Property Rights

14-01 General

Comply with Section 9.

draft

Section 15. Submittal Requirements

15-01 General

Comply with Part III.Section 10.

draft

Section 16. Permitting for Construction

16-01 General

Comply with *Section 11*, except pre-construction submittals for permit issuance will not require cut sheets or precast manhole bases. Any other pre-construction submittals will be determined during the Plan Review process by Central San.

draft

Part V. Construction Requirements

Section 17. Control of the Work

17-01 Authority of the Central San Inspector

- A. The Inspector shall decide all questions that arise in the field regarding the quality or acceptability of materials and/or equipment, completed work and/or the interpretation of the Plans and/or these Specifications.
- B. If the Inspector determines that any work is not in compliance with the Permit, Plans, Specifications, District Code, or any applicable rules, laws or regulations, then the Inspector may suspend work, issue a Notice of Violation, or order that the noncompliant work be corrected, or removed and replaced, so as to fully comply with the requirements. If work is suspended, the Contractor shall do all work necessary to provide for safe, smooth, and unobstructed passage for traffic through the construction zone during the period of the suspension of work, or at the end of each workday. The work may be resumed when conditions are corrected and verified by the Inspector and the Contractor is willing and able to properly resume work.
- C. If the Contractor fails to comply with any order made under the provisions of this article within a reasonable time, Central San may have the defective work corrected at the Contractor's expense.
- D. No decisions rendered, nor directions given by the Inspector shall relieve the Contractor, the Owner or the owner's surety of their obligations or responsibilities to diligently prosecute the job or establish any contingent liability on the part of Central San.
- E. If the Contractor fails to act promptly or diligently in the prosecution of work done under a Central San permit, or should the urgency of a particular situation require that corrections be made before the Contractor can be notified or respond to notification, then Central San may have the corrections made at the Contractor's expense, and the Contractor shall be charged and shall pay to Central San the cost of such work plus the current Central San overhead rate to compensate Central San for administration of work ([District Code §5.10](#)).

17-02 Inspection

- A. Access: All work done and all materials furnished shall be subject to inspection. The Inspector shall have access to the work at all times during construction, and the Contractor shall provide proper and safe facilities for such access and inspection. The Inspector shall be furnished with every

reasonable facility for ascertaining that the materials and the workmanship are in accordance with the requirements and intentions of the Plans and these Specifications. The Contractor shall submit properly authenticated documents or samples of materials demonstrating compliance with these Specifications at any time so requested by Central San.

- B. Schedule Inspections: The Contractor shall call to arrange for Central San inspections required by these Specifications a minimum of one business day prior to the commencement of work. No work shall begin prior to scheduling of an inspection. The Contractor shall notify the Inspector of any changes in work schedule affecting inspections as soon as possible to allow time for rescheduling. If less than 1 working day's notice is provided, then rescheduling fees will be required.
- C. Regular Work Hours and Overtime: Regular work hours and District Holidays are posted at <https://www.centralsan.org/pod/hours-directions>. Any inspection performed outside regular work hours will be charged at the overtime rate and paid by the Contractor. If amounts owed for such services are not paid within 30 days from the date of billing, then no permits for additional work will be issued.
- D. Time Restrictions: The following activities have time-restrictions to ensure the work can be completed and the site restored during regular inspection hours. Any variances shall be approved in advance by the Inspector and may be subject to overtime or additional inspection charges.

Table 10. Time Restrictions on Construction Activities

Activity	Shall start before
Trenchless	1 p.m.
Tapping or connections to in-service main or trunk sewers	1 p.m.

17-03 Superintendence

The Contractor, or a representative of the Contractor who is authorized to make field decisions, shall always be present at the jobsite when work is in progress. The Inspector will communicate any determinations or instructions to the Contractor or its authorized representative. Any determination or instruction given by the Inspector that is not otherwise required by these Specifications or the [District Code](#) to be in writing will, on request of the Contractor, be given or confirmed by Central San in writing.

17-04 Safety

- A. The Contractor shall be responsible for the safety of its plant, equipment and personnel, and the public in the immediate vicinity of work subject to these Specifications. The Contractor shall take any precautions it deems necessary to prevent injury to people and damage to property.

- B. The Contractor and its subcontractors shall comply with all applicable federal, state, and local safety rules, regulations, requirements, and orders in the performance of the work. This shall include the Construction Safety Orders and rules of the Division of Industrial Safety, State of California, as contained in the California Administrative Code, Title 8, Chapter 4.
- C. Protection of excavation and trenching shall comply with [District Code §9.10.030](#) and with applicable provisions of the State of California Administrative Code, Title 8; Industrial Relations, Chapter 4, Subchapter 4, Construction Safety Orders, and the federal Occupational Safety and Health Administration (OSHA) Regulations, 29 CFR Part 1926 Subpart P – Excavations.
- D. Competent Person: A Competent Person shall be designated by the Contractor for any job that requires any individuals to enter a trench or other excavation regardless of depth. The Competent Person shall conduct daily or more frequent site inspections as appropriate. The designated Competent Person shall possess a current certification.
- E. Underground Utilities: Prior to any excavation, it is the Contractor's responsibility to determine the location of all utility installations including, without limitation, pipes, conductors and conduits for electricity, gas, water, telephone, cable TV, sewage, storm drainage that could be encountered during excavation. At least 48 hours prior to commencing any excavation, the Contractor shall notify **Underground Service Alert (USA) by calling 1-800-227-2600, or 811**, in accordance with California state law.
- F. Stability of Adjacent Structures: Systems for support of structures adjacent to excavations are to be provided when the stability of such structures is threatened by excavation operations. Sidewalks, pavement, and other structures shall not be undermined unless an appropriate protective system is provided to protect from collapse.

17-05 Plans

- A. Final Plans for Main Extensions
 - 1. No changes shall be made in any plan or drawing after it has received favorable "Final Review for Construction" by Central San, except with Central San's written concurrence.
 - 2. The Contractor shall keep copies of the Central San-stamped Final Plans for the project, the Central San Permit, and applicable permits from other governing agencies incidental to the work at the jobsite (e.g. encroachment permit) during prosecution of the work, and shall make the copies available to the Inspector upon request. The Final Plans, these Specifications, and required supplementary documents are considered requirements of the work, and the Contractor shall familiarize itself and fully comply with all such requirements.

B. Submittals

1. Submit shop drawings and/or other information as required by the Final Plans or these Specifications to the Inspector for favorable review prior to commencing the related work. These submittals may include, but are not limited to schedules, fabrication detail drawings, certifications that materials comply with the specification, evidence of worker's special qualifications, and information regarding proposed alternate materials, methods and/or equipment.
2. Review of the Contractor's submittals by Central San shall not relieve the Contractor of its responsibility for the accuracy of dimensions and details or for completion of permitted work in compliance with these Specifications or the Final Plans.

C. Conformity with the Plans and Allowable Deviations

1. Finished surfaces shall conform to the lines, grades, cross-sections, and dimensions shown on the Final Plans.
2. Only deviations from the Plans approved in advance by Central San will be allowed. Central San reserves the right to order deviation from the Plans and Specifications as deemed necessary for the proper completion of the facilities being constructed.

17-06 Lines and Grades

- A. Where available grade for side sewer installation is less than 2% and where the side sewer is more than 100 feet in length, the Central San Inspector may require that cut sheets and field stakes be submitted by a licensed surveyor and/or the Contractor use an industrial-standard laser grade control system to confirm that the pipe is installed to the proper grade.
- B. The Contractor shall notify the Job Engineer of the requirements in advance of starting operations that require stakes or marks. The Contractor shall request utility marking from USA prior to staking, and favorable review by the Inspector of stakes in the field is required prior to the commencement of work. In the judgment of the Inspector, if the stakes or marks suggest that the new work may conflict with existing improvements, the Contractor shall pothole the existing improvements to determine whether redesign of the work is required.
- C. Stakes and marks shall be carefully preserved by the Contractor. If any such stakes and marks necessary to complete construction are destroyed or damaged, the Contractor shall arrange for such stakes and marks to be replaced.
- D. All distances and measurements shall be made in a horizontal plane. Grades are given from the top of hubs, nails, or other points designated by the Job Engineer.

17-07 Workers

The Contractor shall employ enough competent workers or subcontractors to produce the work required. If an employee of the Contractor or any subcontractor is incompetent, appears to be under the influence of alcohol or illegal drugs, or acts in an unsafe or improper manner, the Contractor shall remove that person from the site immediately. However, nothing contained in this paragraph shall be construed to shift the responsibility for supervision of employees of the Contractor or any subcontractor from the Contractor or subcontractor to Central San, or to require Central San to take any action regarding any employee of the Contractor or subcontractor.

17-08 Equipment

The Contractor shall provide adequate and suitable equipment (including, but not limited to, Personal Protective Equipment, shoring, trench plates, traffic cones, etc.) needed to produce the quality of work required prior to commencing each day's work and, when ordered by the Inspector, shall remove unsuitable equipment from the work.

Each machine or piece of equipment shall be operated by a person experienced in handling the make of machine or piece of equipment in use, at a speed or rate of production not to exceed that recommended by the manufacturer.

17-09 Notice to Adjacent Property Owners and Residents

The Contractor or Owner shall provide written notice to property owners and/or residents who may be impacted by main sewer or recycled water extension or private side sewer or recycled service lateral work. The notice shall describe the type of work to be done and its tentative schedule. For private facility work on property owned by someone other than the Contractor's customer, the notice shall be made at minimum of 2 working days prior to the beginning of any work.

17-10 Public Convenience

- A. No work may be performed in any public right-of-way without first obtaining an encroachment permit from the agency having local jurisdiction (i.e., local traffic engineering, public works department, and/or police).
- B. The Contractor shall provide for the safe passage of traffic, including emergency response vehicles, through the work during construction if work is located in or affects traffic in any public or private road, right-of-way or access easement. The attention of the Contractor is directed to the encroachment permit requirements of Caltrans and/or Contra Costa County and/or cities within the County regarding the Contractor's responsibility for providing for the convenience of the public in connection with its operations. Where a conflict arises, the local ordinances and regulations shall prevail. The Contractor shall comply with the State of California Department of Transportation's "Manual of Temporary Traffic Controls for Construction and Maintenance Work Zones" (latest edition), and any applicable local agency encroachment permit

requirements when work is done in streets, roadways, or similar thoroughfares subject to vehicular traffic.

- C. The Contractor shall conduct its operations to minimize possible obstruction and inconvenience to traffic, and have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights and convenience of the public.
 - 1. Where existing roads are not available for use as detours, all traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.
 - 2. Spillage resulting from hauling operations along or across the traveled way shall be removed immediately.
 - 3. For trenching in existing streets, excavation and pipe installation shall be coordinated so that no more than 100 linear feet of trench shall be open at any time. Backfilling operations shall closely follow pipe installation. In new subdivisions more than 100 feet of trench may be opened if allowed by the Inspector and if the excavation is properly shored, sloped or benched.
- D. Convenience of abutting Property Owners along the road or sewer shall reasonably be provided for. Convenient access to driveways, houses and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition.
- E. Right is reserved to cities, local and county authorities, and to water, gas, telephone, cable and electric power transmission utilities to enter upon any public highway, road or right-of-way for the purpose of making repairs and changes that have become necessary by the reason of the sewer or recycled water installation.
- F. All fences subject to interference shall be maintained by the Contractor until the work is completed, at which time they shall be restored to the condition existing prior to starting the work.
- G. Excavation and backfill shall always be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by traffic. When possible, sewer/recycled water construction shall be conducted on one-half the width of the traveled way at a time and that portion of the traveled way being used by traffic shall be kept open and unobstructed until the opposite side of the traveled way is completely ready for use by traffic.
- H. While trenching and paving operations are under way, the Contractor shall ensure that traffic can use the shoulders and the side of the roadbed opposite the one under construction. When sufficient width is available, a passageway wide enough to accommodate 2 lanes of traffic shall always be kept open at locations where construction operations are in active progress.

- I. Bridges designed by a licensed Professional Engineer and approved by Central San shall be installed and maintained across the trench at all crosswalks, intersections, and at such other points where, in the opinion of the Inspector, traffic conditions make it advisable for the convenience of pedestrian traffic.
- J. In order to expedite the passage of traffic through or around the work and where ordered by the State, municipal, local, and/or county authorities having jurisdiction and/or the Inspector, the Contractor shall install signs, lights, flares, barricades, and shall furnish a pilot car and driver and other facilities for the sole convenience and direction of traffic. Whenever the Contractor's operations create a hazardous condition or where directed by the State, municipal, local, and/or county authorities having jurisdiction, the Contractor shall provide and station competent flaggers whose sole duties shall consist of directing the movement of traffic through or around the work.
- K. In addition to the requirements specified for furnishing facilities and flaggers to expedite the passage of traffic through or around the work, the Contractor shall furnish and erect, within or adjacent to the limits of the work, such warning and directional signs as may be required by the previously named agencies having jurisdiction.

17-11 Maintenance of Access and Detours

- A. The Contractor shall maintain enough trench plates on the jobsite to effect immediate access for emergency vehicles and reasonable access for property owners affected by the work. If required, the Contractor shall construct, maintain, and remove detours to direct both pedestrian and vehicular traffic through or around the jobsite, as shown on the Plans, or as directed by the Inspector or other public agency having jurisdiction.
- B. At the end of each work day, the Contractor shall ensure that excavations are properly secured, shored and covered with trench plates to provide for public safety and unobstructed safe access for vehicular and pedestrian traffic
- C. Where the Contractor's operations are not being satisfactorily controlled or maintained by the Contractor for safe passage of traffic, the Inspector and/or other public agencies having jurisdiction may order the Contractor to correct any unsafe conditions, and the Contractor shall comply with such orders.
- D. The failure or refusal of the Contractor to properly provide emergency or Property Owner access, or to employ, control or maintain detours shall be sufficient cause for suspension of the work until proper access and/or detours are provided by the Contractor.

17-12 Cleanliness of Jobsite

- A. The Contractor shall keep the jobsite clean and orderly and shall sweep streets affected by the work daily.

- B. The Contractor shall promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by work in a neat and clean condition. Adjacent structures shall be cleaned of dust, dirt, and debris resulting from the work, as directed by Central San or other local jurisdictions, and adjacent areas shall be returned to the condition existing prior to start of work.
- C. All clearing, grubbing, demolition, abandonment, and salvage work shall comply with applicable local, state, and federal statutes, ordinances, codes, standards, rules, procedures, regulations and safety orders. The Contractor shall obtain required permits and file required reports in a timely manner.
- D. For *Sewer Extension Permits*, the Contractor shall use appropriately sized equipment such as power brooms and street sweepers.

17-13 Construction Sequencing

- A. All abandonments of side sewer connections to the main sewer shall be completed before construction of new side sewers or main sewer extensions on the job.
- B. No building connection will be allowed until downstream sewer jobs passed in accordance with Subsection 17-17 and accepted in accordance with Subsection 17-19.
- C. Sewer pipelines shall be laid upgrade from the point-of-connection to the existing sewer with the bell end at the upgrade end of each pipe length.

17-14 Temporary Storm Water Pollution Control

- A. The Contractor shall employ best management practices for control of erosion and jobsite runoff, pollution prevention and protection of water quality.
- B. The Contractor shall comply with all applicable federal, state, and local regulations for disposing of contaminated storm water, groundwater and contaminated soils resulting from or discovered during excavation.
- C. Major contamination, large spills, and other serious hazardous waste incidents shall require initial containment and immediate response from specialists. Spills of any material (e.g. sediment-laden wastewater) hazardous or not, shall be reported immediately. The Contractor shall notify the Inspector, the Office of Emergency Service (OES) at 8008527550, the RWQCB at 510-622-2300, and the County Health Department when a hazardous spill occurs. If there is indecision as to whether water quality will be impacted, the Contractor shall contact the RWQCB to discuss the situation.

17-15 Bypassing Wastewater

When work requires that an existing sewer be taken out of operation, the Contractor shall:

- A. Secure and comply with the provisions of permits required for wastewater bypassing operations, including encroachment permits for equipment and piping from the applicable local jurisdiction (City or Contra Costa County).
- B. Furnish all labor, materials, tools, equipment and supplies required to convey wastewater from a point upstream to a point downstream of the work.
- C. Flow in existing sewers shall not be dammed or otherwise restricted without the approval of the Inspector. All wastewater facilities shall remain in continuous operation during construction. Bypassed sewage shall be contained in an enclosed hose or pipe and shall be redirected into the sanitary sewer system. Dumping, overland or open channel flow of sewage is strictly prohibited. Flushing of sewage from spills or from bypass equipment leakage into storm drains or creeks is also prohibited. Any spill or leakage shall be immediately contained and conveyed to a sanitary sewer or hauled to the Wastewater Treatment Plant without undue delay.
- D. Pumped bypass systems shall be continuously monitored.
- E. After the work necessitating bypassing is completed, flow shall be restored to normal, all equipment shall be removed from the sewer system, and all pipes or structures modified or damaged during the bypass operations shall be restored to their original condition.

17-16 Disruption of Services

If any operation results in the disruption of service to the public main sewer or recycled water distribution system, the Contractor shall immediately notify Central San's Inspector or Central San's emergency dispatch at 925-933-0990. In such a case, Central San crews will be dispatched, and the Contractor will be billed for all Central San's costs.

17-17 Final Inspection of the Work

The Contractor may request the Final Inspection when the following has been met:

- A. All work covered by the Central San permit is completed, including correction of deficiencies.
- B. All proposed public facilities are set to the final grade.
- C. For private developments such as subdivisions, tracts, townhouses, condominiums and commercial centers, installation is complete for all other utilities and permanent structural site improvements such as roadway surfacing, curbs, gutters, sidewalks, etc.
- D. The Contractor has cleaned all roadways, rights of way, and all ground used in connection with the work, of all rubbish, excess materials, falsework,

temporary structures, and equipment, and all parts of the work shall be left in a neat and presentable condition. Nothing herein, however, shall require the Contractor to remove warning and directional signs prior to acceptance by Central San, but the Contractor shall do so immediately after the Final Inspection is passed.

17-18 Warranty of Proposed Public Facilities

- A. Immediately upon passing the Final Inspection for proposed public facilities, a one-year warranty period on all work shall commence. The warranty shall be in addition to, and not in limitation of, any other warranty/guarantee required by law.
- B. During the warranty period, Central San, at its sole discretion, may perform CCTV or other inspections to determine the condition of the proposed public facilities.
- C. Any defective materials, faulty workmanship, and/or deficiencies which are discovered within the warranty period shall be corrected and/or replaced by the Contractor.
 - 1. The warranty period may be extended for an additional one-year after acceptance of such correction or replacement at the discretion of Central San.
 - 2. If the repair work is not satisfactorily completed in a timely manner, Central San may proceed with the necessary repairs and deduct the cost from the project security in accordance with [District Code §5.16.080](#).

17-19 Acceptance of Proposed Public Facilities

- A. Staff will recommend that the Board of Directors, or their authorized representative, accept the proposed public facilities as contributed assets after the following conditions have been met:
 - 1. The Final Inspection was passed in accordance with *Subsection 17-17*
 - 2. The Owner has obtained, on behalf of Central San, sufficient property rights in accordance with *Section 9 or Section 14*
 - 3. Manufacturer's guarantees, instructions, and parts lists have been delivered to Central San, if applicable
- B. Acceptance of contributed assets for proposed public facilities shall be made by Central San's Board of Directors, or authorized representative.

Section 18. Control of Material

18-01 Contractor Furnished Materials

The Contractor shall furnish all materials required to complete the work. The Contractor shall ensure that materials needed each day are on the jobsite prior to commencing that day's work.

18-02 Source of Supply and Quality of Materials

Only materials listed on the *Approved Materials List* shall be used in the work. Alternative materials conforming to the requirements of these Specifications and favorably reviewed by Central San will be added to the *Approved Materials List* and may be used in the work. All materials proposed for use may be inspected or tested by Central San at any time during their preparation and use. If it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish material from other sources on the *Approved Materials List*. No material which after approval has in any way become unfit for use shall be used in the work.

18-03 Acquisition of Materials

The Contractor shall have on-hand, at the time construction starts on any section of the work, all materials necessary to complete that section of the work in a reasonable time period.

18-04 Storage of Materials

Materials shall be stored in an approved staging area to ensure the preservation of their quality and fitness for the work. When determined to be necessary by the Inspector, materials shall be covered and/or placed on wooden platforms or other hard, clean surfaces and not on the ground. Stored materials shall be located to facilitate prompt inspection.

18-05 Defective Materials

Materials that do not conform to the requirements of these Specifications shall be deemed defective. Such defective materials, whether in place or not, shall be rejected and removed immediately from the site of the work, unless otherwise permitted by the Inspector. Central San may remove and replace defective material should the Contractor fail to comply promptly with any order made under the provisions of this paragraph. Any cost incurred by Central San will be charged to the Contractor and/or Owners.

18-06 Trade Names and Alternatives

- A. For convenience, certain equipment or materials may be designated on the Plans in these Specifications, or in the *Approved Materials List* by trade name or manufacturer citing model and/or part numbers. The use of alternative equipment and/or materials that are of equal quality and of the required characteristics for the purpose intended may be permitted in accordance with the following requirements:

1. All information necessary for evaluation of proposed alternative equipment or materials shall be submitted a minimum of 10 working days prior to the date that the equipment or materials shall be ordered by the Contractor to ensure that there is no unacceptable delay in the work. This information shall include: the names of the manufacturer and supplier of the item, the manufacturer's model or part number, trade name or other item identification, the manufacturer's published application, installation and/or operation manuals and any guarantees, warranties, catalog cuts, data sheets, and certification of compliance with standards testing agency specifications or other test procedures used for product quality assurance.
 2. Within 5 working days of its receipt of a complete request for consideration of proposed alternative equipment and/or materials, Central San will render a determination regarding the suitability of the proposed alternative for addition to the *Approved Materials List*, and its determination shall be final.
- B. If the Contractor does not submit timely requests for consideration of proposed alternative equipment and/or materials, it shall use only equipment and/or materials that are specifically named in these Specifications, shown on the Plans or listed in the *Approved Materials List*.

18-07 Testing Materials

- A. Whenever reference is made to a test designation of the American Society for Testing and Materials (ASTM), or any other recognized national testing or standards organization, it is to be understood that the most current test method in use on the date of these Specifications shall prevail.
- B. Whenever abbreviations are used in these Specifications or on the Plans in connection with a reference to material or work requirements or test methods, such abbreviations shall be construed as set forth under Acronyms, Abbreviations and Terms.
- C. When requested by the Inspector, the Contractor shall furnish samples of materials proposed for use in the work. Materials may be tested at any time during the progress of the work. Material found to be defective shall be rejected.

18-08 Inspection at Source of Supply

Central San may inspect equipment and/or materials proposed for use in main sewer or recycled water extensions at the source of supply or manufacture. Representatives of Central San shall be provided reasonable access to such parts of production facilities that are related to the manufacture or production of equipment and/or materials proposed for use in the work. Central San assumes no obligation to inspect materials at the source of supply.

18-09 Certificates of Compliance

- A. Central San may permit the use of equipment and/or materials without sampling and testing if the equipment and/or materials are accompanied by a Certificate of Compliance stating that the equipment and/or materials comply in all respects with the requirements of these Specifications. The certificate shall be signed by an authorized representative of the manufacturer of the equipment and/or materials.
- B. All materials used based on a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Plans and Specifications and any such material not conforming to such requirements will be subject to rejection whether in place or not.

draft

Part VI. Technical Specifications

draft

Section 03 20 00 - Concrete Reinforcing

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall furnish, fabricate, and place all concrete reinforcing, welded wire fabric, couplers and concrete inserts for use in reinforced concrete.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 60 00 - Grout

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
- ACI 315 Detail and Detailing of Concrete Reinforcement
 - ACI 318 Building Code Requirements for Structural Concrete and Commentary
 - ASTM A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement
 - ASTM A 185 Specification for Steel Welded Wire Reinforcement, Plain for Concrete
 - ASTM A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - ASTM A 775 Specification for Epoxy-Coated Reinforcing Steel Bars
 - CRSI MSP-1 Concrete Reinforcing Steel Institute Manual of Standard Practice

Part 2 - Products

2.1 GENERAL

Materials specified in this Section that may remain or leave residue on or within the concrete shall be classified as acceptable for potable water use by the U.S. Environmental Protection Agency.

2.2 CONCRETE REINFORCING

- A. Concrete reinforcing for all cast-in-place, reinforced concrete construction shall conform to the following requirements:
1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement with supplementary requirement S-1, or as otherwise shown.
 2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and the details shown; provided that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10"; and provided further that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.

3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.

B. Accessories:

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice, including special requirements for supporting epoxy-coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8" minimum thickness of plastic coating that extends at least 1/2" from the concrete surface. Plastic shall be gray in color.
2. Concrete blocks (dobies), used to support and position Concrete Reinforcing, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.

- C. Epoxy coating for reinforcing and accessories, where indicated, shall conform to ASTM A 775.

2.4 EPOXY GROUT

Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature and orientation of the hole to be filled. Epoxy grout shall meet the requirements specified in *Section 03 60 00 - Grout*.

Part 3 - Execution

3.1 GENERAL

- A. All reinforcement-steel, welded wire fabric and other appurtenances shall be fabricated and placed in accordance with the requirements specified herein. Welded splices or mechanical couplers shall not be used unless approved by Central San. Reinforcement shall not be straightened or re-bent.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 FABRICATION

- A. Concrete Reinforcing shall be accurately formed, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318. Stirrups and tie bars shall be bent around a pin having a diameter not less than 1" for No. 3 bars, 2" for No. 4 bars and No. 5 bars. Bars shall be bent cold. The Contractor shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists and placing drawings.

- B. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

Bars	Tolerance (inch)
Cut or sheared length	1
Depth of truss bars	+0, -1/2
Stirrups, ties, and spirals	1/2
All other bends	1

3.3 PLACING

- A. Concrete Reinforcing shall be accurately positioned and shall be supported and wired together to prevent displacement, using annealed-iron wire ties or suitable clips at intersections. Concrete, plastic, metal supports, spacers, or metal hangers shall support all Concrete Reinforcing. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support Concrete Reinforcing shall be tied to the steel with wire ties that are embedded in the blocks. For concrete over form work, the Contractor shall furnish concrete, metal, plastic or other acceptable bar chairs and spacers.
- B. Limitations on the use of bar support materials shall be as follows:
1. Concrete dobies are permitted at all locations, except where architectural finish is required.
 2. Wire bar supports are permitted only at slabs over dry areas and exterior wall surfaces.
 3. Plastic bar supports are permitted at all locations, except on grade.
 4. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
- C. Bars additional to those shown that may be found necessary or desirable for the purpose of securing reinforcement in position shall be provided by the Contractor.
- D. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318.
- E. Bars may be moved as necessary to avoid interference with other Concrete Reinforcing, conduits, or embedded items. If bars are moved more than 1 bar diameter or enough to exceed the specified tolerances, the resulting arrangement of bars shall be as acceptable to Central San.
- F. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30" on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane indicated.

- G. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.
- H. Epoxy-coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.
- I. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.4 SPACING OF BARS

The clear distance between parallel bars not including bundled bars (except in columns and between multiple layers of bars in beams) shall not be less than the nominal diameter of the bars, not less than one and 1-1/2 times the maximum size of the coarse aggregate, nor less than 1". The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

3.5 SPLICING

- A. Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to Central San.
- B. The length of lap for reinforcement bars, unless otherwise shown, shall be in accordance with ACI 318.
- C. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.
- D. Splices in column spiral reinforcement, when necessary, shall be made by a lap of 1-1/2 turns.

3.6 CLEANING AND PROTECTION

- A. Concrete Reinforcing shall be protected at all times from conditions conducive to corrosion until concrete is placed around it.
- B. The surfaces of all Concrete Reinforcing and other metal work to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale, rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be re-inspected and, if necessary, re-cleaned.

3.7 EMBEDMENT OF DRILLED, REINFORCING-STEEL DOWELS

A. Hole Preparation:

1. The hole diameter shall be as recommended by the epoxy manufacturer but shall be no larger than 1/4" greater than the diameter of the outer surface of the reinforcing bar deformations.
2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless noted otherwise.
3. The hole shall be drilled by methods that do not interfere with the proper bonding of epoxy.
4. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.
5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.

B. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that ensures that excess material will be expelled from the hole during dowel placement.

C. Dowels shall be coated with epoxy and twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

- END OF SECTION -

Section 03 30 00 - Cast-In-Place Concrete

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall furnish materials, form, mix, place, cure, repair, finish and do all other work required to produce finished concrete in accordance with the provisions of this section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 20 00 - Concrete Reinforcing

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:

ACI 301	Specifications for Structural Concrete for Buildings
ACI 347	Guide to Formwork for Concrete
ASTM C 33	Specification for Concrete Aggregates
ASTM C 94	Specification for Ready-Mixed Concrete
ASTM C 150	Specification for Portland Cement
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete
ASTM C 309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Specification for Chemical Admixtures for Concrete
ASTM C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

1.4 CONTRACTOR SUBMITTALS

- A. When the Contractor proposes to use a mix design not listed in the *Approved Materials List*, the proposed mix design including the proportions and gradations of all materials proposed shall be submitted to Central San and shall receive favorable review prior to use. Mix designs shall be tested by an independent testing laboratory for properties specified in this section, and the results shall be submitted with the proposed concrete mix designs.
- B. Where ready-mix concrete is used, the Contractor shall furnish certified delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring, and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate, added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each certificate shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the time when

the batch was dispatched, when it left the plant, when it arrived at the job, when unloading began, and when unloading was finished.

- C. When a water-reducing admixture is proposed, the Contractor shall furnish mix designs for concrete both with and without the admixture.

Part 2 - Products

2.1 CONCRETE REINFORCING

Concrete Reinforcing shall satisfy the requirements specified in *Section 03 20 00 - Concrete Reinforcing*.

2.2 CONCRETE MATERIALS

- A. See *Approved Materials List*, or approved equal.
- B. Materials shall be delivered, stored, and handled to prevent damage by water or breakage. Only one brand of cement shall be used.
- C. All materials furnished for the work shall comply with the requirements of Sections 201, 203, and 204 of ACI 301, as applicable.
- D. Materials for concrete shall conform to the following requirements:
 - 1. Cement shall be standard brand Portland cement conforming to ASTM C 150 for Type II or Type V.
 - 2. Clean potable or recycled water free from objectionable quantities of silty organic matter, alkali, salts and other impurities shall be used.
 - 3. Aggregates shall be obtained from pits acceptable to Central San, shall be non-reactive, and shall conform to ASTM C 33. Lightweight sand for fine aggregate shall not be permitted.
 - 4. Ready-mix concrete shall conform to the requirements of ASTM C 94.
 - 5. Air-entraining agent shall meet the requirements of ASTM C 260.
 - 6. Fly Ash shall meet the requirements of ASTM C 168.
 - 7. Admixtures may be added at the Contractor's option to control the set, effect water reduction, and increase workability. The use of an admixture shall be subject to acceptance by Central San. Concrete shall not contain more than one water reducing admixture. Water reducing admixture shall conform to ASTM C 494, Type A or Type D.
 - 8. Calcium chloride shall not be used in concrete.

2.3 CURING MATERIALS

Materials for curing concrete shall conform to ASTM C 309 and be on the *Approved Materials List*. Curing compounds shall be white pigmented and resin based. Sodium silicate compounds shall not be used.

2.4 CONCRETE DESIGN REQUIREMENTS

A. General

1. Concrete shall be composed of cement, admixtures, aggregates and water. These materials shall be of the qualities specified. The mix shall be designed to produce a concrete capable of being deposited to obtain maximum density and minimum shrinkage and where deposited in forms to have good consolidation properties and maximum smoothness of surface.
2. The Contractor is cautioned that the limiting parameters specified below are NOT a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by the Contractor's construction methods.

B. Concrete shall meet the requirements in the following tabulation:

Minimum 28-Day Compressive Strength (psi)	4,000
Maximum Size Aggregate (inches)	1
Minimum Cement per cu yd (sacks*)	6.0
Slump Range	2" to 4"
Maximum W/C Ratio (by weight)	0.45

*Note: One sack of cement equals 94 lbs.

2.5 MEASUREMENT OF CEMENT AND AGGREGATE

The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment acceptable to Central San.

2.6 MEASUREMENT OF WATER

The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device acceptable to Central San and capable of measuring the water in variable amounts within a tolerance of 1%.

2.7 READY-MIXED CONCRETE

- A. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been 250 revolutions, whichever occurs first. In hot weather, or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85°F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.
- B. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

- C. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.
- D. Each batch of ready-mixed concrete delivered at the jobsite shall be accompanied by a certified delivery ticket furnished to Central San's Inspector.
- E. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted only if the pour can be made with continuous placement and within 30 minutes of batching at the plant.

Part 3 - Execution

3.1 GENERAL

Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 FORMWORK REQUIREMENTS

- A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of all forms, and any forms that are unsafe or inadequate in any respect shall promptly be removed from the jobsite and replaced. The design and inspection of concrete forms, false work, and shoring shall comply with applicable local, state and federal regulations. All design, construction, maintenance, preparation, and removal of forms shall be in accordance with ACI 347 and the requirements specified herein.
- B. All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is called for on the Plans.
- C. Forms may be reused only if in good condition and acceptable to Central San

3.3 REINFORCEMENT REQUIREMENTS

- A. All Concrete Reinforcing and appurtenances shall be fabricated and placed in accordance with *Section 03 20 00 - Concrete Reinforcing*.
- B. Reinforcement shall not be straightened or re-bent. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold.
- C. Concrete Reinforcing shall be accurately positioned as shown and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such

support be continuous. All concrete blocks used to support Concrete Reinforcing shall be tied to the steel with wire ties that are embedded in the blocks.

- D. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
- E. Concrete Reinforcing shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

3.4 *PROPORTIONING AND MIXING*

- A. Proportioning of the concrete mix shall conform to the requirements of Chapter 3 of ACI 301.
- B. Mixing of concrete shall conform to the requirements of Chapter 7 of ACI 301.
- C. Re-tempering of concrete that has partially hardened shall not be permitted.

3.5 *PREPARATION OF SURFACES FOR CONCRETING*

- A. Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.
- B. All water entering the space to be filled with concrete shall be cut off or diverted prior to placement of concrete. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete.

3.6 *HANDLING, TRANSPORTING AND PLACING*

- A. Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.
- B. Concrete shall be conveyed from the mixer to place of deposit by methods that prevent separation or loss of material.
- C. No concrete shall be placed when the ambient temperature exceeds 105°F.

3.7 *CONSOLIDATION*

As concrete is placed in the forms or in excavations, it shall be thoroughly settled, tamped and compacted, throughout the entire depth, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement using mechanical vibrators. Vibrators shall be high speed power vibrators (8,000 to 10,000 rpm).

3.8 FINISHING CONCRETE SURFACES

- A. Finished surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface, and shall be plumb, level or conform to the profiles and dimensions shown on the Plans.
- B. No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects.
- C. Surface holes larger than 2" in diameter or deeper than 3" are defined as surface defects in basins and exposed walls.

3.9 CURING

- A. All concrete shall be cured for no less than 7 days after placing, in accordance with the methods indicated below:

Surface to be Cured	Method
Unstripped forms	1
Encasement concrete, thrust blocks, manhole bases and top blocks	2
All other concrete surfaces	3

- B. Method 1: Outside of wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removal. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 7 days of placing the concrete, curing shall be continued in accordance with Method 3.
- C. Method 2: The surface shall be covered with moist earth for no less than 4 hours or more than 24 hours after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete. Stacking of manhole components on cast-in-place bases shall not commence until the next working business day after the base has been placed.
- D. Method 3: The surface shall be sprayed with a liquid curing compound applied in accordance with the manufacturer's printed instructions. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces and within one hour after removal of forms. Repairs to formed surfaces shall be made within the one-hour period.

3.10 TREATMENT OF SURFACE DEFECTS

All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this section, using approved methods which will not disturb the bond, cause sagging or cause horizontal fractures. Surfaces of said

repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.11 CARE AND REPAIR OF CONCRETE

The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress or any other cause until Acceptance of Proposed Public Facilities by Central San. Care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the Acceptance of Proposed Public Facilities, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Plans, shall be satisfactorily removed and replaced with acceptable concrete.

- END OF SECTION -

draft

Section 03 34 13 - Controlled Low-Strength Material (CLSM)

Part 1 - General

1.1 THE REQUIREMENTS

The Contractor shall furnish all materials for Controlled Low Strength Material (CLSM) in accordance with the provisions of this Section.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM C 33	Specification for Concrete Aggregates
ASTM C 39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Specifications for Ready-mixed Concrete
ASTM C 150	Specification for Portland Cement
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete
ASTM C 494	Specification for Chemical Admixtures for Concrete
ASTM C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Filler in Portland Cement Concrete

1.3 CONTRACTOR SUBMITTALS

When the Contractor proposes to use a mix design not listed in the *Approved Materials List*, the proposed mix design including the proportions and gradations of all materials proposed shall be submitted to Central San and shall receive favorable review prior to use. Mix designs shall be tested by an independent testing laboratory for properties specified in this Section, and the results shall be submitted with the proposed CLSM mix designs.

1.4 QUALITY ASSURANCE

Central San Inspectors may take samples of CLSM from time to time to ensure compliance with the requirements of this Section.

Part 2 - Products

2.1 MATERIALS

- A. See *Approved Materials List*, or approved equal.
- B. CLSM shall be a mixture of cement (one sack per cubic yard minimum; two sacks per cubic yard maximum), pozzolan, fly ash, coarse and fine aggregate, admixtures, and water batched by a ready mix concrete plant and delivered to the work by means of standard transit mixing trucks. The mixture shall produce a material which may be excavated by hand. The minimum 28-day compressive strength shall be 50 psi and the maximum 28-day

- compressive strength shall be no greater than 150 psi in accordance with ASTM C 39.
- C. Cement shall be Type II in accordance with the requirements of ASTM C 150.
 - D. Pozzolan and/or fly ash may be added to improve the flowability and shall be Type F in accordance with the requirements of ASTM C 618.
 - E. Coarse aggregate shall consist of a well-graded mixture of crushed rock, or sand with a maximum size aggregate of 3/8". 100% shall pass the 1/2" sieve. Not more than 30% shall be retained by the 3/8" sieve and not more than 12% shall pass the number 200 sieve. All material shall be free from organic matter and meet the requirements of ASTM C 33.
 - F. Clean potable or recycled water free from objectionable quantities of silty organic matter, alkali salts and other impurities shall be used.

2.2 ADMIXTURES

- A. An air entraining admixture may be added to improve the workability and shall be in accordance with the requirements of ASTM C 260. The entrained air content shall be a minimum of 8% and a maximum of 20% as required by the Contractor to meet the uses specified herein.
- B. A water reducing agent may be added in accordance with the requirements of ASTM C 494 to improve workability.

Part 3 - Execution

3.1 GENERAL

Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 PREPARING FOR PLACEMENT

The subgrade and compacted fill and/or trench to receive CLSM shall be appropriately bedded, backfilled and compacted.

3.3 MIXING AND DELIVERING

CLSM shall be batched by a ready-mix batching plant acceptable to Central San.

3.4 PLACEMENT

- A. Use of CLSM in the pipe zone may cause flotation or displacement of the pipe during installation of the CLSM. The Contractor shall take necessary precautions to prevent flotation and ensure that the pipe is installed according to the alignment and grade shown on the Plans.
- B. CLSM shall be placed by means of tailgate discharge, conveyor belts, concrete pumps, or other means acceptable to Central San.

- C. A vibrator may be used to ensure that all voids, crevices, and pockets are filled with CLSM. Care shall be taken to avoid over-consolidation of the material separating the large and fine aggregate.
- D. Where new CLSM shall be placed against existing CLSM, the placement shall be clean of all loose and foreign material. The surface of existing CLSM shall be soaked a minimum of one hour before placement of fresh CLSM. No standing water will be allowed before starting placement of fresh CLSM.
- E. When placing CLSM for trench dams, the Contractor shall ensure that no voids exist around the pipe barrel and that the CLSM completely fills the trench width, including keyways, for the full depth required, as shown.
- F. When using CLSM as abandonment grout, the Contractor shall contain CLSM in sewer pipelines and structures to be abandoned using bulkheads.

3.5 *FINISHING CLSM*

The finished surface of CLSM shall be smooth and to the grade shown on the Plans or as directed by Central San.

3.6 *PROTECTION*

CLSM shall be protected from running water, rain, freezing, or other conditions that could damage the material until cure is complete.

3.7 *TRENCH BACKFILL*

No equipment, traffic, or backfill shall be allowed on the CLSM until the surface of the CLSM is able to withstand a 20-psi load without displacement or damage. If necessary, the Contractor shall provide steel trench plates that span the trench until the CLSM has reached the required strength.

- END OF SECTION -

Section 03 40 00 - Precast Concrete

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall furnish and install precast boxes and vaults as shown on the Plans, including appurtenances necessary for a complete installation.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 00 - Cast-In-Place Concrete

B. Section 03 60 00 - Grout

1.3 CONTRACTOR SUBMITTALS

The Contractor shall submit shop drawings for all precast concrete items not included in the *Approved Materials List*. Submitted drawings shall show all dimensions, location and type of embedded items, lifting inserts, and details of reinforcement and joints.

1.4 QUALITY ASSURANCE

- A. Tests on component materials and for compressive strength of concrete will be performed as specified herein.
- B. Test methods and criteria for evaluation and acceptance of concrete shall be as specified in *Section 03 30 00 - Cast-In-Place Concrete*.

Part 2 - Products

2.1 MANUFACTURED ITEMS

- A. Precast items shall be as listed in the *Approved Materials List* or approved equal.
- B. Concrete used for manufactured vaults shall have a minimum 28-day compressive strength of 3,000 psi.
- C. Precast items to be installed in areas subject to vehicular traffic shall be designed for H-20 loads.

2.2 PREFORMED JOINT SEALANT

Preformed joint sealant shall be as listed in the *Approved Materials List* or approved equal.

2.3 NON-SHRINK GROUT

Non-shrink grout shall be as specified in *Section 03 60 00 - Grout*.

Part 3 - Execution

3.1 GENERAL

Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and

conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 *INSTALLATION*

- A. All precast items shall be installed in accordance with the manufacturer's recommendations. All joints shall be sealed by the use of preformed sealant or joint tape so as to be watertight. All precast boxes and vaults shall be set on a minimum foundation of 6" of Type I Bedding and Backfill Material compacted to 95% relative compaction.
- B. Connections to precast items shall be made by one of the following:
 - 1. Casting sections of pipe into the item.
 - 2. Core drilling or casting pipe chases into the items. Where core drilled holes or cast-in pipe chases are used; the annular space between the core-drilled hole or chase and the connecting pipe shall be filled with non-shrink grout or sealed using an approved resilient connector, skirt or reducing coupling, unless otherwise specified on the Plans. All such connections shall be watertight.

- END OF SECTION -

Section 03 60 00 - Grout

Part 1 - General

1.1 THE REQUIREMENT

- A. The Contractor shall furnish grout and shall form, mix, place, cure, repair, finish and do all other work as required to produce finished grout in accordance with the provisions of this Section.
- B. The following types of grout are covered in this Section:
 - 1. Non-Shrink Grout: shall be used wherever grout is shown on the Plans or required by these Specifications, unless another type is specifically referenced.
 - 2. Epoxy Grout
 - 3. Grout for Topping and Concrete Fill
 - 4. Abandonment Grout

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 30 00 - Cast-In-Place Concrete
- B. Section 03 34 13 - Controlled Low-Strength Material (CLSM)

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
 - ASTM C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
 - ASTM C 579 Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 - ASTM C 827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
 - ASTM C1107 Standard Specification for Packaged dry, Hydraulic Cement Grout (Non-shrink)

1.4 CONTRACTOR SUBMITTALS

Upon request by Central San, the Contractor shall submit certified test results verifying that grout meets the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

1.5 QUALITY ASSURANCE

- A. Field Tests: Compression test specimens may be taken by the Inspector at any time during construction to ensure continued compliance with these Specifications. The specimens will be made by the Inspector.
1. Compression tests and fabrication of specimens for non-shrink grout will be performed as specified in ASTM C 109.
 2. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B.

Part 2 - Products

2.1 CEMENT GROUT

- A. Cement grout shall be composed of 1-part cement, 3 parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. The minimum required compressive strength at 28 days shall be 4,000 psi.
- B. Component materials for cement grout materials shall be as specified in *Section 03 30 00 - Cast-In-Place Concrete*.

2.2 PREPACKAGED GROUTS

- A. Non-Shrink Grout:
1. Non-shrink grout shall be inorganic, non-gas liberating, nonmetallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout shall be as recommended by the manufacturer for the particular application.
 2. Non-shrink grouts shall have a minimum 2) day compressive strength of 5,000 psi; shall have no shrinkage (0.0%) and a maximum of 4% expansion in the plastic state when tested in accordance with ASTM C 827; and shall have no shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with ASTM C1107.
 3. Non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the Plans; except for those applications where epoxy grout, grout for topping and concrete fill, and abandonment grout is specified herein.
- B. Epoxy Grout:

1. Epoxy grout shall be a pourable, non-shrink, 100% solids system. The epoxy grout system shall have 3 components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75°F.
4. The epoxy grout shall develop a compressive strength 5,000 psi in 24 hours and 10,000 psi in 7 days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (0.0%) and a maximum 4% expansion when tested in accordance with ASTM C 827.

2.3 GROUT FOR TOPPING AND CONCRETE FILL

- A. Grout for topping of slabs and building up surfaces of tank, channel and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as specified herein. All component materials and procedures specified for concrete in *Section 03 30 00 - Cast-In-Place Concrete* shall apply except as noted otherwise herein.
- B. Topping grout and concrete fill shall contain a minimum of 6 sacks (564 pounds) of cement per cubic yard with a maximum water-cement ratio of 0.45.
- C. Coarse aggregate shall be graded as follows:

U.S. Standard Sieve Size	Percent by Weight Passing
1/2"	100
3/8"	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

- D. Final mix design shall be as determined by trial mix design under supervision of an approved testing laboratory.
- E. Strength: Minimum compressive strength of topping grout and concrete fill at the end of 28 days shall be 3,000 psi.

2.4 ABANDONMENT GROUT

Refer to *Section 03 34 13 - Controlled Low-Strength Material (CLSM)* for abandonment grout requirements.

2.5 CURING MATERIALS

- C. Curing materials shall be as specified in *Section 03 30 00 - Cast-In-Place Concrete* for cement grout and as recommended by the manufacturer of prepackaged grouts.

2.6 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency shall be such that the grout is plastic and moldable but will not flow. Where dry pack is called for on the Plans, it shall mean a grout of that consistency; the type of grout to be used shall be as specified herein for the particular application.
- B. The slump of grout for topping and concrete fill shall be adjusted to match placement and finishing conditions but shall not exceed 4".

2.7 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

Part 3 - Execution

3.1 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in *Section 03 30 00 - Cast-In-Place Concrete*. The finish of the grout surface shall match that of the adjacent concrete.
- B. Base concrete shall have attained its design strength before grout is placed, unless otherwise authorized by Central San.
- C. Grout at the consistency necessary for the particular application shall be placed in such a manner so as to completely fill the space to be grouted.
- D. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 GROUTING PROCEDURES

- A. Prepackaged Grouts:

1. All mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

B. Grout for topping or concrete fill:

1. All finish work shall be completed prior to placement of topping or concrete fill. The base slab shall be given a roughened textured surface by sandblasting or hydro blasting, exposing the aggregates, to ensure bonding to the base slab.
2. The minimum thickness of grout topping and concrete fill shall be 1". Where the finished surface of concrete fill is to form an intersecting angle of less than 45° with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3" wide by 1" deep.
3. The base slab shall be thoroughly cleaned and wetted prior to placing topping and fill. No topping concrete shall be placed until the slab is free from standing pools or ponds of water. A thin coat of Type II cement shall be broomed into the surface of the slab just before topping of fill placement. The topping and fill shall be compacted by rolling or tamping, brought to established grade, and floated.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping and fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

C. Abandonment Grout

1. Placing of Material
 - a) Batching, mixing, and placing may be started if the weather conditions are favorable and when the air temperature is 34°F and rising. At the time of placement, the abandonment grout shall have a temperature of at least 40°F. Mixing and placing shall stop when the air temperature is 38°F or less and falling.
 - b) The Contractor shall contain abandonment grout in sewer pipelines and structures to be abandoned using bulkheads.
 - c) The Contractor shall utilize an air gap or relief for proper flow.

- END OF SECTION -

Section 05 50 00 - Miscellaneous Metal Work

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall provide miscellaneous metalwork and appurtenances, complete, in accordance with the Plans and these Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 20 00 - Concrete Reinforcing
- B. Part VI Standard Drawings

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:

ASTM A 36	Carbon Structural Steel
ASTM A 48	Specification for Gray Iron Castings
ASTM A 123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	Carbon Steel Bolts and Studs, 60,000 psi Tensile
ANSI/AWS D1.1	Structural Welding Code— Steel
AWS	American Welding Society Standards

Part 2 - Products

2.1 GENERAL

- A. See *Approved Materials List*, or approved equal.
- B. Standard: Structural steel shapes, plates, bars (excluding Concrete Reinforcing covered in *Section 03 20 00 - Concrete Reinforcing*) shall conform to the requirements of ASTM A 36.
- C. Corrosion Protection: Fabricated steel shall be coated in accordance with *Section 05 50 00 - Miscellaneous Metal Work* or shall be hot dip galvanized as indicated on the Plans.
- D. Stainless Steel: Unless otherwise indicated, stainless steel metalwork and bolts shall be of Type 316 stainless steel and shall not be galvanized.

2.2 BOLTS AND ANCHORS

- A. Standard Service Bolts (Not Buried or Submerged): Bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 307 Grade A or B, or threaded parts of ASTM A 36.

- B. Length of Bolts: The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than ½" beyond the nut.
- C. Adhesive Anchors: Unless otherwise indicated, all drilled, concrete or masonry anchors shall be adhesive anchors. No substitutions will be considered unless accompanied with ICBO report verifying strength and material equivalency.
- D. Epoxy adhesive anchors are required for drilled anchors where exposed to weather, in submerged, wet, splash, overhead and corrosive conditions, and for anchoring handrails, pumps, mechanical equipment and reinforcing bars. Epoxy systems shall be per the *Approved Materials List*. Threaded rods shall be Type 316 stainless steel. Holes are to be clean and dry prior to the application of epoxy.
- E. Unless otherwise shown, glass capsule, polyester resin adhesive anchors will be permitted in locations not specified above and shall be per the *Approved Materials List*. Threaded rod shall be galvanized steel.
- F. Expanding-Type Anchors: Expanding-type anchors if indicated or permitted shall be steel expansion type per the *Approved Materials List*. Lead caulking anchors will not be permitted. Size shall be as shown. Non-embedded buried or submerged anchors shall be Type 316 stainless steel.
- G. Lubricant: Non-seize lubricant shall be applied to the threads of all stainless-steel bolts prior to installation.

2.3 CASTINGS

- A. Steel castings shall contain no less than 0.6% of manganese and not less than 0.2% of silicon.
- B. All castings shall be sound and free from shrinkage crack, blow holes and other defects. All fins and burnt sand shall be removed. Excessive porosity and spongy surfaces will constitute causes for rejection. Central San shall be final judge as to whether the defects present are sufficient to cause rejection.
- C. No welding or patching of defects in castings will be permitted unless authorized by the Inspector. Any such welding or patching done without the Inspector's consent shall be cause for rejection.
- D. All castings shall be true to the form and dimensions shown on the Standard Drawings. After inspection and prior to shipping, all machined surfaces shall be coated with a blue rust inhibitive lacquer, or other material which can be easily removed, unless otherwise specified.
- E. Castings shall not be more than 7-1/2% overweight.

2.4 CAST IRON FRAME AND COVERS

- A. Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30. Cast iron covers and frames with a rubber O-ring shall be heavy traffic type with a minimum weight and diameter as shown in the Standard Drawings. Frame and cover shall be designed for H-20 traffic loading. Each item in a set of frames and covers shall be supplied by the same Manufacturer.
- B. Refer to *DWG 19-08* for cover requirements. Covers for public sewer manholes shall be marked "CCCSO." Covers for manholes in private sewer systems shall be marked "Sanitary Sewer".
- C. The cover and its seat in the frame shall be machined so that the cover will sit evenly and firmly in the frame. Cast iron frames and covers shall be dipped or painted with asphalt.

2.5 FILLETS

- A. Steel, gray iron, malleable iron and bronze castings shall be provided with continuous fillets in all inside angles. The radius of curvature of the exposed surface of a fillet shall define the size of the fillet.
- B. The size of fillets shall not be less than one-half ($1/2$) of the thickness of the thinnest adjoined member nor less than $1/2$ ".

2.6 MATCH MARKING

Connecting parts assembled in the shop for the purpose of alignment in the field shall be match marked.

Part 3 - Execution

3.1 GENERAL

Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 FABRICATION AND INSTALLATION REQUIREMENTS

Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction," current edition.

3.3 WELDING

- A. All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's (AWS) "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.

- B. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Welded reinforcement shall be as indicated by the AWS Standards. Upon completion of welding, all weld splatter, flux, slag and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which are to be painted or coated shall be ground to a minimum 1/32" chamfer.
- C. Welding electrodes shall be uniformly and heavily coated (not washed) and shall be of such nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

3.4 GALVANIZING

All structural steel plates shapes, bars and fabricated assemblies to be galvanized shall be thoroughly cleaned of rust and scale, and galvanized in accordance with the requirements of ASTM A 123. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153. Field repairs to galvanizing shall be made using approved coating according to the *Approved Materials List*.

3.5 DRILLED ANCHORS

Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, cleaned and dried. Expanding anchors if permitted shall not be installed until the concrete has reached the required 28-day compressive strength. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

3.6 CUTTING WITH TORCH

- A. The use of a cutting torch is permissible if the metal being cut is not carrying stress during the operation.
- B. When cutting with a torch, cuts shall be true to line with a maximum deviation of 1/8". All burned edges shall be finished by grinding or chipping.
- C. The use of the cutting torch will be permitted on ends that form compression connections providing a minimum of 1/4" of metal is left to be removed by machining.

- END OF SECTION -

Section 09 90 00 - Painting and Coating

Part 1 - General

1.1 THE REQUIREMENT

- A. The Contractor shall apply protective coatings, complete and in place, where indicated on the Plans, or as directed by the Inspector, in accordance with the requirements of this Section.
- B. The Contractor or its subcontractor who applies the protective coatings shall possess a valid license from the California Contractor's State License Board as required for performance of the painting and coating work.

1.2 CONTRACTOR SUBMITTALS

- A. Upon request by Central San, the Contractor shall submit the following information prior to commencement of protective coating work:
 - 1. Coating Materials List: Showing the manufacturer and the name of the product. The list shall be submitted prior to or at the time of submittal of samples.
 - 2. Upon request by Central San, Contractor shall provide samples of all paint, finishes, and other coating materials on 8-1/2" by 11" sheet metal. Each sheet shall be completely coated over its entire surface with one protective coating material, type, and color.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards: The following referenced surface preparation Specifications of the Steel Structures Painting Council shall form a part of this specification:

SSPC SP		Description
1	Solvent Cleaning	Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion or steam.
2	Hand Tool Cleaning	Removal of loose rust, loose mill scale, loose paint and other loose detrimental foreign matter, by hand chipping, scraping, sanding and wire brushing.
3	Power Tool Cleaning	Removal of loose rust, loose mill scale, loose paint and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing and grinding.
5	White Metal Blast Cleaning	Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.
6	Commercial Blast Cleaning	Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33% of each square inch of surface area.

7	Brush-Off Blast Cleaning	Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust and loose paint.
10	Near-White Blast Cleaning	Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter, except that staining shall be limited to no more than 5% of each square inch of surface area.
13	Surface Preparation of Concrete, Abrasive Blast Cleaning Method	Removal of all visible oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.

1.4 QUALITY ASSURANCE

- A. The Contractor shall prepare surfaces and apply coatings in strict accordance with the requirements and intent of the Specifications. All materials furnished and all work accomplished shall be subject to inspection by Central San. The Contractor shall provide access and allow for adequate time to perform all inspections.
- B. Quality assurance procedures and practices shall be used to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be used provided they meet recognized and acceptable professional standards and are approved by Central San.

Part 2 - Products

2.1 GENERAL

- A. The Contractor shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the site.
- B. Coating materials shall be sealed in containers clearly labeled to indicate the designated name, formula or specification number, batch number, color, date of manufacture and name of manufacturer, all of which shall be plainly legible at the time of use.

2.2 COATING SYSTEMS FOR EXPOSED STEEL PIPE

- A. Zinc/Epoxy/Polyurethane System: The zinc primer shall be an aromatic urethane that contains at least 83% of metallic zinc by weight in the dried film and is recommended by the coating manufacturer as a primer for this system. The intermediate coat shall be a high-build two-component epoxy with a solids content of at least 69% by volume. Finish coats shall be a two-component aliphatic acrylic or polyester polyurethane coating material that provides superior color and gloss retention, resistance to chemical fumes and severe weathering. Finish coat shall have a minimum solids content of 73% by volume.
 - 1. Prime coat (minimum dry film thickness = 3 mils): Tnemec Series 90-97 Tneme-Zinc, Amercoat 68HS, Carbozinc 859, or equal.

2. Intermediate coat (minimum dry film thickness = 4 mils): Tnemec Series N69 Polyamidoamine Epoxy, Amerlock 400, Carboguard 890 or equal.
3. Finish coats (one or more, minimum dry film thickness = 3 mils): Tnemec Series 1075 Endurashield, Ameron Amershield, Carbothane 134 HG or equal.
4. Total system minimum dry film thickness = 10 mils.
5. Intermediate coat shall be applied in excess of 4 mils minimum dry film thickness or in more than one coat as necessary to completely cover the organic zinc primer and prevent application bubbling of the polyurethane finish coat.
6. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture. If the organic zinc primer is used as a pre-construction or shop applied primer, all damaged and uncoated areas shall be spot abrasive blasted and coated after construction using the indicated material.

Part 3 - Execution

3.1 GENERAL

Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 STORAGE, MIXING AND THINNING OF MATERIALS

- A. **Manufacturer's Recommendations:** Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating and for all other procedures relative to coating shall be strictly observed.
- B. All protective coating materials shall be used within the manufacturer's recommended shelf life.
- C. **Storage and Mixing:** Coating materials shall be stored under the conditions recommended by the Material Safety Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.3 METAL SURFACE PREPARATION (UNGALVANIZED)

- A. The minimum abrasive blasting surface preparation shall be as indicated in the coating manufacturer's printed recommendations for the intended service.
- B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion

Engineers (NACE), Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.

- C. All oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 - Solvent Cleaning prior to blast cleaning.
- D. All sharp edges shall be rounded or chamfered and all burrs, surface defects and weld splatter shall be ground smooth prior to blast cleaning.
- E. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular coating and service conditions. Abrasives for submerged and severe service coating systems shall be clean, hard, sharp cutting crushed slag. Automated blasting systems shall not be used for surfaces that will be in submerged service. Metal shot or grit shall not be used for surfaces that will be in submerged service, even if subsequent abrasive blasting is planned to be one with hard, sharp cutting crushed slag.
- F. The abrasive shall not be reused unless an automated blasting system is used for surfaces that will be in non-submerged service. For automated blasting systems, clean oil-free abrasives shall be maintained. The abrasive mix shall include at least 50% grit.
- G. The Contractor shall comply with the applicable federal, state and local air pollution control regulations for blast cleaning.
- H. Compressed air for air blast cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil and moisture separators that remove at least 95% of the contaminants.
- I. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.
- J. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.
- K. Damaged or defective coating shall be removed by the blast cleaning to meet the clean surface requirements before recoating.
- L. If the required abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC SP2 or SSPC SP3 is to be used.
- M. Shop applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast-iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be

completely removed by solvent cleaning per SSPC SP1 before the abrasive blast cleaning work has been started.

- N. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.4 *SURFACE PREPARATION FOR GALVANIZED FERROUS METAL*

- A. Unless noted otherwise, galvanized ferrous metal shall be alkaline cleaned per SSPC SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system to be used, followed by brush off blast cleaning per SSPC SP7.
- B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.5 *SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS*

- A. General: All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.
- B. The Contractor shall provide the degree of cleaning indicated in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not indicated in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC SP6. Areas of tightly adhering coatings shall be cleaned to SSPC SP7, with the remaining thickness of existing coating not to exceed 3 mils.
- C. If coatings to be applied are not compatible with existing coatings, the Contractor shall apply intermediate coatings per the paint manufacturer's recommendation for the indicated coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.
- D. Coatings of unknown composition shall be completely removed prior to application of new coatings.
- E. Where indicated or where site conditions do not permit dry abrasive blasting due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless indicated.

3.6 PREPARATION FOR COATING

- A. All surfaces to receive protective coatings shall be cleaned as indicated prior to application of coatings. The Contractor shall examine all surfaces to be coated and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application. Surfaces to be coated shall be dry and free of visible dust.
- B. Surfaces that are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.
- C. All hardware, lighting fixtures, switch plates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.
- D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The Contractor shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.
- E. Cleaning and coating shall be coordinated so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

3.7 APPLICATION OF COATING

- A. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough cleaning and adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The finish coat application shall be so complete that the addition of another coat would not substantially change the color or texture of the finished work.
- B. All damage to surfaces resulting from the work shall be cleaned, repaired, and refinished to its original condition.

- END OF SECTION -

Section 22 05 29 - Hangers and Supports for Piping

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, and installation of all pipe supports, hangers, guides, and anchors shown, specified, or required for a complete and operable piping system.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

Commercial Standards:

- A. AISC Specifications for the Design Fabrication, and Erection of Structural Steel for Buildings
- B. ANSI/ASME B31.1 Power Piping
- C. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

Part 2 – Products

2.1 GENERAL

- A. Code Compliance: All piping systems and pipe connections to equipment shall be properly supported, to prevent undue deflection, vibration, and stresses on piping, equipment, and structures. All supports, and parts thereof, shall conform to the requirements of ANSI/ASME B31.1, except as supplemented or modified by these Specifications. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code, or local administration requirements.
 - 1. All pipe supports and restraints shall be designed to support their respective pipes under the maximum combination of peak loading conditions, including pipe weight, liquid weight, liquid movement, pressure forces, thermal expansion and contraction, vibrations and all probable externally applied forces, including but limited to seismic forces, wind forces and forces applied during construction.
- B. Structural Members: Wherever possible, pipes shall be attached to structural members. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction.
- C. Support Spacing: Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending and shear stresses in the piping, with special consideration given where components, such as flanges and valves, impose concentrated loads. Where calculations are not made or more stringent requirements from pipe manufacturers prevail, suggested maximum spacing of supports are given in

the tables herein. Vertical supports shall be spaced to prevent the pipe from being overstressed from the combination of all loading effects:

1. Support Spacing for Schedule 40 & 80 Steel Pipe:

Pipe Size (in)	Max Span (ft)
1/2	6
3/4 & 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 & 10	19
12 & 14	23
16 & 18	25
20 & Above	30

2. Support Spacing for Welded Fabricated Steel Pipe:

Maximum Spans for Pipe Supported in Minimum 120-degree Contact Saddles (feet)										
Pipe Size (in)	Wall Thickness (inches)									
	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
24	33	37	41	43	45	47				
26	34	38	41	44	46	48				
28	34	38	41	44	47	49				
30	34	38	42	45	48	49				
32	34	39	42	45	48	50				
34	35	39	43	46	48	50				
36	35	39	43	46	49	51	55			
38	35	39	43	46	49	51	55			
40	35	40	43	47	49	52	56			
42	35	40	44	47	50	52	56			
45	--	40	44	47	50	53	57			
48	--	40	44	47	50	53	58	61		

For steel pipe sizes not presented in this table, the support spacing shall be designed so that the stress on the pipe does not exceed 5,000 psi. Maximum deflection of pipe shall be limited to 1/360th of the span and shall be calculated by using the formula:

$$L = (7500tD/(32t+D))^{1/2}$$

where:

t	=	Thickness (inches)
D	=	Diameter (inches)
L	=	Maximum span (feet)

3. Support Spacing for Ductile Iron Pipe:

Pipe Size (in)	Suggested Max Span (ft)
All Sizes	Supports per length or 10 feet (One of 2 supports located at joint)

4. Support Spacing for Copper Tubing:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
1/2 to 1-1/2	6
2 to 4	10
6 and greater	12

- D. Pipe Hangers: Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow for free expansion and contraction of the piping and shall prevent excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed so that they cannot become disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading, only.
- E. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2", or where the hanger rod deflection from the vertical is greater than 4° from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.
- F. Spring-Type Hangers: Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. The support shall be designed for a maximum variation in supporting effort of 25% for the total travel resulting from thermal movement.
- G. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints. They shall permit the piping to expand and contract freely in directions away from the anchored points and shall be structurally suitable to withstand all loads imposed.

- H. Heat Transmission: Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment
- I. Riser Supports: Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.
- J. Freestanding Piping: Free-standing pipe connections to equipment, like chemical feeders, pumps, etc., shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps, securing the pipes.
- K. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, fiber glass, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations, to avoid undue pipe stresses and failures. To avoid point loads, all supports on plastic and fiber glass piping shall be equipped with extra wide pipe saddles or galvanized steel shields.
- L. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material, at each pipe support, bracket, clip, or hanger.

2.2 MANUFACTURED SUPPORTS

- A. Stock Parts: Where not specifically shown or detailed, designs, generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.
- B. Manufacturers, or Equal:
 - 1. Basic Engineers, Pittsburgh, PA;
 - 2. Bergen-Paterson Corp., Boston, MA;
 - 3. Elcen Metal Products Company, Franklin Park, IL;
 - 4. Grinnell Corp., Cranston, RI;
 - 5. NPS Industries, Inc., Secaucus, NJ.

2.3 COATING

- A. Galvanizing: Unless otherwise indicated in the Project Documents, all fabricated pipe supports, other than stainless steel or non-ferrous supports, shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A123.

- B. Other than stainless steel or non-ferrous supports, all supports shall receive protective coatings in accordance with the requirements of *Section 09 90 00 - Painting and Coating*. Pipe supports shall be painted to match the piping system.

Part 3 – Execution

3.1 *INSTALLATION*

- A. General: All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.
- B. Appearance: Pipe supports and hangers shall be positioned in such a way as to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

3.2 *FABRICATION*

- A. Quality Control: Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

- END OF SECTION -

Section 31 05 19 - Geosynthetics for Earthwork

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall furnish and install geotextile in accordance with the provisions of this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 23 16 - Excavation, Bedding and Backfill
- B. Section 32 12 16 - Asphalt Paving

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM D 276	Test Methods for Identification of Fibers of Textiles
ASTM D 4354	Practice for Sampling of Geosynthetics for Testing
ASTM D 4491	Standard Test Methods for Water Permeability of Geotextiles
ASTM D 4533	Standard Test Methods for Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	Test Method for Determining Apparent Opening Size of a Geotextile
ASTM D 4833	Standard Test Methods for Index Puncture Resistance of Geomembranes and Related Products
ASTM D 4873	Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples
TxDOT 3099	Geotextile Asphalt Retention

Part 2 – Products

2.1 GEOTEXTILE FOR WRAPPING FOUNDATION ROCK

- A. Geotextile shall be as listed in the *Approved Materials List*.
- B. Geotextile wrapped around the foundation rock material shall be a high modulus woven fabric. The fabric shall be inert to commonly encountered chemicals, rot-proof, and resistant to ultraviolet light exposures, insects, and rodents. The fabric shall meet the following physical requirements:

Property	Requirement	Test Method
Grab/Elongation, lbs/%	160 x 160 / 150 x 50	ASTM D 4632
Trapezoidal Tearing Strength, lbs.	60 x 60	ASTM D 4533

Apparent Opening Size	US Sieve <70	ASTM D 4751
Puncture, lbs.	95	ASTM D 4833
Permeability, Sec-1/gpm/ft.	1.4/110	ASTM D 4491

2.2 GEOTEXTILE FOR PAVING

- A. Geotextile paving fabric shall be as listed in the *Approved Materials List*.
- B. Geotextile for paving shall be a non-woven material consisting of at least 85% by weight of polyolefin, polyesters, or polyamides. The fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects that will adversely alter its physical properties. The fabric shall be specifically designed for pavement application and be heat bonded on one side only to assist in preventing bleed through of tack coat and sticking of fibers to wheels of lay-down equipment. The fabric shall meet the following physical requirements:

Property	Requirement	Test Method
Tensile Strength, lbs.	80	ASTM D 4632
Elongation, percent	50	ASTM D 4632
Asphalt Retention, gal/sq yd	0.2	TxDOT 3099
Melting Point, degrees F	300	ASTM D 276
Surface Texture	Heat bonded on one side only	Visual inspection

Note: All numerical values shown above represent minimum average roll values. Test results from any sampled roll in a lot shall meet or exceed the minimum values shown. Lots shall be sampled in accordance with ASTM D 4354.

2.3 TACK COAT

The tack coat used to bond the fabric to the base pavement shall be in accordance with the requirements of *Section 32 12 16 - Asphalt Paving*, except that the use of cutbacks or emulsions that contain solvents shall not be allowed.

Part 3 – Execution

3.1 GENERAL

- A. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.
- B. Geotextile shall be provided in rolls wrapped with protective covering to protect the fabric from mud, dirt, dust, debris, ultraviolet radiation, and abrasion. The fabric shall be free of defects or flaws that significantly affect its

physical properties. Each roll of fabric in the shipment shall be labeled in accordance with ASTM D 4873.

- C. Geotextile shall be handled and placed in accordance with the manufacturer's recommendations.

3.2 *INSTALLATION OF GEOTEXTILE FOR FOUNDATION ROCK*

- A. Geotextile for foundation rock shall be installed as specified in the Plans and *Section 31 23 16 - Excavation, Bedding and Backfill*. The geotextile shall be wrapped entirely around the rock with a minimum 12" overlap. Punctures in the geotextile shall be covered with a 12" square minimum patch.
- B. Geotextile and foundation rock shall be provided beneath manholes and structures where water or soft ground is present.

3.3 *PAVEMENT SURFACE PREPARATION*

The pavement surface shall be cleaned to remove all dirt, water, and oil from base pavement or aggregate base rock. Cracks ¼" wide and wider shall be cleaned and filled with suitable bituminous material or by a method approved by Central San and/or the local jurisdiction. Crack filling material shall be allowed to cure prior to geotextile placement. Where pavement is severely cracked, rutted, deformed, or otherwise distressed, a leveling course shall be placed as directed by Central San and/or the local jurisdiction.

3.4 *TACK COAT*

- A. Minimum air and pavement temperature shall be 50°F or higher for placement of asphalt and shall be 60°F or higher for placement of asphalt emulsion.
- B. The sealant material shall be spread by means of a calibrated pressure distributor truck. The asphalt sealant shall be uniformly spray-applied to the prepared dry pavement surface at the rate of 0.20 to 0.30 gallons per square yard or as recommended by the geotextile manufacturer and approved by Central San. When using emulsions, the application rate shall be increased as directed by Central San to offset water content of the emulsion. Some underlying surfaces may require a higher application rate. Within street intersections, on steep grades, or in other zones where vehicle speed changes are commonplace, the normal application rate shall be reduced about 20% as directed by Central San but to no less than 0.20 gallons per square yard.
- C. For paving grade asphalt cements, the distributor tank temperature shall not be less than 285°F nor exceed 325°F to avoid damage to the geotextile. For asphalt emulsions, the distributor tank temperatures shall be maintained between 130°F and 160°F.
- D. The target width of sealant application shall be the width of the geotextile plus 6". The sealant shall be applied only as far as in advance of geotextile installation as is appropriate to insure a tacky surface at the time of geotextile placement. Geotextile shall be placed the same day as the sealant. Traffic

shall not be allowed on the sealant. Excess asphalt shall be cleaned from the road surface.

3.5 PLACEMENT OF GEOTEXTILE FOR PAVING

- A. The geotextile shall be placed into the sealant using mechanical or manual laydown equipment capable of providing a smooth installation with a minimum amount of wrinkling or folding prior to the sealant cooling and losing tackiness. When asphalt emulsions are used, the emulsion shall be allowed to cure properly, essentially with no moisture remaining prior to placing the geotextile and overlay. Wrinkles or folds in excess of 1" shall be slit and laid flat. All transverse joints and slit folds or wrinkles shall be shingle-lapped in the direction of the paving operation. Brooming and/or pneumatic rolling will be required to maximize geotextile contact with pavement surface. Additional hand-placed sealant material may be required at laps and repairs as determined by Central San and/or the local jurisdiction.
- B. All areas with geotextile placed shall be paved the same day. No traffic except necessary construction equipment and emergency vehicles shall be allowed to drive on the fabric. Turning of the paver and other vehicles shall be done gradually and kept to a minimum to avoid movement and damage to the geotextile. Abrupt starts and stops shall also be avoided. Damaged geotextile shall be removed and replaced with the same type of geotextile, and the overlaps shall be shingle-lapped in the direction of paving. Overlaps shall not exceed 6".

3.6 PLACEMENT OF OVERLAY OR TRENCH PATCH

- A. All areas in which geotextile has been placed shall be paved during the same day. The temperature of the hot mix shall not exceed 325°F. Sealant bleeding through the geotextile shall be removed. Excess sealant can be removed by broadcasting hot mix or sand on the fabric. Excess sand or hot mix should be removed before beginning the paving operation. In the event of rainfall on the fabric prior to the placement of the asphalt overlay, the geotextile shall be allowed to dry completely before asphalt is placed. This will prevent the trapping of water (steam) under the hot asphalt that could induce cracking.
- B. Asphalt concrete pavement shall be placed over the geotextile to a minimum thickness of 2-1/2" or the thickness required by the local jurisdiction, whichever is greater in accordance with the requirements specified in *Section 32 12 16 - Asphalt Paving*.

- END OF SECTION -

Section 31 23 16 - Excavation, Bedding and Backfill

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall provide all labor, materials, and equipment necessary to perform all excavation, bedding, backfill and grading operations required for construction of the work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03 34 13 - Controlled Low-Strength Material (CLSM)
- B. Section 31 05 19 - Geosynthetics for Earthwork
- C. Part VI Standard Drawings

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM D 1556	Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D 1557	Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³))
ASTM D 2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregates
ASTM D 2487	Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 6938	Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D 4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D 4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

1.4 CONTRACTOR SUBMITTALS

- A. Compaction testing of bedding and backfill materials shall be required for all main sewer extensions and laterals in public streets.
- B. Compaction testing of bedding and backfill for side sewer work on private property may be required at the discretion of the Inspector.
- C. The required compaction testing shall be conducted under the direction of a Civil or Geotechnical Engineer licensed by the State of California. As a condition of Central San's Final Inspection, a Certification Report indicating

that compaction results meet or exceed the requirements of these Specifications shall be submitted by the engineer in responsible charge of the compaction testing with a cover letter bearing the engineer's professional stamp.

- D. Compaction testing shall be completed prior to the acceptance televising of the sewer and installation of final paving.

1.5 QUALITY ASSURANCE

- A. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 6938, or by such other means acceptable to Central San. At a minimum, compaction tests shall be conducted for each 50 feet of trench and for each 2 feet of trench depth, unless otherwise specified by the agency with jurisdiction for the roadway.
- B. If a first test and a subsequent re-test of the bedding or backfill show non-compliance with the density required under this Section, the Contractor shall remove and re-compact the material represented by the test/retest as necessary to ensure compliance.
- C. The Contractor shall provide access in the excavation for the soil compaction testing technician or Inspector. This shall include providing site-specific safety equipment and temporary shoring to enable compaction testing at each required level within the excavation. Should the Contractor have backfilled to an elevation above that required to be tested, he shall excavate the backfill down to the necessary level for testing and provide shoring at his cost. Subsequent backfilling shall also be at the Contractor's cost.

Part 2 – Products

2.1 SUITABLE BEDDING AND BACKFILL MATERIAL

- A. Bedding and backfill material shall be selected or processed clean, free from grass, roots, brush, other vegetation, debris, refuse or other deleterious material of any kind.
- B. The following types of bedding and backfill materials are designated and defined as follows:
 - 1. Type I Bedding and Backfill Material (Class 2 Aggregate Base): Shall be newly quarried or recycled material (not mined alluvial material), and shall be certified by the quarry or recycler as complying with the provisions of Caltrans Specifications Section 26 (Class 2 Aggregate Base) for 3/4" maximum grading.

2. Type III Bedding and Backfill Material (native material from trench excavation): Shall be free from vegetable matter, debris and refuse, shall contain no concrete, stones or clods larger than 3" in any dimension and shall contain sufficient fines so that all voids will be filled when compacted, and shall be so constituted that compaction requirements can be met.
3. Select Type III Bedding and Backfill Material (native material from trench excavation): Shall meet all requirements of the above described Type III Bedding and Backfill Material with the additional requirement that the maximum particle size shall be 3/4" in diameter.
4. Coarse Bedding Material (Drain Rock/Foundation Rock): Shall be crushed stone or gravel (not mined alluvial material), with a minimum of 95% crushed particles per CTM 205, durable and free from slaking or decomposition under action of alternate wetting and drying with minimum Durability Index of 40 per CTM 229. The material shall meet the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1-1/2-inch	90-100
3/4-inch	5-30
3/8-inch	0-5
No. 200	0-2

- C. Controlled Low Strength Material shall conform to the requirements of Section 03 34 13 - Controlled Low-Strength Material (CLSM).

2.2 UNSUITABLE MATERIAL

- A. Unsuitable materials for bedding and backfill shall include soils, which when classified under ASTM D 2487 fall in the classifications of PT, OH, CH, MH, or OL. In addition, any soil that cannot be sufficiently compacted to achieve the percentage of maximum density specified for the intended use shall be considered unsuitable.
- B. Chemical testing for corrosivity shall be performed for all materials proposed for use as bedding and backfill for metallic or reinforced concrete pipe. The testing shall be in accordance with the requirements of CTM 417, CTM 422 and CTM 643. Bedding and backfill materials shall be considered unsuitable when the chloride concentration exceeds 500 ppm, sulfate concentration exceeds 1,500 ppm, resistivity is less than 2,000 ohm-cm or pH is less than 6.5. Testing shall be performed by a qualified laboratory approved by Central San, and the data shall be submitted to the Inspector for acceptance prior to use of the material in the work.
- C. Type III materials which are too wet to be compacted to specified compaction shall not be rejected solely because they are too wet for proper compaction. The Contractor may at its option, dry these materials in accordance with Paragraph 3.8.G of this section prior to compaction. Alternatively, the

Contractor may remove the Type III materials and provide imported backfill material.

- D. Backfill placed within 6" of any structure or pipe shall be free of rocks or unbroken clods of earth larger than 3" in any dimension.
- E. All material that is determined to be unsuitable for use as bedding and backfill or that is in excess of the amount required shall be removed immediately and disposed of properly by the Contractor.

2.3 *USE OF SUITABLE BEDDING AND BACKFILL MATERIAL*

Backfill types shall be used in accordance with the following provisions:

- A. Pipe zone backfill (bedding, haunching and shading), as defined under paragraph 3.6 Bedding and Backfill herein, shall be Type I Bedding and Backfill Material (Class 2 Aggregate Base) unless otherwise specified on the Plans.
- B. Trench zone backfill, as defined under paragraph 3.6 Bedding and Backfill herein, for pipelines in public and private streets and other paved areas shall be Type I Bedding and Backfill Material (Class 2 Aggregate Base).
- C. Trench zone backfill in future roadway or street rights-of-way or in off road locations (e.g., easements) may be Type III Bedding and Backfill Material (native trench soil) so long as specified compaction is achieved.
- D. Final Backfill as defined under "Pipe and Utility Trench Backfill herein, for pipelines in public and private streets and other paved areas shall be Type I Bedding and Backfill Material (Class 2 Aggregate Base).
- E. Backfill around structures, vaults, and valve boxes shall be Type I Bedding and Backfill Material (Class 2 Aggregate Base).
- F. Backfill used to replace structure and pipeline trench over-excavation of wet or soft trench bottom conditions shall be Coarse Bedding and Backfill Material (Drain Rock/Foundation Rock) with a geotextile envelope (minimum one-foot overlap) around the rock to prevent migration of fines.
- G. Controlled Low Strength Material may be used for pipe zone backfill and trench zone backfill whenever pre-approved in writing by Central San or shown on the Plans.
- H. Trenches in landscaped or cultivated areas shall have the top 12" inches backfilled with topsoil.

2.4 *FILTER FABRIC*

Filter fabric shall be as specified in Section 31 05 19 - Geosynthetics for Earthwork.

2.5 *TRENCH DAMS, AND PIPE ANCHORS*

Trench Dams and Pipe Anchors shall be provided at the locations shown on the Plans and shall be constructed as shown in the Standard Drawings as follows:

- DWG 20-05 Trench Dams
- DWG 21-03 Pipe Anchor Detail

Trench dams shall be of the length and width dimensions shown in the detail, shall extend below finished grade as shown in the detail, and shall be constructed of controlled low strength material (CLSM) as specified in *Section 03 34 13 - Controlled Low-Strength Material (CLSM)*.

Part 3 – Execution

3.1 GENERAL

- A. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.
- B. Prior to any excavation and backfill work, the Contractor shall obtain and provide Central San with copies or other evidence of acquisition thereof, all required permits for the work, including but not limited to: County and/or City encroachment permits, Central San permits, Cal OSHA Excavation Permit, and Competent Person certification.
- C. Material to be used for backfill shall be laid alongside of the trench and kept trimmed so as to cause as little inconvenience as possible to public travel and the normal use of adjacent properties. However, stockpiled material shall be kept a minimum of two feet from the edge of the trench and the face of the stockpile shall be sloped as needed. Free access shall be provided to all fire hydrants, water gates, meters, and private drives. Gutters or other drainage ways shall be kept clear unless other temporary provisions are made for maintaining drainage.
- D. In advance of placing sewer pipe or structures, material within the area where such pipe or structures are to be placed, which in the opinion of the Inspector is unsuitable including, but not limited to vegetable matter, garbage, and junk piles, either on the surface or buried, shall be removed and disposed of.
- E. Water to control dust resulting from grading operations, excavation, backfill, and the passage of traffic through the work area shall be applied by means that will ensure a uniform application of water with no runoff.
- F. The Contractor shall remove and dispose of all excess excavated material at a suitable preferred site(s). The Contractor shall obtain all necessary fill and grading permits and a written release from property owners upon completion of use of said sites.

3.2 STRUCTURE EXCAVATION

- A. Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and

completion of the work. The removal of these materials shall conform to the lines and grades shown on the Plans or as directed by the Inspector Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The Contractor shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures required for the removal or exclusion of water, including storm water, groundwater, and wastewater reaching the site of the work from any source so as to provide dry working conditions and to prevent damage to the work or adjoining property. Excavations shall be benched, sloped, shored or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

- B. Excavation under structures, manholes, vaults and others: Except where otherwise specified for a particular structure or directed by the Inspector, excavation shall be carried to the grade of the bottom of the bedding. Where shown on the Plans or directed by the Inspector, areas beneath structures shall be over-excavated. The exposed surface shall be scarified to a depth of 6", brought to optimum moisture content, and compacted to 95% relative compaction. Where over-excavation is directed by the Inspector to provide for the placement of foundation rock over wet or soft soils, scarification and re-compaction shall not be performed.

3.3 TRENCH EXCAVATION

- A. Excavation for sewers shall be made only after pipe and other necessary materials are delivered on the site of the work. After such delivery, trench excavation shall proceed as rapidly as possible, and the pipe installed and the trench backfilled without undue delay. In public street areas, excavation and pipe installation shall be coordinated to the end that a minimum of interference with traffic will result.
- B. Refer to table below for required trench widths according to nominal pipe size.

Pipe Size (in)	Trench Width (in)
2-4	18
6-8	24
10-12	30
14-18	36
24	42

- C. The pipe bedding shall be given a final trim, using a laser for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the bottom of the pipe. The Contractor shall excavate bell holes at pipe joints.
- D. For trenching in existing streets, excavation and pipe installation shall be coordinated so that no more than 100 linear feet of trench shall be open at

any time. Backfilling operations shall closely follow pipe installation. In new subdivisions more than 100 feet of trench may be opened if allowed by the Inspector and if the excavation is properly shored, sloped or benched. All trenches shall be fully backfilled at the end of each day or, properly shored and covered by heavy steel plates adequately braced and capable of supporting H-20 vehicle loads in those locations subject to traffic and with 1-1/8" plywood in off road locations where it is impractical to backfill at the end of each day. Use of steel traffic plates is subject to the prior approval of the agency issuing the encroachment permit. Traffic plates shall be staked in place, with adjacent plates tack-welded together, and shall be provided with non-skid coating. Compacted cold mix asphalt shall be placed around the plate perimeter to provide a smooth transition from adjacent pavement.

- E. Where the bottom of the trench becomes soft or is unstable due to groundwater and/or movement of construction equipment, the Contractor shall over-excavate unsuitable material to a minimum depth of 9" below the base elevation to establish a stable foundation for the bedding or to a depth as otherwise directed by the Inspector. Geotextile shall be placed on the over-excavated trench bottom and staked to the trench walls, coarse bedding material in conformance with these specifications shall be placed on the fabric, and the fabric shall then be un-staked from the trench wall and wrapped over the coarse bedding material forming a closed envelope with a minimum 1-foot overlap at the top edges of the fabric.
- F. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled and compacted to the required grade with the specified material.

3.4 EMBANKMENT EXCAVATION

- A. The relative compaction of the natural ground area upon which embankments are to be constructed, for a depth of not less than 2 feet below finished grade, shall be not less than 90% relative compaction.
- B. If finished grade is less than 3 feet, above natural ground, the natural ground shall be excavated to a depth of not less than 3 feet below finished grade and re-compacted to a relative compaction of not less than 90%.
- C. When embankments are to be made and compacted on hillsides, or where new fill is to be compacted against existing embankments, the slopes of the original hillside, old or new fill, shall be cut into a minimum of 6 feet horizontally as the work is brought up in layers. Material thus cut out shall be re-compacted along with the new fill. Fill shall be compacted to a relative compaction of not less than 90%.

3.6 BEDDING AND BACKFILL

- A. Except for required foundation material (in an envelope of geotextile) coarse bedding material being placed in over-excavated areas, where water or soft

ground is present, backfill shall not be placed until after all water is removed from the excavation.

- B. Pipe zone bedding and backfill operations shall be performed in accordance with the following requirements:
1. Type I Bedding and Backfill Material (Class 2 Aggregate Base) shall be placed and properly compacted in the pipe zone. The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 4 to 6" below the bottom surface of the pipe, i.e., the trench sub-grade, and a plane at a point 12" above the top outside surface of the pipe. The sub-zones of the pipe zone are defined as follows:
 - a) "Bedding is that portion of the Pipe Zone between the bottom of the trench or the top of required foundation material and the lowest point on the outside surface of the pipe barrel excepting bells;
 - b) "Haunching" is that portion of the Pipe Zone between the top of the Bedding and the horizontal centerline of the pipe;
 - c) "Shading" is that portion of the Pipe Zone between the top of the Haunching and a horizontal plane 12" above the highest point on the outside surface of the pipe barrel excepting bells.
 2. Controlled Low Strength Material (CLSM) shall be provided in lieu of Type I Bedding and Backfill Material where indicated on the Plans Contractor shall provide a method to prevent pipe from floating during backfill. (The remaining portions of the trench shall be backfilled as specified elsewhere in this Section.)
 3. After compacting the bedding, the Contractor shall perform a final trim using a laser for establishing grade, such that each pipe section when laid will be continually in contact with the bedding along the bottom of the pipe. The Contractor shall provide bell holes at each pipe joint.
 4. Backfill in trenches shall be placed uniformly on each side of the pipe to prevent displacement. The Contractor shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations. The Contractor shall hand shovel slice the bedding along the sides of the pipe in order to ensure filling any voids under the pipe haunches.
- C. Warning Tape: A colored detectable metallic foil core plastic tape, at least 3" in width, shall be placed on top of the pipe zone backfill wherever sewers are installed. The tape shall have printed on it the words "Caution: Sewer Buried Below." The warning tape shall be utilized for all pipes (mains and laterals).
- D. After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the trench excavation between the top of the shading and the ground surface in unpaved

areas, and the horizontal plane at lowest point of the pavement structural section in paved areas.

- E. "Final Backfill" is that portion of the Trench Zone in paved areas between the top of the trench backfill and the lowest point of the pavement structural section.
- F. Joint utility trench excavations shall conform to the requirements shown on *DWG 20-06*.

3.7 PLACING AND SPREADING OF BACKFILL AND EMBANKMENT MATERIALS

- A. Backfill materials shall be placed and spread evenly in layers. The backfill layers shall be evenly spread so that each layer shall not exceed 8" in uncompacted thickness. Backfill layers greater than 8" but no more than 24" may be used after the Contractor demonstrates by compaction testing as specified in 3.8 below, that required compaction levels will be achieved.
- B. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted, the pipe zone backfill will provide uniform bearing and side support.
- C. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is within the range where the specified compaction can be achieved.
- D. Where the backfill material moisture content is too high to permit the specified degree of compaction, the material shall be bladed, aerated or dried and/or mixed with dryer material until the moisture content is satisfactory.
- E. Whenever selection is possible, embankment material having a sand equivalent value of less than 10 shall be deposited in the lower portions of embankments and no such material shall be placed within 3 feet of planned finished grade.
- F. When the embankment material consists of large rocky material, or hard lumps such as hardpan or cemented gravel which cannot be broken readily, such material shall be well distributed throughout the embankment, and sufficient earth or other fine material shall be placed around the large material as it is deposited so as to fill the interstices and produce a dense compact embankment, but in no case shall any material exceed 24" in any dimension.

3.8 COMPACTION OF BACKFILL AND EMBANKMENT MATERIALS

- A. The Contractor shall provide a minimum of one compaction test per day, and an additional compaction test for each 500 sf completed and at each structure (e.g. manholes), and as required on the Plans or at the direction of the Central San Inspector.

- B. Each layer of backfill material as defined herein, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content. Compaction at the top of the pipe zone shall be done using a plate compactor.
- C. Flooding, ponding, or jetting shall not be used.
- D. Equipment weighing more than 10,000 pounds shall not be used within a horizontal distance equal to the depth of the trench. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.
- E. The following compaction requirements shall be in accordance with ASTM D 1557 except for free draining materials (i.e., Coarse Bedding Material/Drain Rock/Foundation Material), which shall be in accordance with ASTM D 4253 and D 4254 for cohesionless free draining type materials. Where other public agency, utility company or encroachment permit requirements govern, the highest compaction standards shall apply.

Percent (%) Location or Use of Fill	Relative Compaction
Pipe zone backfill including bedding and over excavated foundation zone	90
Final backfill beneath paved areas or structures.	95
Trench backfill in unpaved easement or future street areas.	90
Trench Zone backfill.	90
Backfill under structures.	95
Backfill around structures under paved areas.	95
Backfill around structures in landscaped areas.	90
Embankment material	90

- F. The Contractor shall maintain the indicated trench cross section at a minimum of 12" above the top of the pipe (the top of the "pipe zone").
- G. Embankments shall be constructed as recommended by the geotechnical engineer in compacted layers of uniform thickness.
- H. At the time of compaction, the moisture content of embankment material shall be such that the relative compactions specified will be obtained and the embankment will be in a firm and stable condition. Embankment material which contains less than the required moisture content shall be watered and material which contains excessive moisture shall not be compacted until the material is dry enough to obtain the required compaction.

3.9 *TEMPORARY PAVING*

A minimum of 2" of cold or hot mix temporary asphalt shall be placed in finished trenches and rolled to a smooth surface at the end of each day unless final paving can be completed, or steel plates are used to cover trenches in paved streets. Traffic plates shall be subject to the requirements of 3.3 above. The temporary asphalt shall be placed within 1/4" of finished pavement grade.

- END OF SECTION -

draft

Section 32 12 16 - Asphalt Paving

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall perform all work associated with Asphalt Concrete (AC) pavement and base restoration as specified herein and satisfying all the encroachment permit requirements of agencies having right-of-way jurisdiction, whichever is more stringent.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 05 19 - Geosynthetics for Earthwork
- B. Section 31 23 16 - Excavation, Bedding and Backfill

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
 - ASTM D 1188 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
 - ASTM D 1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - ASTM D 2950 Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
 - AASHTO T 209 Maximum Specific Gravity and Density of Bituminous Paving Mixtures
 - Caltrans Standard Specification §37 Bituminous Seals
 - Caltrans Standard Specification §39 Asphalt Concrete
 - Caltrans Standard Specification §59 Painting
 - Caltrans Standard Specification §84 Traffic Stripes & Pavement Markings
 - Caltrans Standard Specification §85 Pavement Markers
 - Caltrans Standard Specification §92 Asphalts
 - Caltrans Standard Specification §93 Liquid Asphalt
 - Caltrans Standard Specification §94 Asphaltic Emulsions

Part 2 - Products

2.1 GENERAL

Without limiting the generality of other requirements of the Plans, all work specified herein shall conform to or exceed the requirements of the local jurisdiction.

2.2 AGGREGATE BASE

Aggregate base shall be Type I backfill material as specified in *Section 31 23 16 - Excavation, Bedding and Backfill*.

2.3 PRIME COAT

Prime coat shall be Grade SC-70 liquid asphalt complying with the requirements of Caltrans Standard Specification §93.

2.4 TACK COAT

Tack coat shall be emulsified asphalt Grade SS-1 or SS-1h, CSS-1 or CSS-1h diluted with one-part water to one-part emulsified asphalt. Emulsified asphalt shall comply with the requirements of Caltrans Standard Specification §94.

2.5 ASPHALT

Asphalt shall be Grade AR-4000 complying with the requirements of Caltrans Standard Specification §92.

2.6 ASPHALT-AGGREGATE COURSE MIXTURE

- A. The job-mix formula for the asphalt-aggregate mixture shall be within the limits specified in Caltrans Standard Specifications §39. Asphalt aggregate shall be Type A, 1/2" maximum, medium.
- B. The asphalt-aggregate course mixture shall meet the Caltrans Standard Specifications §39-2.02.

2.7 PAVEMENT MARKINGS, STRIPES, PAVEMENT MARKERS AND CURB PAINTING

- A. Stripes and pavement marking replacement shall be thermoplastic material in accordance with Caltrans Standard Specifications, Section 84.
- B. Pavement marker replacement shall be in accordance with Caltrans Standard Specifications §85.
- C. Paint for replaced curbs, where required for fire lanes, no parking zones, and other similar markings shall match existing color and be in accordance with Caltrans Standard Specifications §59-6.
- D. Pavement lane delineators shall match existing and shall be in accordance with Caltrans Standard Specifications requirements.

Part 3 - Execution

3.1 GENERAL

- A. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, **in which case the greater requirements shall govern.**

- B. Pavement Restoration: Pavement cut for trenching and/or damages caused during the work shall be restored with a cross section equal to that of the existing road, or a minimum of 4" of asphalt over 6" of aggregate base (whichever is greater). The limits of the pavement restoration shall extend to competent existing pavement, and shall be "T-cut" with a minimum width equal to the trench width plus 12" on each side of the trench. Where the edge of the "T-cut" is within 24" of the edge of the existing paving, restoration in that area shall extend to the edge of the road.

3.2 SUBGRADE PREPARATION

The subgrade shall be prepared as specified *Section 31 23 16 - Excavation, Bedding and Backfill*. The surface of the subgrade after compaction shall be hard, uniform, smooth, self-draining and true to grade and cross-section with roller.

3.3 PREPARATION OF EXISTING AC PAVEMENT

The edge of existing AC pavement shall be saw cut to provide a smooth joint for new pavement. The Contractor may saw cut or mechanically grind the pavement before excavating the trench to facilitate removal of pavement. After trench backfill and compaction, the Contractor shall saw cut and remove a minimum of 12" AC beyond any irregular or damaged pavement on each side of the trench before installation of the trench pavement patch.

3.4 AGGREGATE BASE

Aggregate base (AB) shall be provided where shown to the thickness required. The Contractor shall install aggregate base to match existing pavement AB thickness or a thickness of 6", whichever is greater. AB shall be delivered to the jobsite as uniform mixtures and each layer shall be spread in one operation. Segregation shall be avoided, and the base shall be free of pockets of coarse or fine material. Where the required thickness is 6" or less, the base materials may be spread and compacted in one layer. Where the required thickness is more than 6" the base material shall be spread and compacted in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any single layer shall not exceed 8". The compaction of each layer of aggregate base shall be not less than 95% of maximum density when measured in accordance with ASTM D 1557. The compacted surface of the finished aggregate shall be hard, uniform, smooth, self-draining and true to grade and cross-section.

3.5 PRIME COAT

Prior to placing pavement, a prime coat shall be applied to the compacted base or subgrade at a rate between 0.30 and 0.50 gal/sq yd.

3.6 TACK COAT

A tack coat shall be applied to existing paved surfaces where new asphalt concrete is to be placed on or against existing pavement. It shall also be applied to the contact surfaces of all pavement joints, curbs, gutters, manholes and the like immediately before the adjoining asphalt pavement is placed. Care shall be taken to

prevent the application of tack coat material to surfaces that will not be in contact with the new asphalt concrete pavement. Tack coat shall be applied at the rate of 0.20 to 0.30 gal/sq yd.

3.7 ASPHALT CONCRETE

- A. At the time of compaction, the temperature of mixture shall not be lower than 285°F or higher than 325°F, the lower limit to be approached in warm weather and the higher in cold weather.
- B. Asphalt concrete shall not be placed when the atmospheric temperature is below 50°F or during unsuitable weather.
- C. Asphalt concrete shall be spread and compacted in the number of layers and thicknesses specified in Caltrans Standard Specifications, Section 39-6.
- D. The depositing, distributing and spreading of the asphalt concrete shall be accomplished in a single, continuous operation.
- E. The mix shall be compacted using suitable compaction methods immediately after placing, such as a paving roller for larger jobs.
- F. Upon completion, the final surface, pavement shall be true to grade and cross-section. The edge between new and existing pavements shall be flush. When a 10-foot long straightedge is laid on the finished surface parallel to the center of the roadway, the surface shall not vary from the edge of the straight edge more than 1/8" except at intersections or changes of grade. In the transverse direction, the surface shall not vary from the edge of the straightedge more than 1/4".
- G. The relative density after compaction shall be 96% of the density obtained by using AASHTO Test Method T 209. A properly calibrated nuclear asphalt testing device shall be used for determining the field density of compacted asphalt concrete in accordance with ASTM D 2950, or cores may be laboratory tested in accordance with ASTM D 1188. The Contractor shall supply certified test reports of the adequacy of compaction. The Contractor shall provide a minimum of one compaction test per day and an additional compaction test for each 500 sf completed.

3.8 PAVEMENT MARKINGS, STRIPES, PAVEMENT MARKERS AND CURB PAINTING

- H. The Contractor shall restore all existing pavement markings, stripes and pavement markers to their original or better condition. Stripes and pavement marking replacement shall be installed in accordance with Caltrans Standard Specifications §84 unless otherwise directed by Central San.
- I. Pavement marker replacement shall be installed in accordance with Caltrans Standard Specifications §85 unless otherwise directed by Central San.

- J. Paint for replaced curbs, where required for fire lanes, no parking zones and other similar markings shall be installed in accordance with Caltrans Standard Specifications §59-6 unless otherwise directed by Central San.

3.9 SLURRY SEAL

- A. For all locations that will not receive a full-width pavement overlay, a slurry seal shall be applied to match the surfaces of adjacent existing pavement and to cover the joint between the pavement patch and the existing pavement. Before placing slurry seal the pavement shall be cleaned by sweeping or other means necessary to remove all loose particles of paving, dirt and other extraneous material.
- B. The slurry seal shall be mixed in accordance with the requirements of Caltrans Standard Specifications §37-2.04 and the following provisions:
 - 1. Mixing machines shall be equipped with a water pressure system and nozzle type spray bars to provide a rate of application of the fog spray. The mixing machine shall be adjusted to compensate for ambient temperature, surface texture, etc., and shall cover the entire surface without flowing or ponding.
 - 2. The slurry mixture shall be uniformly spread by means of a controlled spreader box conforming to the requirements of Caltrans Standard Specifications §37-2.05.
 - 3. The slurry mix shall be placed in accordance with the requirements of Caltrans Standard Specification §37-2.06 and the following provisions:
 - 4. Slurry seal shall not be placed if the pavement or the air temperature is below 55°F.
 - 5. Slurry seal shall be feathered onto existing pavement to provide a smooth transition between new and existing pavements.
- C. All existing and new manhole covers, valve boxes, vault covers and the like shall be temporarily covered during slurry sealing to prevent contact with these surfaces. The temporary coverings shall be removed after application of the slurry seal.

3.10 ASPHALT CONCRETE PAVEMENT OVERLAY

- A. Pavement grinding shall be performed such that the new finished pavement grade accurately matches the grade of existing gutters and storm drain inlets and restores the existing street crown sloping.
- B. Where indicated on the Plans, the Contractor shall install geotextile paving fabric in accordance with *Section 31 05 19 - Geosynthetics for Earthwork* prior to placement of the pavement overlay.
- C. Existing manhole covers, valve and survey monuments pots and vault lids shall be raised to the new pavement grade as required by each agency with

jurisdiction over these appurtenances. The Contractor shall restore any utility structures and appurtenances that become damaged during grinding or overlay work including, but not limited to, raising castings to match new finished grades and repairing concrete collars. The Contractor shall coordinate work with those utility agencies that require repairs to be performed by their own forces.

- D. Any joint between overlaid pavement and existing pavement shall be slurry sealed per Paragraph 3.9 upon completion of the overlay work. Existing pavement markings shall be restored in accordance with the requirements of Paragraph 3.8 above.
- E. Overlaid pavement shall be flush with the existing pavement grade at all joints with existing pavement and/or gutters.

- END OF SECTION -

draft

Section 32 15 60 - All-Weather Access Roads

Part 1 - General

1.1 THE REQUIREMENT

All-weather roads shall be provided for permanent maintenance access to all Central San structures (e.g., manholes and rodding inlets). The Contractor shall construct these roads as shown on the Plans and specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 23 16 - Excavation, Bedding and Backfill
- B. Section 32 12 16 - Asphalt Paving
- C. Section 03 30 00 - Cast-In-Place Concrete

1.3 CONTRACTOR SUBMITTALS

- A. Any alternative materials not listed in this Section shall be submitted for review and approval by Central San. If the alternative material is a requirement of a local jurisdiction (e.g. City or County), the Applicant shall submit a copy of correspondence with the local jurisdiction stating their acceptance and/or requirement of the material.

Part 2 - Products

2.1 MATERIALS

- A. Type I Bedding and Backfill Material (aggregate base) shall be in accordance with the requirements of Section 31 23 16 - Excavation, Bedding and Backfill.
- B. Asphalt Concrete shall be in accordance with Section 32 12 16 - Asphalt Paving.
- C. Concrete shall be in accordance with the requirements of Section 03 30 00 - Cast-In-Place Concrete.

Part 3 - Execution

3.1 REQUIRED STRUCTURAL CROSS SECTION

- A. The minimum structural cross section for all-weather access roads shall depend on the finished grade of roadway as follows:

Finished Grade	Minimum Required Structural Cross Section
<10%	11" of Type I Bedding and Backfill Material (newly quarried crushed "Clayton Blue" or equal, not recycled material or mined alluvium), or equivalent section based on Caltrans "Gravel Equivalent Method", over competent native sub-base
10-15%	2-1/2" of Asphalt Concrete (AC), over a minimum of 9" of Type I Bedding and Backfill Material (newly quarried crushed "Clayton Blue" or equal, not recycled material or mined alluvium), or equivalent based on Caltrans "Gravel Equivalent Method", or 6" reinforced concrete (#4 @ 16" OC each way, or equivalent WWF), over a minimum of 3" Type I Bedding Material sub-base
15-20%	6" of reinforced concrete (#4 @ 16" OC each way, or equivalent WWF) over a minimum of 3" Type I Bedding Material sub-base compacted to 95% relative compaction, grooved per Contra Costa County Fire Protection District Drawing. No. FPS-001-D3.

>20% | not allowed

3.2 *REQUIRED GEOMETRY*

A. Minimum geometric requirements for all-weather access roads shall be as follows:

1. The minimum width of access roads shall be 12 feet.
2. The maximum cross slope of access roads shall be 2%.
3. The minimum radius at the centerline of access roads shall be 28 feet.
4. Access roads shall either have access to a public road at each end, or shall have a turn-around as shown on *DWG 20-08*.

3.3 *DRAINAGE*

Engineered drainage facilities to properly convey storm water runoff from the roadway surface and adjacent areas into storm drains or drainage ways shall be provided.

- END OF SECTION -

Section 33 01 30.11 - Inspection of Sewers

Part 1 - General

1.1 THE REQUIREMENT

- A. The Contractor shall furnish all labor, materials, tools, and equipment necessary to clean, perform testing, and provide for televising of completed sewer pipelines.
- B. The Contractor shall call the Central San Inspection Office at least one business day in advance to arrange for an Inspector to be present for the pre-installation CCTV inspection.
- C. The Contractor shall notify the Inspector at least one business day prior to any cleaning, testing, or televising work. All final testing and cleaning of sewer lines shall be done in the presence of the Inspector.
- D. The Contractor shall complete cleaning and testing of sewer lines as required in this Section prior to requesting CCTV inspection.
- E. No testing will be allowed until all utilities have been installed.
- F. If deficiencies are identified during testing, the Contractor shall re-test after the deficiencies have been corrected.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
 - ASTM C 969 Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
 - ASTM C 1091-03a Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines
 - AWWA C600-54T Installation of Ductile-Iron Water Mains and Their Appurtenances
 - ASTM D 3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - ASTM F 679 Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

Part 2 - Products

2.1 MATERIAL REQUIREMENTS

- A. Mandrels, temporary plugs, low-pressure testing equipment and all other necessary materials shall be provided by the Contractor, subject to the Inspector's approval.
- B. No materials shall be used which would be injurious to the public, personnel, adjacent improvements or the pipeline.

- C. Air test gauges shall be laboratory-calibrated test gauges and shall be recalibrated by a certified laboratory prior to the leakage test. Gauge shall be easy to read in no more than 1 psi per increment and have a maximum full-scale range of 5 psi.

Part 3 - Execution

3.1 GENERAL

- A. The Contractor shall clean pipelines by balling and flushing or hydroflushing prior to deflection and pressure testing.
- B. The Contractor shall perform deflection and pressure tests after submittal of compaction reports demonstrating compliance with the backfill compaction requirements and before CCTV inspections.
- C. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 CLEANING

- A. After the pipeline installation has been completed to the satisfaction of Central San, the Contractor shall clean the pipe in the presence of the Inspector.
- B. The Contractor shall clean all sewer installations, deemed necessary by the Inspector, with a cleaning ball or device in accordance with the device manufacturer's instructions or recommendations and flushed. Hydroflush-pressure shall be maintained below 2,000 psi. Traps with screens in accordance with *DWG 21-08* shall be used to trap debris. The Contractor shall remove all debris from the manhole prior to removing the trap.
- C. Release of water during and/or after cleaning and testing has been completed, shall be performed in a manner approved by the Inspector. The Contractor shall be responsible for the proper disposal of water released.
- D. The Contractor shall perform an additional cleaning of the pipeline after the installation of final paving, top block, frames and covers, and after all other required inspections, if required by the Inspector due to a reasonable determination that additional debris may have accumulated in the pipeline after initial cleaning.

3.3 PIPELINE DEFLECTION TESTING

PVC and HDPE pipe 8" in diameter or larger shall be tested for deflection, joint displacement, or other obstruction by passing a rigid mandrel through the pipe. Deflection shall be tested after submittal of daily compaction reports demonstrating compliance with, but prior to, permanent resurfacing. The mandrel shall be a full circle, rigid, non-adjustable, an odd-numbered leg (9 leg minimum), acceptable to the Inspector as to design and manufacturer. Mandrel size shall meet the minimum requirements set forth in ASTM D 3034 and ASTM F 679. The circular cross section

of the mandrel shall have a diameter of at least 95% of the specified average inside diameter of the pipe and the minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. Where obstructions and excessive deflection encountered by the mandrel, the Contractor shall remove, replace and retest the deficient section. Re-rounding will not be allowed.

3.4 PIPELINE LEAKAGE TESTING

A. Repaired pipelines shall be re-tested as follows:

Sewer Type/Size	Acceptable Tests
Gravity \leq 16"	low-pressure air test or a water pressure test
Gravity $>$ 16"	water pressure test only
Pressurized (force mains)	air-over-water pressure test at 120% of maximum design operating pressure, measured at the lowest point of the pipeline section being tested.

B. Air Testing

- Each section of main sewer and its appurtenant connected laterals shall be tested between successive manholes by plugging and bracing all openings in the sewer lines. If any leaks are found, the air pressure shall be released, the leaks eliminated, and the test procedure started over again.
- Air tests shall be conducted in accordance with the following procedure and the table below:

Pipe Diameter (in)	Length of Line (ft)	Length of test (minutes)
4 to 8	All	4
10	0 to 215	4
	> 215	5
12	0 to 155	4
	155 to 190	5
	> 190	6
15 & 16	0 to 120	5
	120 to 165	7
	> 165	8
>16	Hydrostatically test in accordance with Paragraph C	

Note: All tests shall be performed at 4 psi using a 5 lb gage.

All necessary test equipment shall be in proper working order and tests shall be made in the presence of the Inspector. Test plugs shall be carefully placed at each end of the section of line to be tested. When all necessary test equipment is in place, a compressed air supply shall be attached to the air fitting on the test equipment and the air pressure within the line increased to 4

psi. After the air supply is securely turned off or disconnected, there shall be a 2-minute waiting period to allow stabilization of air within the sewer line before the actual test period begins. In no case shall the air pressure within the line be less than 3-1/2 psi at the beginning of the test period. The allowable air pressure loss shall not exceed 1 psi. When testing side sewers, or portions thereof, the test period shall be 4 minutes and the allowable loss shall not exceed 1 psi. After completion of a test, the air pressure shall be released slowly through the valve, which is incorporated in the test equipment. Air test plugs shall not be removed until the air pressure is no longer measurable.

- C. New sewers larger than 16" diameter shall be hydrostatically tested in accordance with the following procedure:
1. After installation, all new trunk sewer pipelines shall be thoroughly cleaned prior to pressure testing. A section of trunk sewer shall be prepared for testing between two structures by plugging the inlet side of the discharge manhole and all openings in the upstream manhole except the discharge opening. All plugs shall be properly braced against the manhole wall to withstand the forces of the test in order to prevent loss in the event of a failure.
 2. A section of the trunk sewer prepared as above shall be tested by filling it with water to an elevation 5 feet above the top of pipe at the upstream end of the test section, or 5 feet above the existing groundwater elevation, whichever is greater. The water shall be introduced into the test section at least one hour in advance of the test period and refilled as necessary prior to commencement of the test period to allow the pipe and joint material to become saturated. The loss in water may be determined by measuring the rate of fall of the water level, but the level shall not be allowed to fall more than one foot below the specified head during the test period.
 3. For RCP, the pressure shall be maintained for not less than 4 hours and the leakage rate shall not exceed 200 gallons per inch of diameter per mile of pipe for 24 hours (ASTM C 969-02). For VCP, the pressure shall be maintained for not less than one hour and the leakage rate shall not exceed 200 gallons per inch diameter per mile for 24 hours (ASTM C 1091-03a). For DIP, the pressure shall be maintained for not less than one hour and the leakage rate shall not exceed 70 gallons per inch diameter per mile of pipe of 24 hours (AWWA C600-54T).
- D. When leakage exceeds the amount allowed by the specifications, the Contractor shall locate the leaks, submit a repair procedure for the Inspector's review, and make the necessary repairs.

3.5 MANHOLE TESTING

- A. Hydrostatic Testing: Central San may require hydrostatic testing for leakage after installation and prior to backfilling. Prior to hydrostatic testing, all manholes shall be visually inspected. All defects shall be repaired by the Contractor, with non-shrink grout, to the satisfaction of the Inspector. All pipes

entering the manhole shall be sealed at a point outside the manhole walls to include testing of the pipe/manhole joints. Safety lines shall be secured to all plugs utilized. The manhole shall be filled with water to a level 2" below the top of the frame. After a period of at least one hour to allow the water level to stabilize, the manhole shall be refilled and the water level shall be checked. The water level shall again be checked after a period of 4 hours. If the water level drops by more than 1", the leakage shall be considered excessive, and the Contractor shall make necessary repairs and retest the manhole.

- B. Vacuum Testing: As an alternative to manhole hydrostatic testing, the Inspector may allow the use of vacuum testing. A vacuum of 10" of mercury shall be drawn on the manhole, the valve on the vacuum line of the test hood closed and the vacuum pump shut off. The manhole shall be deemed to have passed the test if the vacuum drop is less than 1" of mercury during a one-minute test period.

3.6 CCTV INSPECTION

- A. Central San will perform a CCTV inspection of the sanitary sewer upon substantial completion of the work.
1. The Contractor shall coordinate with the Inspector to arrange for an acceptable time to conduct the inspection.
 2. Defects discovered by the CCTV inspection shall be corrected and the line re-inspected at the Contractor's cost.
 3. If a portion of an entire job is to be CCTV inspected, a separate fee will be due as established by Central San. Inspection fees are payable prior to the date of the partial CCTV inspection.
 4. The Contractor shall request CCTV inspection once the following have been completed:
 - a) Sewer pipelines are installed, backfilled, and compacted.
 - b) Structures are in place, channeling is complete, and pipelines are accessible from structures.
 - c) All other underground facilities, utility piping, and conduits in the vicinity are installed.
 - d) For street locations, placement of aggregate base has been completed.
 - e) Pipelines to be inspected have been cleaned and flushed.
 - f) Final pressure test has been completed.
 - g) Mandrel testing is complete.
- B. The procedure outlined below will be repeated until all deficiencies observed by CCTV inspection have been corrected to the satisfaction of Central San.

1. The Contractor shall request Central San to schedule the CCTV inspection.
 - a) If Central San's CCTV crew arrives at the jobsite and the work is not ready or accessible, the Contractor will be billed the cancellation fee payable to Central San prior to the date of rescheduled CCTV inspection. The Contractor shall reschedule CCTV inspection as outlined above.
2. Central San will televise the job.
 - a) If no deficiencies are observed, the work will be considered satisfactory.
 - b) If deficiencies are observed, a recording will be made and defects serious enough to require correction will be identified by the Inspector who will provide written notification. If corrective work is indicated and viewing of the recording is desired, the Contractor shall contact the Inspector to set a time for the viewing. All corrective work will be subject to approval by Central San. Central San reserves the right to require cleaning and additional leak testing of the repaired pipeline. Those portions of the pipeline where deficiencies have been corrected shall be re-televised. Payment of re-television inspection fees shall be paid to Central San prior to the scheduled date of the inspection.
- C. The following observations from CCTV inspections will require correction:
 1. Low spot 0.0625 x diameter of pipe or greater (e.g., 0.5" for an 8" pipe).
 2. Joint separations (3/4" or greater opening between pipe sections).
 3. Cocked joints present in straight runs or on the inside of pipe curves.
 4. Chips in pipe ends.
 5. Cracked or damaged pipe.
 6. Offset joints.
 7. Infiltration.
 8. Debris or other foreign objects.
 9. Other obvious deficiencies.
- D. CCTV inspection of the work and the correction of observed defects shall not relieve the Contractor of its responsibility for the warranty period.

– END OF SECTION –

Section 33 05 13 - Manholes and Structures

Part 1 - General

1.1 THE REQUIREMENT

The Contractor shall furnish and install manholes and structures, complete with precast manhole bases or cast-in-place (if approved during Plan Review), pipe connections, barrel and cone components, preformed joint sealant, grade rings, frames, covers and other appurtenances shown on the Plans or specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Part VI Standard Drawings
- B. Section 03 30 00 - Cast-In-Place Concrete
- C. Section 03 60 00 - Grout
- D. Section 05 50 00 - Miscellaneous Metal Work
- E. Section 31 05 19 - Geosynthetics for Earthwork
- F. Section 33 01 30.11 - Inspection of Sewers

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
 - ASTM C 150 Specification for Portland Cement
 - ASTM C 478 Specification for Precast Reinforced Manhole Sections

1.4 CONTRACTOR SUBMITTALS

Upon request by Central San, the Contractor shall submit complete shop drawings for all precast manhole bases to Central San and shall receive favorable review prior to ordering the bases.

1.5 QUALITY ASSURANCE

After installation, the Contractor shall demonstrate that all manholes have been properly installed, level, with tight joints, at the correct elevations and orientations and that the backfilling has been carried out in accordance with the Plans and these Specifications. Vacuum testing of manholes may be required at Central San's sole discretion.

Part 2 - Products

2.1 MATERIALS

- A. Manhole bases may be either cast-in-place or precast. Channels and shelves shall conform to the requirements *DWG 19-01* through *19-07*. Manhole channels shall be shaped to form a smooth transition of uniform cross-section from inlet pipes to the outlet pipe, both horizontally and vertically.

- B. Precast Concrete Components: Only components listed in the *Approved Materials List* shall be used in the construction of manholes.
1. Precast manhole bases, and barrel and cone sections shall be manufactured by a process that will produce dense homogeneous reinforced concrete of high quality in conformance with ASTM C 478. Cement shall be Type V Portland Cement as specified in ASTM C 150.
 2. Precast manhole components shall be designed to support vertical AASHTO H-20 truck loading, plus the weight of soil above the cone section.
 3. Pipe connections at precast bases shall be pipe bells of the size, material and class of inlet and outlet pipes, integrally cast into the base by the manufacturer.
 4. The minimum wall thickness for barrel and cone sections (in inches) shall be calculated by dividing the nominal diameter of the barrel (in inches) by twelve (i.e., $D/12$).
 5. Manhole throats shall be constructed of reinforced concrete grade rings.
- C. Preformed plastic sealing gasket for sealing joints between the manhole base, barrel and cone sections shall be as listed in the *Approved Materials List*.
- D. Non-shrink grout shall conform to the requirements *Section 03 60 00 - Grout*.
- E. Castings for manhole frames and covers shall conform to the requirements of *Section 05 50 00 - Miscellaneous Metal Work*.
- F. Primer and sealant tape for sealing exterior joints between precast components shall be as listed in the *Approved Materials List*.
- G. Concrete for cast-in-place manhole and rodding inlet components (bases and top blocks) shall conform to *Section 03 30 00 - Cast-In-Place Concrete*.

2.2 TEMPORARY COVERS

Temporary covers for new construction or reconstruction of manholes shall be fabricated as detailed in *DWG 19-12*.

2.3 TEMPORARY PLUGS

Temporary plugs shall be of the mechanical expanding type. Pneumatic are not acceptable.

Part 3 - Execution

3.1 GENERAL

- A. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms

and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

- B. An All-Weather Access Road as specified in this Section is required for access to all structures in off-road locations (e.g., easements).

3.2 INSTALLATION

A. Temporary Plugs

1. Mechanical expanding-type temporary plugs shall be installed and removed, as specified below, in the presence of an Inspector. Plugs shall be secured by tethering with a ¼" nylon rope attached to the top of a wood 2'x4' of sufficient length to extend from the shelf to a point in the throat within 6" of the underside of the cover.
 - a) When a manhole exists or a new manhole is constructed at the beginning of a new main extension, a temporary plug shall be installed at the inlet of the new pipe at the existing manhole or new manhole.
 - b) When a new main extension begins at an existing rodding inlet or stub, a temporary plug shall be installed on the outlet of the first manhole upstream from the beginning of the new main extension.

B. Cast-in-Place Manhole Bases

1. Cast-in-place manhole bases over existing sewers shall be poured against undisturbed native soil, which has been excavated to the dimensions shown on the Plans. For new sewer installations, the cast-in-place manhole base shall be poured over 6" Type 1 Backfill. See *DWG 19-01* through *19-08*. If the excavation extends beyond the dimensions shown on the Standard Drawings, the Contractor shall construct forms and pour the base to the specified dimensions.
2. If water or soft ground is encountered at the bottom of the excavation, a minimum lift of 9" of coarse-bedding material in a geotextile wrap shall be used as shown on *DWG 19-01*.
3. A joint forming ring shall be used to form a level joint groove in the manhole base while the concrete is fresh to receive the first precast barrel section. The metal forming ring may be removed as soon as the concrete has set sufficiently to eliminate any slump in the joint groove.
4. Manhole channels shall be shaped to form a smooth transition from inlet pipes to the outlet pipe, both horizontally and vertically.

C. Precast Manhole Bases (on all new main sewer extensions)

1. Precast manhole bases shall be placed to the lines and grades shown on the Plans as an integral part of the pipe laying operation on a minimum thickness of 6" of Type I Bedding and Backfill Material compacted to 95% relative compaction. Where soft ground or water is present, a minimum thickness of 9" of Coarse Bedding Material in a wrap of geotextile, per the

requirements of *Section 31 05 19 - Geosynthetics for Earthwork*, shall be placed below the course of Type I Bedding and Backfill Material.

2. Inlet and outlet pipe connections at precast bases shall be pipe bells cast into the base by the manufacturer.
3. All precast concrete manholes shall be installed in strict conformance with the manufacturer's written instructions on a well-compacted foundation.

D. Setting Precast Barrel and Cone Sections

1. All joint surfaces of precast manhole bases, barrel and cone sections shall be thoroughly cleaned and dried prior to setting, and shall be sealed with a preformed plastic sealing gasket listed in the *Approved Materials List* at each joint as follows:
 - a) Remove the paper wrapper from one side of the gasket, retaining the outside paper in place to protect the gasket and assure against stretching.
 - b) Place the plastic gasket strip in the joint, forming a continuous gasket around the entire circumference of the manhole joint.
 - c) Remove the paper wrapper from the exposed side of the gasket and place the next manhole component.
 - d) Care shall be taken in the handling of barrel and cone sections after the plastic gasket has been affixed to avoid displacing the gasket or contaminating the joint or gasket with dirt or other foreign material. Any displaced or soiled gaskets shall be removed and replaced.
 - e) Care shall be taken to properly align the manhole section with the previously set section before it is lowered into position.
 - f) During cold or wet weather, the joint surfaces shall be heated with hot air until ice, frost, and moisture are removed and surface to be primed is dry and warm. Hot air shall also be passed over plastic gasket strips immediately prior to attaching them to joint surfaces and immediately prior to setting the section.

E. Manhole frames and covers shall not be set to final grade until the pavement has been completed, unless otherwise approved by Central San. Precast concrete grade rings shall be installed as shown in the Standard Drawings. Paving around the manhole shall be in accordance with local jurisdiction requirements. Openings in manholes shall be protected from construction loads, debris and unauthorized entry.

F. When new piping is installed in existing structures, the Contractor shall accurately position core-drilled openings in the concrete as shown on the job Plans and Standard Drawings or otherwise directed by the Inspector. Openings shall be of sufficient size to permit a final alignment of pipelines and fittings without deflection of any part and to allow adequate space for

satisfactory placement of mechanical seals or packing with non-shrink grout where the pipe passes through the wall to ensure the resulting structure is watertight. Before placing the non-shrink grout, concrete surfaces shall be sandblasted, thoroughly cleaned of sand and any other foreign matter, and coated with epoxy bonding compound. After connection of the new inlet pipe, the Contractor shall re-channel the inside of the existing manhole base to provide a smooth flow channel to the new exit pipe.

- G. The throat shall be constructed using appropriately sized reinforced concrete grade rings to bring the manhole cover to finished grade surface. No plastic sealing gaskets shall be used for jointing grade or extension rings.
- H. Manhole top blocks shall be poured against forms constructed to the specified dimensions shown on *DWG 19-01*.
- I. All manholes located on slopes steeper than 3:1 (horizontal to vertical) in easement areas shall be constructed with a reinforced concrete, reinforced concrete masonry unit or interlocking masonry unit retaining wall as shown on *DWG 19-11*.
- J. All manholes shall be tested in accordance with *Section 33 01 30.11 - Inspection of Sewers*.
- K. Temporary covers shall be used during construction until permanent frames and covers are installed.

3.3 RECONSTRUCTION OF EXISTING STRUCTURES

A. General

- 1. Reconstruction work on any particular structure shall be diligently prosecuted so as to be completed within 3 calendar days after work is begun on that particular structure. The Contractor shall provide continuous access for Central San maintenance forces to the structure at all times.
- 2. When removing existing structures, the Contractor shall take precautions to ensure that no foreign material enters the structure or the downstream system. Before any work is started, the base shall be covered with a plywood ("false bottom") as shown on *DWG 19-13*, and then the false bottom shall be covered with a drop cloth of heavy canvas. The drop cloth and false bottom shall be kept in place during the work to catch debris, and upon completion, shall be removed with the collected debris. No debris shall enter the downstream system or be allowed to remain in the manhole.

B. Structure Adjustments and Repairs

- 1. All workmanship and materials for structure adjustments shall conform to the requirements of these Specifications. In the case of existing brick or cast-in-place concrete structures, repair or adjustments shall be

accomplished with materials in-kind or with precast elements as detailed on the Plans.

2. Existing structure precast elements, adjustment rings, frames, and covers removed for adjustments and/or repairs may be reinstalled only when such undamaged items are permitted by the Inspector for reuse.
3. Manhole adjustments shall be accomplished by one of the methods specified below or as shown on the Plans:
 - a) Upward adjustments of manholes to finish grade surface may be accomplished with reinforced concrete grade rings, formed concrete and/or a single cast iron extension ring when the adjusted manhole throat will not exceed 12" in height. In no case shall multiple cast iron extension rings be used in adjustments. When adjustments are made that position the bottom of the cast iron manhole frame above the existing concrete top block, the top block shall be reconstructed in accordance with the requirements of *DWG 19-01* through *19-08*.
 - b) Whenever upward adjustment of manholes would result in a completed manhole throat section exceeding 12" in height, the upper manhole section, including the top block and cone section, shall be removed and the adjustment shall be made by reconstructing the structure using manhole barrel and cone sections, grade rings and frames and covers in accordance with the requirements of these Specifications and *DWG 19-01* through *19-08*.
 - c) Downward adjustments of manholes shall be accomplished by removal of existing grade or extension rings and cone and barrel sections as required, and reconstructing the structure using manhole barrel and cone sections, grade rings and frames and covers in accordance with the requirements of these Specifications and *DWG 19-01* through *19-08*.
4. Rodding inlet adjustments shall be accomplished by one of the methods specified below or as detailed on the Plans:
 - a) Upward adjustments of rodding inlets shall be accomplished with formed concrete or cast-iron extension rings where the extension will not exceed 8", including any previous adjustments. When adjustments are made that position the bottom of the cast iron frame above the existing concrete top block, the top block shall be reconstructed in accordance with the requirements of these Specifications and *DWG 19-14*.
 - b) Upward adjustments of rodding inlets exceeding 8" shall be accomplished by removing the structure's frame, cover, and top block, and reconstructing the structure in accordance with the requirements of these Specifications and *DWG 19-14*. Pipe used for such

adjustments shall be as required for pipeline repair and shall be installed to extend the line and grade of the existing pipe.

- c) Downward adjustments of rodding inlets shall be accomplished by removal and reconstructions of the entire upper section of the structure including the top block.

- END OF SECTION -

draft

Section 33 05 16 - Cast-Iron Pipe (CIP)

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install cast-iron pipe (CIP) and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and in *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
 - ASTM A 74 Standard specifications for Hub and Spigot Cast Iron Soil Pipe and Fittings
 - CISPI 301 Hubless Cast Iron Soil Pipe and Fitting for Sanitary and Storm Drain, Waster and Vent Piping Applications

1.4 QUALITY ASSURANCE

- A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- B. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 PIPE AND FITTINGS

- A. All hub and spigot cast iron pipe (CIP) shall conform to the requirements of ASTM A 74 as it applies to single hub, extra heavy and service weight pipe.
- B. Service weight, Class SV, pipe shall be the normal requirement of CIP installations; however, the Inspector may require use of extra heavy, Class XH, pipe or ductile iron pipe under special conditions.
- C. CIP may be installed without the use of foundation bedding material where such trench bottom provides solid bearing for the full length of the pipe. The Inspector may require foundation bedding material where conditions warrant.
- D. Cast Iron “Hubless” pipe and fittings shall conform to the requirements of the Cast Iron Soil Pipe Institute, (CISPI), “Standard No. 301.”

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.
- C. CIP shall not be used in food service or grease interceptor applications.

3.2 COUPLINGS

- A. Hubless pipe shall be installed in accordance with CISPI Pamphlet No. 100 using only 4 banded couplings or approved equals per the *Approved Materials List*.
- B. The use of a properly calibrated torque wrench set to 60 foot-pounds for jointing shall be mandatory.

- END OF SECTION -

Section 33 05 19 - Ductile Iron Pipe (DIP)

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install ductile iron pipe (DIP) and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and in *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 00 - Sanitary Sewerage Piping
- C. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:

ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. for Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3 in. through 12 in. for Water and Other Liquids
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances

1.4 QUALITY ASSURANCE

- A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- B. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 GENERAL

- A. Ductile-iron pipe (DIP) shall conform to the latest revision of ANSI/AWWA C150/A21.50 subject to the following supplemental requirements. The pipe

shall be furnished complete with rubber gaskets, and all special fittings shall be provided as shown on the Plans.

- B. Bell and spigot joints and mechanical joints are acceptable for underground applications. As an alternative to bell and spigot joints the use of mechanical and flanged joints will be permitted for above ground applications only.

2.2 PIPE

Ductile iron pipe shall be of the diameter indicated at a minimum Class 52, and shall be manufactured with standard bell and spigot joints in accordance with the latest revision of ANSI/AWWA C151/A21.51.

2.3 LINING AND COATING

Pipe shall have standard asphaltic coating on the exterior and be epoxy lined on the interior with Protecto 401™ ceramic epoxy lining as manufactured by U.S. Pipe, or approved equal.

2.4 FITTINGS

- A. Fittings shall be ductile iron at a minimum of Class 52. Fittings shall conform to the latest revision of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Fittings and accessories shall be furnished with either Push-on or Mechanical Type Joints in accordance with ANSI/AWWA C111/A21.11.
- B. Ductile-iron pipe and fittings shall be furnished with mechanical joints, push-on joints, flanged joints, and/or restrained joints, as required. Bolted joints shall not be used for underground installations.
 - 1. Mechanical and push-on bell and spigot joints shall conform to ANSI/AWWA C111/A21.11 and be furnished complete with all necessary accessories.
 - 2. Flanged joints shall conform to ANSI/AWWA C115/A21.15.
 - 3. Restrained joints shall be per the *Approved Materials List*.

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 INSTALLATION OF PIPE

All pipe shall be installed in accordance with ANSI/AWWA C600.

3.3 RUBBER-GASKETED JOINTS

Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket, lubricated with an approved vegetable-based lubricant, shall be placed in the bell groove. The spigot end of the pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and pushed into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

- End of Section -

draft

Section 33 05 24 - Steel Pipe

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install steel pipe and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 09 90 00 - Painting and Coating
- B. Section 33 01 30.11 - Inspection of Sewers
- C. Section 33 31 00 - Sanitary Sewerage Piping
- D. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM C 150	Standard Specification for Portland Cement
AWWA C208-07	AWWA Standard for Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C205-07	AWWA Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4 in (100 mm) and Larger-Shop-Applied
AWWA C620-07	AWWA Standard for Spray-Applied In-Place Epoxy Lining of Water Pipelines, 3 In. and Larger
ANSI/AWS D1.1	Structural Welding Code

1.4 CONTRACTOR SUBMITTALS

- A. Upon request by Central San, the Contractor shall submit shop drawings and material details for steel pipe and fittings before the pipe and/or fittings are manufactured.
- B. If such shop drawings are to be submitted by the pipe fabricator or manufacturer for Central San's review, the District assigned Job Number and Contractor's signature shall appear on each drawing, attesting the fact that the manufacturer has reviewed the drawings, and if such are accepted, installation will be in conformance therewith.

1.5 QUALITY ASSURANCE

- A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.

- B. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 GENERAL

- A. Lining refers to corrosion protection applied to the inside of a pipe. While coating refers to corrosion protection applied to the outside of pipe.
- B. Cement-Mortar protective lining and coating for steel pipe shall meet the requirements of AWWA Standard C205-07.
- C. Epoxy protective lining and coating for steel pipe shall meet the requirements of AWWA Standard C620-07.

2.2 LININGS AND COATINGS

- A. Concrete linings and coatings shall be manufactured with Type II Portland cement conforming to the requirements of ASTM C 150, Concrete linings shall extend to the ends of each pipe length. The concrete coating shall be held back 3" from each end of each pipe, except where otherwise specified for abutting pipe or structure connections.
- B. Approved corrosion protective coating shall meet the requirements of *Section 09 90 00 - Painting and Coating*, and be shop applied to all exposed metal portions of pipe before shipment. Minor shop coating damage shall be repaired in the field with material consistent with that used by the pipe manufacturer as directed by the Inspector.

2.3 FABRICATION

- A. All pipe shall be clearly marked with date of manufacture, type of lining and/or coating and name or trademark of the manufacturer as identification on each individual length unless otherwise specified or shown on the Plans.
- B. Fabrication of steel pipe shall be in accordance with the minimum basic requirements of the following table:

Minimum Basic Steel Pipe Fabrication Requirements					
Diameter of Pipe (in.)*	6	8	10	12	14
Steel Cylinder Gauge (US Std)	10		7		
Uniform Minimum Lining Thickness (inches)	1/2			2/3	
Uniform Minimum Coating Thickness (inches)	1				
Rod-Wrapping or Wire Reinforcement	7/32 inch diameter or greater at 1.75 inches maximum clear spacing. Self-furring welded fabric of 2-by-4 inch No. 13 gauge steel wire.				

*The lined pipe shall have a nominal pipe size within the one quarter (1/4) inch tolerance.

2.4 FITTINGS

- A. Fittings for steel pipe shall conform to the requirements of AWWA C 208. Special fittings shall be shop fabricated as detailed on the Plans and approved shop drawings for construction.
- B. Steel coupling for joining steel pipe shall consist of acceptable beveled or flared sleeves, pressed or rolled steel flanges, rubber or neoprene gaskets and steel bolts with hexagon nuts.
- C. Deflection fittings shall not exceed 11.25° at any one angle break in such fitting and the minimum distance between all miters in a fabricated fitting shall be 3 feet.

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 WELDING

- A. All welding shall be performed by qualified welders, welding operators, and tackers who have had prior experience with the type of materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than six (6) months prior to commencing work on the casing or pipeline. Machines and electrodes similar to those used in the work shall be used in qualification tests.
- B. Appropriately sized joint rings for joining steel pipe shall be welded to the cylinder to form a self-centering bell and spigot type joint sealed by a compressed rubber gasket. When such method of jointing is used, Class I mortar shall be used to point the joint on the inside and Class I non-shrink grout shall be used to completely fill the annular space between abutting pipe sections on the outside.
- C. Field welds will be permitted only as shown on the Plans. A hand hole will be required for all field welds. Welding shall be in accordance with the AWS standards. After field welding is complete and inspected by Central San, all exposed portions of the cylinder and joint shall be wrapped with 18-gauge stucco wire and then cement grout band coated with Class I non-shrink grout. The grout band, once finished, shall immediately be coated with a membrane-type, fast curing material that will seal the band surface completely.

- END OF SECTION -

Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install PVC pipe and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 00 - Sanitary Sewerage Piping
- C. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

- | | |
|--------------|--|
| AWWA C900-07 | Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm through 300 mm), for Water Transmission and Distribution |
| AWWA C905-08 | Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution |
| ASTM D 1784 | Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds. |
| ASTM D 2241 | Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series) |
| ASTM D 2321 | Practice for Underground Installation of Thermoplastic Sewer Pipe for Sewers and Other Gravity-Flow Applications |
| ASTM D 3034 | Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings |
| ASTM F 477 | Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe |
| ASTM F 1674 | Test Method for Joint Restraint Products |

1.4 QUALITY ASSURANCE

- A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- B. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 GENERAL

All PVC pipe shall be continuously and permanently marked with the manufacturer's name, pipe size and pressure rating in psi.

2.2 PIPE

- A. All PVC pipe shall be joined by compression, solvent-welded, thermo-fusion welded or mechanical restrained joints as shown on the Plans.
- B. Polyvinyl chloride pipe (PVC) shall conform to the requirements of ASTM D 3034, SDR-26, or AWWA C900 or C905, Class 100, 150, 165, 200, 253, or 305. Material for PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12454-B or 12454-C as defined therein.
- C. Flexible rubber rings for compression type joints for PVC pipe and fittings shall conform to the requirements of ASTM F 477.
- D. All sun-faded pipe or pipe with noticeable surface defects will be rejected and shall be replaced by the Contractor.

2.3 COUPLINGS AND FITTINGS

- A. Couplings shall be as listed in the *Approved Materials List*.
- B. All fittings for PVC pipe shall conform to the requirements of ASTM D 2241. The ring groove and gasket ring shall be compatible with PVC pipe ends.
- C. The strength class of fittings shall be no less than the strength class of any adjoining pipe.
- D. PVC fittings shall, at a minimum, conform to the requirements of ASTM D 3034 as they apply to type SDR-26 PVC Sewer Pipe using an Elastomeric Gasket Joint in a bell and spigot assembly system. Rubber sealing gaskets shall meet the requirements of ASTM F 477.
- E. All PVC pipe entering or leaving a concrete structure shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated perpendicular to the pipe axis, around the pipe banded and cast into the structure base or near the structure wall center as a water stop. Said water stop may also consist of a manhole coupling with rubber sealing rings cast into the structure base (see DWG 20-05).

2.4 RESTRAINED JOINTS FOR C900 PVC PIPE

All restrained joints used in sanitary sewer applications shall meet or exceed the requirements of ASTM F 1674. All restrained joints shall be per the *Approved Materials List*.

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- B. Work shall meet the specified requirements of these Specifications unless the requirements of the local agency having jurisdiction are greater, in which case the greater requirements shall govern.

3.2 INSTALLATION

PVC pipe shall be installed in accordance with the requirements of ASTM D 2321; as specified herein and shown on the Plans.

3.3 HORIZONTAL CURVES

Horizontal curves shall be installed using straight pipe segments, each a minimum of five feet in length and joint deflections or fittings in accordance with the requirements of *DWG 21-01*, or with forced bends where the radius of the curve exceeds the minimums specified in the table below:

SDR-26 PVC Pipe (Forced Bends)				
Pipe Diameter	4"	6"	8"	10"
Minimum Radius	135'	200'	260'	322'

3.4 FIELD JOINTING

- A. Each pipe compression-type joint shall be joined with a lock-in rubber ring and a ring groove that is designed to resist displacement during pipe insertion.
- B. The ring and the ring seat inside the bell shall be wiped clean before the gasket is inserted. A thin film of lubricant shall be applied to the exposed surface of the ring and to the outside of the clean pipe end. Lubricant other than that furnished with the pipe shall not be used.
- C. Joints shall not be deflected either vertically or horizontally in excess of the printed recommendations of the pipe manufacturer.

- END OF SECTION -

Section 33 05 31.33 - Acrylonitrile Butadiene Styrene (ABS) Pipe

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install ABS pipe and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals
- C. Section 33 31 00 - Sanitary Sewerage Piping

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM D 1527	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
ASTM D 2235	Standard Specification for Solvent Cement for Acrylonitrile Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D 2680	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings

1.4 QUALITY ASSURANCE

- A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- B. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 GENERAL

Products shall be per the *Approved Materials List*.

2.2 PIPE AND FITTINGS

- A. Composite ABS pipe and fittings shall conform to the requirements of ASTM D 2680.

- B. All ABS solid wall pipe and fittings less than 6" in diameter (side sewer) shall, at a minimum, conform to the requirements of ASTM D 2751 and D 1527 as they apply to schedule 40 ABS sewer pipe respectively using solvent cement joint assembly systems.

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 INSTALLATION

- A. Cement used for all ABS pipe joints shall conform to the requirements of ASTM D 2235. Jointing shall be accomplished by applying a coating of cement to the inside of the socket and to the outside of the spigot end of pipe to be joined in sufficient quantity that when the spigot is fully inserted into the socket a bead of excess cement will form around the entire circumference of the outside juncture of the said spigot and socket. Excess cement shall then be removed.
- B. The Contractor shall apply a coating of cement to all pipe ends of ABS composite pipe whether within a coupling or not. The purpose is to prevent migration of groundwater into the annular space.
- C. All ABS pipe entering or leaving a concrete structure shall have a standard (water stop) manhole gasket, as supplied by the pipe manufacturer, firmly clamped around the pipe exterior and cast into the structure base or near the structure wall center as a water stop.

3.3 REPAIRS

When repairing an ABS composite pipe a standard chemically welded coupling is required for each joint. Cut each coupling at a 45° angle with a narrow-bladed saw and deburr the edges. Each pipe shall be cut square and deburred. A minimum of a 2-foot piece of pipe shall be used. With 2 straps placed loosely on the edges of each repair joint, apply primer and cement to inside of the coupling and outside of the ABS pipe at each joint. Center the coupling around the repair joint placing the cut upward. Tighten the straps around the coupling allowing the coupling to slide such that there is a tight fit around the ABS pipe. Finally, dip fiberglass tape into the primer and lay over the cut applying cement over the strip. Do not apply test pressures internally or externally for 16 hours, but install bedding and backfill immediately.

- END OF SECTION -

Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install high-density polyethylene pipe (HDPE) and all appurtenances as specified, complete in place, as shown on the Plans, as specified in this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*. The HDPE pipe and fittings specified herein shall be used only in association with pipe bursting methods and directional drilling construction methods unless otherwise approved by Central San.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 00 - Sanitary Sewerage Piping
- C. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM D 638	Test Method for Tensile Properties of Plastics
ASTM D 696	Test Method for Coefficient of Linear Thermal Expansion of Plastics
ASTM D 746	Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 1238	Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D 1248	Specification for Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1505	Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D 1525	Test Method for Vicat Softening Temperature of Plastics
ASTM D 1693	Test Method for Environmental Stress-Cracking of Ethylene Plastics
ASTM D 2240	Test Method for Rubber Property - Durometer Hardness
ASTM D 2837	Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
ASTM D 3350	Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM F 585	Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers

ASTM F 714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

PLASTICS PIPE Renewing Sewers with Polyolefin Pipe Industry (PPI)

1.4 QUALITY ASSURANCE

- A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- B. Submittals and testing shall be done in compliance *Section 33 01 30.11 - Inspection of Sewers.*

Part 2 – Products

2.1 GENERAL

Referenced pipe sizes are nominal pipe diameters.

2.2 PIPING MATERIALS

- A. Pipe and fittings shall be high density, high molecular weight polyethylene with a cell classification of 345434D, as defined in ASTM D 3350 and shall be colored white or light gray. In addition, the material shall be listed by the Plastic Pipe Institute with a designation of PE 3408 and shall be classified as a Type III, Class C, Category 5, Grade P34 material, as defined in ASTM D 1248.
- B. Fittings shall be of the same material and class as the pipe. Identification of pipe and fittings shall be in accordance with ASTM D 3350. Pipe and fittings shall be made from virgin material. No rework compound, except that obtained from the manufacturers own production of the same formulation, shall be used. Pipe and fittings shall be homogeneous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- C. Dimensions of pipe and fittings shall be in accordance with ASTM F 714. Pipe and fittings shall be at minimum SDR-17 with cast iron/ ductile iron outside diameter and have a minimum pressure rating of 100 psi at 73.4°F.
- D. The physical properties of the pipe and fittings material shall be as follows:

PROPERTY	TEST METHOD	VALUE
Density	ASTM D 1505	0.955 gm/cc
Melt Index	ASTM D 1238	0.14 gm/10 min
Environmental Stress-Cracking Resistance ^a	ASTM D 1693	> 5,000 hr > 800 hr
Tensile Strength, Yield ^b	ASTM D 638	3,200 psi
Elongation at Break ^c	ASTM D 638	> 750 percent
Vicat Softening Temperature	ASTM D 1525	257° F
Brittleness Temperature	ASTM D 746	< -180° F
Flexural Modulus	ASTM D 3350	125,000 psi

PROPERTY	TEST METHOD	VALUE
Modulus of Elasticity	ASTM D 638	105,000 psi
Hardness	ASTM D 2240	65 Shore D
Coefficient of Linear Thermal Expansion ^d	ASTM D 696	8.3x10 ⁻⁵ in/in/°F 1.2x10 ⁻⁴ in/in/°F
Long Term Strength ^e	ASTM D 2837	1,600 psi 800 psi

a - Condition A, B & C @ 0°F; Compressed Ring @ 50°F

b - Type IV specimen

c - Type IV specimen

d - Molded specimen; Extruded pipe

e - @ 73°F; @ 140°F

2.3 JOINTS

- A. Joints in HDPE pipe shall be made using thermal butt-fusion welding equipment designed for the specific purpose of permanently connecting HDPE pipes. This equipment shall be capable of squarely facing the pipe ends to be joined, properly heating each pipe end to the temperature range specified by the pipe manufacturer, and applying and sustaining the appropriate pressure, as recommended by the pipe manufacturer. Test joints may be requested at the Inspector's discretion to ensure the quality of the joints.
- B. Internal beads shall be removed for all sewers.
- C. For main sewer installation, the butt-fusion welding machine shall be outfitted with a measuring and recording unit that documents the conditions existing during the fusion of each individual weld. A printout that includes the date and time each joint was made, the joint number, the initials of the machine operator, the platen temperature at the time of mating, the pressure during the heating cycle, the time period for the heating cycle, the pressure during the soak cycle, and the time period of the soak cycle shall be machine-generated and delivered to Central San at the end of each work shift, if required by the Inspector. The recording unit shall be a **DataLogger, as manufactured by McElroy Manufacturing, Inc., or approved equal.**
- D. Fusion equipment shall be operated by technicians who have been certified by a major gas public utility such as Pacific Gas and Electric or Southern California-Edison for operation of such equipment. A copy of the technician's certification shall be provided to Central San prior to the start of the work, if requested by the Inspector. Furthermore, all technicians performing butt-fusion welding on this project shall have a minimum of 2 years' experience operating the same equipment used hereon.
- E. Butt-fusion welding equipment shall be as follows, or approved equal:

1. McElroy No. 412 Hydraulic Fusion Machine, McElroy Manufacturing, Tulsa, Oklahoma.
2. Proweld Field 12 (315)-R, Asahi/America, Malden, Massachusetts.

2.4 *FITTINGS*

- A. The Contractor shall provide fabricated fittings where required. Fabricated fittings shall be of the same material as, and shall have a minimum pressure rating equal to, the pipeline material. If the fitting is in-line with the pipeline (i.e., a flange adapter), then the I.D. of the fitting shall be the same as the pipe. If the fitting is off-line (i.e., a tee), then the fitting shall have an I.D. in accordance with the Plans. Unless otherwise required, all fittings shall be butt-fusion welded or flanged.
- B. Terminations to pipe or fittings made of other pipe materials shall be made by using flanges. Flanges shall consist of flange adapters butt-fusion welded to the HDPE pipe end, ductile iron back-up rings with a pressure rating of at least 150 psi, Type 316 stainless steel bolts, nuts and washers, and 1/8" thick, black-reinforced rubber gaskets. In no case shall threaded fittings or adapters be used to connect HDPE materials.

Part 3 – Execution

3.1 *GENERAL*

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 00 - Sanitary Sewerage Piping* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 *HANDLING AND STORAGE*

1. The Contractor shall inspect each pipe and fitting prior to butt-fusion welding and again prior to installation. Any damaged pipe or fittings shall be replaced by the Contractor.
2. Prior to butt-fusion welding or installation, each pipe or fitting shall be thoroughly cleaned and shall be kept clean. The material used to clean the pipe and fittings shall be as recommended by the pipe manufacturer.

3.3 *BUTT-FUSION WELDING*

- A. Butt-fusion welds shall be performed in accordance with manufacturer's instructions.
- B. For main sewer installations, the Contractor shall mark each joint with the individual joint number, corresponding to the joint identification number appearing on the printout of the data logger attached to the butt-fusion

welding machine. The printout shall be attached to the pipe near the joint for collection by Central San.

- C. Contractor shall remove the internal melt bead from the welded joint and shall be accomplished in a manner that does not score or gouge the pipe.

3.4 PIPE DEFLECTION

Horizontal curves shall be installed by forced bending of the pipe. Minimum curvature radius requirements for HDPE pipe are shown on the table below. All designs of curvilinear sewers are subject to approval by Central San.

Pipe DR	Minimum Curve Radius
≤ 9	20 times pipe O.D.
> 9 - 13.5	25 times pipe O.D.
> 13.5- 21	27 times pipe O.D.
> 21	30 times pipe O.D.
Fitting or flange present in bend	100 times pipe O.D.

3.5 FIELD COUPLINGS

- A. Fittings/joints that are to be assembled after pipe bursting or directional drilling has been completed shall be butt fused where accessible.
- B. Electrofusion couplings listed in the *Approved Materials List* shall be used on inaccessible locations.
- C. Saddles used for taps shall be per the *Approved Materials List*.

- END OF SECTION -

Section 33 05 39.41 - Reinforced Concrete Pipe (RCP)

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install reinforced concrete sewer pipe (RCP) and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and *Section 33 31 00 - Sanitary Sewerage Piping*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 00 - Sanitary Sewerage Piping

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:

ASTM C 76	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C 150	Specification for Portland Cement
AWWA C 302	Reinforced Concrete Pressure Pipe, Non-cylinder Type, for Water and Other Liquids

1.4 CONTRACTOR SUBMITTALS

- A. Certificates guaranteeing that the pipe furnished hereunder is in compliance with the requirements of these Specifications and the referenced standards.
- B. Quality control records as required herein.
- C. Detailed fabrication including pipe designs, special pipe, dimensions, weights, joint details, laying diagrams and a fabrication schedule. Drawings shall indicate, at relative scale, concrete covers, reinforcement placements, joint assembly design, the design pipe size, D-load, cement type, concrete strength and areas, and types and placements of reinforcement.
- D. Three-edge bearing test results. Results shall indicate the Central San assigned project number, agency and operator performing the test, date, pipe size and specified D-load and ultimate test load applied. The ultimate test load applied shall not exceed 110% of the specified D-load.
- E. Fabrication plant joint leakage testing results.

1.5 QUALITY ASSURANCE

- A. For concrete pipes of 30" inside diameter and larger, each pipe joint shall be inspected by the Contractor from the inside of the installed piece of pipe before backfilling and before the next piece of pipe is connected. The inspection shall include the checking of proper joint gaps and gasket placement, and damaged or chipped joints. The Contractor shall verify the deflection at each joint by comparing the width of gaps at the top and bottom

and each side of each joint. Gaps exceeding manufacturer's maximum/minimum allowable limits and/or with potentially rolled or pinched gaskets shall be corrected before the next piece of pipe is installed. If a pipe section, which has previously been installed, is moved or dislodged in the process of installing the next pipe section, those pipe joints which have been previously checked and which may have been affected by the moving or dislodging shall be rechecked. In addition, at the completion of each pipe installation day, the Contractor shall again inspect the inside of the pipeline installed that day for potential problems that may have developed since the individual joint inspections. The Contractor shall correct all excessive gaps and potential problems that may affect the passing of the leakage test before any more pipes are installed.

- B. The Inspector may participate in any or all of the alignment checks or interior pipe inspections. The Central San's inspection, if implemented, will be for general compliance only and will not relieve the Contractor from being fully responsible for the overall installation quality including the proper alignment, grades, and the passing of the specified leakage test. The Contractor shall provide all necessary access and safety equipment that will assure a safe work area and facilitate the inspection process for the Inspector.
- C. Central San reserves the right to reject the repairing of pipe joints needed to pass the specified leakage test. Such repairs may be allowed only at the Inspector's discretion, and may require the installation of exterior concrete collars designed for leakage and settlement in addition to interior repairs, or other approved equivalent repair methods to ensure the integrity of the pipeline for the full design life. Repair of chipped joints, if approved by Central San, shall be made after the passing of the specified leakage test, as approved by Central San.
- D. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- E. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 PIPE MATERIALS

- A. All pipe sizes refer to the nominal inside diameter of pipe (including any pipe linings) and no pipe, except where specified herein, shall be more than 3/8" smaller than the nominal size designated. All pipe, joints incorporated into the pipe, and manufactured fittings connecting pipe between structures shall be fabricated by one and only one manufacturer and be of the same type, quality, class, and size unless otherwise specified or shown. Jointing of pipe dissimilar in size and/or material shall be accomplished at structures. All field cut pipe shall be accomplished by methods and equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted. All pipe

and fittings delivered to the jobsite shall be properly marked by the manufacturer with, at a minimum, the manufacturer's name, piece number, pipe diameter, class (or D-load) and date of manufacture. All elliptically reinforced pipe shall also be marked with a "field top" designation.

B. Reinforced Concrete Sewer Pipe with Flared or Flush Bell and Spigot Joint: All reinforced concrete pipe and fittings shall conform to the requirements of ASTM C 76 and as modified herein:

1. Materials shall comply with the appropriate ASTM designation under which the subject pipe is to be manufactured, modified as specified hereunder:
 - a) Cement used in the manufacture of RCP shall be Type II in conformance with ASTM C 150.
 - b) No admixtures shall be introduced to concrete mixes.
 - c) Rubber for gaskets shall be neoprene and shall comply with the requirements of AWWA C 302.
 - d) Aggregates used shall consist of granitic, calcareous or combinations.
2. Design shall comply with appropriate ASTM designation under which the subject pipe is to be manufactured and as modified herein.
 - a) In no case shall pipe be less than that specified under ASTM C 76 provisions for Class III, Walls "B" or "C". Wall "A" shall not be acceptable.
 - b) Total concrete cover of reinforcement at the inner wall, (clearance of steel surface to inner wall surface), nominal 1-1/2", regardless of pipe diameter size or type and placement configuration of reinforcement. Minimum concrete cover at the outer wall shall not be less than 1".
 - c) Joint design for 30" diameter and larger pipe shall be reinforced concrete bell and spigot incorporating a fully-retained, double rubber gasketed joint with a 1/2" diameter Schedule 40 PVC testing tube extending from the inside of the pipe into the annular space between the two gaskets. A removable plastic screw-in plug shall be provided to protect the tube opening. Position of the testing tube shall be at the spring line of the pipe.
 - d) RCP for tunneled installations shall be double spigot type with Type 316 stainless steel joint band. The minimum thickness of the Type 316 stainless steel joint band shall be 1/2" unless a greater thickness is required by the Contractor for the tunnel and jacking operation.
3. PVC lined reinforced concrete pipe shall be manufactured by the vertically cast process, utilizing stationary inner and outer forms. Vertically cast pipe shall be wet cast, vibrated, steam cured, and shall remain in the forms for a minimum of 6 hours. Pipe manufactured by the "Dry Cast" method is

unacceptable. Fabrication of centrifugally spun and vertically cast pipe shall be in accordance with AWWA C 302 and as modified herein:

- a) Form oils or release agents shall not contain any material or substances that would penetrate or otherwise retard concrete set at the formed surface.
 - b) The steel forms shall be placed horizontally in a machine capable of spinning the forms at speeds that will produce concrete meeting or exceeding the concrete strengths required under the appropriate ASTM standard for the subject pipe specified.
4. Pipe fabrication plant and field hydrostatic joint leakage testing shall be in accordance with the following minimum criteria:
- a) All pipes shall be subject to a D-load test by the manufacturer. Three-edge bearing test loads shall be applied to the extent that no greater than a 0.01-inch crack is produced in tested pipe sections.
 - b) Applied test loading may be terminated without producing a 0.01-inch maximum crack if or when such loading has reached 110% of that required for and relative to the specified D-load for the subject pipe. Central San may select at random and test as specified in ANSI/AWWA C 302. The cost of the pipe and the tests shall be borne by the Contractor. Pipe will be acceptable under the test requirements specified herein when all test specimens conform to the test requirements, the manufacturer will be allowed to retest 2 additional specimens for each specimen that failed, and the pipe shall be acceptable only when all of the retest specimens meet the strength requirements.
 - c) Fabrication plant joint leakage testing shall be performed in accordance with AWWA C 302. The pipe test pressure shall be a minimum head of 25 feet.
5. Pipe minimum and maximum lengths, except where required otherwise shall be in accordance with AWWA C 302.
- C. The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by Central San or its assignee. Pipe shall be substantially free of fractures and internal surface roughness. The ends of the pipe shall be normal to the walls and centerline of the pipe, within the limits of variations given in ASTM C 76. Pipe shall be subject to rejection for failure to conform to any of the specification requirements. Central San's decision regarding rejection of the pipe shall be final and the rejected pipe shall be immediately removed from the jobsite and replaced at the Contractor's cost. Individual sections of pipe may be rejected for any of the following defects:

1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
2. Defects that indicate proportioning, mixing, and molding not in compliance with ASTM C 76.
3. Spigot and/or bell surface and/or dimensional irregularities which may impede assembling the joint or affect leak tightness.
4. Surface defects indicating honeycomb, rock pockets or open texture.
5. Damaged or cracked ends where such damage would prevent making a satisfactory joint.
6. Any continuous crack having a surface width of 0.01" or more and extending for a length of 12" or more, regardless of position in the wall of the pipe.

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Part 1 - General*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 PIPE INSTALLATION

- A. RCP shall be installed in accordance with the Manufacturer's recommendations and the additional requirements of this Section.
- B. Bell holes shall be excavated at each joint to provide full-length barrel support of the pipe and to prevent point loading at the bells or couplings.
- C. Pipe bedding or trench subgrade beneath the pipe shall be compacted and graded to provide a uniform and continuous support beneath the pipe at all points between the bell holes or pipe joints.
- D. Unless otherwise required, all pipes shall be laid straight between changes in alignment and at uniform grade between changes in grade. Where lined reinforced concrete pipe is specified, it shall be installed with the unlined area of the pipe circumference centered on the invert. For pipes with elliptical reinforcement, the pipe shall be placed with the minor axis of the reinforcement in a vertical position.
- E. For standard beveled pipes where it is necessary to defect the pipe joint to achieve the required line or grade, the amount of joint "pull" shall not exceed the pipe manufacturer's recommendation. Pipes installed in straight lines or grades shall have a uniform end gap all around the pipe joint.

3.3. PIPE DEFLECTION

Horizontal Curves shall be installed in straight pipe segments and joint deflections or fittings in accordance with *DWG 21-01*. Minimum curvature radius requirements for RCP pipe are shown on the table below. All designs of curvilinear sewers are subject to approval by Central San.

Allowable Deflection Per Joint	Segment Length	Minimum Radius
1.2 Degree Joint Deflection	8'0"	400 ft.

3.4 JOINTS

- A. Care shall be taken to avoid dragging the spigot on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects.
- B. Joint mating surfaces shall be cleaned immediately prior to jointing.
- C. After the subgrade has been prepared as specified, the rubber gaskets shall be placed in the groove(s) on the spigot ring, and the spigot end of the pipe then centered into the bell of the adjoining pipe and pushed into position. Care shall be taken to avoid twisting or cutting the gasket(s) when jointing the pipe. The inside surface of the bell, the gasket groove(s) and the gasket(s) shall be lubricated immediately prior to jointing with a compound recommended by the manufacturer which will facilitate the telescoping of the joint.
- D. After the pipe joint is made, the Contractor shall check proper gasket(s) placement with a feeler gauge supplied by the pipe manufacturer for such testing. Where joint placement is found to be improper, the tested pipe section shall be first removed, the gasket(s) checked for defects due to manufacturing error, a new gasket(s) installed if necessary, the pipe re-laid, and the gasket(s) placement rechecked.

3.5 TRENCH LOAD

- A. Trench load calculations and design shall reflect the following minimum criteria:
 - 1. Maximum trench width of 24" greater than the outside diametric dimension (O.D.) of the pipe barrel not including bells and a backfill density relative to that anticipated but, in all cases, not less 120 pounds per cubic foot.
 - 2. A dead load factor not greater than 1.9 for bedding shown and specified under *DWG 20-01* through *20-03*.
 - 3. Live load and impact factors relative to that anticipated but, in all cases, not less than that produced by using AASHTO H-20 load criteria and an impact factor of 1.5.
 - 4. A safety factor of not less than 1.5.

- END OF SECTION -

Section 33 05 41 - Vitrified Clay Pipe (VCP)

Part 1 – General

1.1 THE REQUIREMENT

The Contractor shall furnish and install vitrified clay pipe (VCP) and all appurtenances as specified, complete and in place, as shown on the Plans, as specified in this Section and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals* and *Section 33 31 00 - Sanitary Sewerage Piping*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 01 30.11 - Inspection of Sewers
- B. Section 33 31 00 - Sanitary Sewerage Piping
- C. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ASTM C 12	Practice for Installing Vitrified Clay Pipe Lines
ASTM C 301	Test Methods for Vitrified Clay Pipe
ASTM C 700	Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated

1.4 CONTRACTOR SUBMITTALS

Upon request by Central San, the Contractor shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section, as specified in the referenced standards.

1.5 QUALITY ASSURANCE

- A. All pipes shall be subject to a hydrostatic pressure test and a 3-edge bearing test at the manufacturer's plant.
- B. All pipe and fittings shall be true, circular, and concentric with the barrel of the pipe, on a plane at right angles to the longitudinal axis of the pipe. At no point shall the thickness of the pipe spigot be less in thickness than the shell of the main body of the pipe. Socket ends shall be square with the longitudinal axis and shall be true, circular and concentric with the barrel of the pipe.
- C. All pipe and fittings shall have smooth interiors and shall be free from injurious cracks, checks, blisters, broken extremities or other imperfections.
- D. Pipe shall be subject to rejection for failure to conform to any specification requirement. Central San's decision regarding rejection of the pipe shall be final and the rejected pipe shall be immediately removed from the jobsite and replaced at the Contractor's cost. Individual sections of pipe may be rejected for any of the following defects:

1. A single crack in the pipe or fitting extending through the entire thickness, regardless of the length of such crack; a single crack which extends through one-fifth (1/5) of the barrel thickness and is over 2" long. Any surface firing crack that is more than 1/32" wide at its widest point.
 2. Lumps, blisters, pits, or flakes on the interior surface of a pipe or fitting.
 3. When spigot or bell of the pipe varies from a true circle more than 3% of its nominal diameter.
 4. Any piece broken from the spigot end that extends through the barrel.
 5. Tramp clays, grog, or other foreign matter fused to the exterior or interior surface of the pipe or fittings.
- E. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.
- F. Submittals and testing shall be done in compliance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 – Products

2.1 PIPE AND FITTINGS

Clay pipe and fittings shall be extra strength, glazed, unless otherwise shown, and shall conform to the requirements of ASTM C 700.

2.2 JOINTS

Joints in vitrified clay pipe shall be made up using a factory-made bell and spigot compression joint, or a coupling listed in the *Approved Materials List*.

Part 3 – Execution

3.1 GENERAL

- A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and *Section 33 31 00 - Sanitary Sewerage Piping*.
- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 INSTALLATION OF VCP

- A. Installation of pipe shall be in accordance with ASTM C 12. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, supported along the full length of the pipe section, and immediately before joining the pipe, the ends of the pipe to be joined shall be cleaned and the rubber gasket lubricated, all

in accordance with the pipe manufacturer's written instructions. Assembly of the pipe length shall be in accordance with the recommendations of the manufacturer. All special tools and appliances required for joining the pipe shall be provided by the Contractor. When cutting or machining of the pipe is necessary, only tools and methods recommended in writing by the pipe manufacturer and approved by Central San shall be employed.

- B. All necessary precautions shall be taken to prevent uplift or floating of the pipe prior to the completion of the backfilling operation. The Contractor shall assume full responsibility for any damage due to this cause and shall restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

3.3 PIPE DEFLECTION

Horizontal curve layouts shall be done as shown on *DWG 21-01*. Minimum curvature radius requirements for VCP pipe are shown on the table below.

Nominal Pipe Diameter (inches)	Max. Allowed Deflection (Degrees)	Equation for Minimum Radius (L= Pipe Length)	r (feet) Minimum Radius of Curvature, for Pipe Length (L) of:			
			4'	6'	8'	10'
4 to 12	2.4	$r = 24.0(L)$	96	144	192	~
15 to 24	1.8	$r = 32.0(L)$	128	192	256	320
27 to 36	1.2	$r = 48.0(L)$	192	288	384	480
39 to 48	0.9	$r = 64.0(L)$	256	384	512	640

3.4 MANHOLES

VCP entering and leaving manholes or other structures shall have 2 standard joints within 3 feet of the manhole base. One joint shall be incorporated in the manhole base or installed immediately adjacent to the manhole base and there shall not be less than 12" between the 2 joints (see *DWG 19-05*).

- END OF SECTION -

Section 33 31 00 - Sanitary Sewerage Piping

Part 1 - General

1.1 THE REQUIREMENT

- A. The Contractor shall furnish all pipe, fittings, tools, materials and labor required to install and test sanitary sewers, in accordance with these Specifications.
- B. Pipe materials and installation procedures shall be in accordance with the pipe manufacturer's recommendations unless otherwise specified in these Specifications.
- C. For a particular sewer installation, pipe and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class and size.
- D. Joining of pipe dissimilar in size and/or material shall be accomplished either by use of an Expansion Block as detailed in DWG 21-04, or by use of special adapters or couplings listed on the *Approved Materials List*.
- E. Where field cuts are required, the Contractor shall use tools and/or equipment recommended by the pipe manufacturer. No hammer nor chisel cuts will be permitted.
- F. All pipe and fittings delivered to the jobsite shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements of these Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Part VI Standard Drawings
- B. Section 4 Design Criteria
- C. Section 8 Design Criteria
- D. Section 09 90 00 - Painting and Coating
- E. Section 31 23 16 - Excavation, Bedding and Backfill
- F. Section 33 01 30.11 - Inspection of Sewers
- G. Section 33 05 19 - Ductile Iron Pipe (DIP)
- H. Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe
- I. Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Commercial Standards:
 - ANSI/ASME B1.20. Pipe Threads, General Purpose (inch)
 - ANSI/AWS D1.1 Structural Welding Code
- B. Codes:
 - Cal/OSHA Construction Safety Orders

1.4 QUALITY ASSURANCE

- A. Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, Central San shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with these Specifications.
- B. Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. The manufacturer shall perform all tests at its own cost.
- C. All installed pipe shall be cleaned and tested in accordance with *Section 33 01 30.11 - Inspection of Sewers*.

1.5 MANUFACTURER'S SERVICE REPRESENTATIVE

Where the assistance of a manufacturer's service representative is required, in order to obtain compliance for pipe joints, supports, or special connections, the Contractor shall arrange for such assistance.

1.6 MATERIAL DELIVERY, STORAGE AND PROTECTION

All piping materials, fittings, valves, and accessories shall be delivered in a clean undamaged condition and stored off the ground. All pipe and appurtenances shall be protected from damage by sunlight, moisture, corrosive materials, equipment, and other sources. All defective or damaged pipe or appurtenances shall be removed from the jobsite and replaced with new materials.

Part 2 - Products

2.1 GENERAL

- A. Pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Section for the particular pipeline material being used and the *Approved Materials List*.
- B. See *Subsection 8-04* for additional requirements.
- C. Referenced pipe sizes are nominal pipe diameters.
- D. Application of pipe coatings shall be in accordance with the requirements of the applicable Section of these Specifications for the particular pipe material being used and *Section 09 90 00 - Painting and Coating*.

2.3 WYES

Sewer lateral bends shall be made with sewer Combination Wye and (1/8) Bends – not with sanitary tees.

Part 3 - Execution

3.1 GENERAL

- A. Line & Grade: Sewer pipelines shall be constructed to the alignment and grade shown on the Plans, and in compliance with these Specifications.

- A. Clearances: Clearance from other utilities and improvements shall comply with *Subsection 8-07*.
- B. Material/Cover: Pipe material and cover shall comply with *Subsection 8-08*.
- C. Surveying: The grade line shall be established by setting cut stakes in compliance with *Section 11-03* before trench excavation is started. During pipe installation, the Contractor shall continuously utilize an industrial-standard laser grade control system to confirm that the pipe is installed to the design grade, subject to the following requirements:
 - 1. The Contractor shall provide a properly calibrated laser instrument and an operator who is qualified and trained in the operation of the particular laser instrument being used.
 - 2. Laser control points shall be established benchmarks or construction cut stakes identified on the approved cut sheets.
 - 3. Laser shall contain a direct grade reading screen, which will allow the Inspector to verify the grade at all times.

3.2 *INSTALLATION*

A. General

- 1. Sewer pipelines shall be laid upgrade from the point-of-connection to the existing sewer with the bell end at the upgrade end of each pipe length.
- 2. Sewer pipes, branches, stubs, or other open ends which are not to be immediately connected, shall be plugged or capped.
- 3. Where it becomes necessary to modify the design pipe alignment to resolve conflicts, the Contractor shall propose a revised alignment to the Inspector who may allow installation per the revised alignment or may require that the revision be submitted to the Job Engineer for consideration. Such revision may be made by the deflection of joints, by the use of fittings or by forced bending of the pipe if permitted, however, in no case shall the deflection in the pipe or at any joint exceed the maximum deflection recommended by the pipe manufacturer.
- 4. The Contractor shall take all necessary precautions to prevent excavated or other foreign material from getting into the pipe during the laying operations. At all times when laying operations are not in progress and at the close of the day's work, the openings of all pipe and specials, whether in the trench or in storage, shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance.

B. Open-Cut:

- 1. Pipe shall not be laid when the Inspector determines that the condition of the trench is unsuitable.

2. If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than the required minimum cover specified pipe material and type, the pipe shall not be laid until the area has been properly filled and compacted to a level at least equal to required minimum cover above the proposed pipe, unless otherwise authorized by the Inspector.
 3. If field conditions in areas that are potentially unstable or subject to settlement warrant, the Inspector may require that the Contractor substitute a different pipe material/type for the pipe shown on the Plans.
 4. Pipe, fittings, and appurtenances shall be carefully handled and protected against damage, impact shocks, and free fall. Pipe shall be stored in a manner which will protect it from damage at the trench site or elsewhere. The Contractor shall inspect each pipe and fitting prior to installation to determine that only undamaged material is installed.
 5. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance and shall be kept clean at all times thereafter.
 6. Non-marring slings shall be used for lowering each length of pipe into the trench (chains shall not be used). The pipe shall be laid on properly compacted bedding material as specified in *Section 31 23 16 - Excavation, Bedding and Backfill*. No blocking will be permitted, and the pipe shall have full bearing for its entire length between bell holes excavated in said bedding material to prevent point loading at the bells or couplings and to allow for unobstructed assembly of all joints. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints. After jointing is completed, bell holes shall be backfilled with properly compacted bedding material, taking care not to damage, move, or lift the pipe from its bedding support.
 7. The Contractor shall prevent the pipe from floating during and after its installation.
 8. Warning Tape Installation: See *Section 31 23 16 - Excavation, Bedding And Backfill* for warning tape requirements.
- C. Alternative Installation Methods: Unless otherwise indicated on the Plans, sewers shall be installed by the open-cut method. Alternate methods of installation may be proposed by the Applicant during the permit application process and subject to the following:
1. Horizontal Directional Drilling (HDD)
 - a) Marked utilities within 10' of centerline shall be potholed.
 - b) Cut stakes shall be placed at 20-foot intervals along the proposed centerline of the pipe alignment.

- c) The installed pipeline shall be within 6" horizontal and 1" vertical of the alignment indicated in the Plans at all locations. In addition, for gravity sewers the pipeline shall be free draining throughout.

2. Boring and Jacking

- a) The annular space between the carrier pipe and the casing shall be filled with grout or silica sand.
- b) Marked utilities within 10' of centerline shall be potholed.

3. Pipe Bursting

- a) Marked utilities within 10' of centerline shall be potholed.
- b) The Contractor shall fully expose the main sewer where a lateral is to be replaced to within 4' of its point-of-connection to the main sewer, so that the point-of-connection can be inspected.
- c) When the Contractor proposes to pull through bends greater than 45), the existing pipe shall be exposed to allow a minimum radius of 2 feet at bends. Realigned pipe shall be properly bedded and backfilled in accordance with *Section 31 23 16 - Excavation, Bedding and Backfill* after bursting.
- d) The pipe shall be pulled a minimum of 2 feet beyond the planned connection to allow inspection of the condition of the pipe (e.g., for scarring or other damage) and removal of approximately 4" where bulging occurs around the bursting head.
- e) Connections to existing pipes in insertion and receiving pits shall employ fittings or couplings listed in the *Approved Materials List*. Prior to making connection at each end of an installed reach of pipe with fittings or couplings, the Contractor shall allow a minimum of 6 hours to elapse to allow pipe to relax from the tension resulting from pulling the pipe and for the pipe to equalize with ambient ground temperature.

4. Cured-In-Place Pipe (CIPP)

- a) The Contractor shall obtain a *Central San Special Discharge Permit* if it proposes to discharge CIPP process wastewater to the public sewer system. Process wastewater shall not be discharged to storm drains, gutters watercourses, swales, impoundments or onto the ground.

3.3 CONNECTIONS TO EXISTING SEWERS

- A. Connections shall be made in compliance with *Subsection 8-06*.
- B. Existing sewers are shown on the Plans at the locations where new sewers are to be connected. It is the responsibility of the Contractor to determine the exact location and depth of the existing sewers prior to the installation of any

sewer pipe. New pipe shall be plugged with mechanical plugs until further connection is necessary.

- C. Connection of new main and/or trunk sewers to existing lines up to and including 48" in diameter shall be made at existing manholes or by constructing a new manhole over the point-of-connection, or by removing an existing rodding inlet or plug and extending new pipe of the same diameter, material and class from the point-of-connection.
1. Where the connection is to be made into an existing manhole, the Contractor shall make the connection by core-drilling through the manhole shelf to the existing channel, installing the new pipe, finishing a new channel within the manhole and repairing any damage to the structure.
 2. Where the connection is to be made by constructing a new manhole on an existing sewer, the manhole and new connection shall conform to the details shown in *DWG 19-01* through *19-06*. The existing sewer shall be kept intact until immediately before the cleaning and flushing operation for the new sewer is to begin.
 3. Where the connection is to be made at a removed rodding inlet or plug, the existing piping shall be cut square and ends properly prepared for the connection shown and an air test fitting shall be installed at the connection of new and existing pipelines.
 4. All new pipe shall be plugged with an approved mechanical plug and mortar until the line is completed and ready for testing.
- D. Side Sewer Connections to Main Sewers: See *Section 4-05* and *Section 33 31 16 - Sanitary Sewer Gravity Service Laterals*.

3.4 REPAIRS TO EXISTING SIDE SEWERS AND MAINS

- A. Repairs to main sewers and trunk sewers 16" or less in diameter shall be made using pipe and fittings specified in *Section 33 05 19 - Ductile Iron Pipe (DIP)*, or *Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe*.
- B. When repair of a damaged section of pipe is required within 18" of a pipe joint, the replacement section shall extend to and include the joint.
- C. Where repair couplings are permitted, only couplings listed in the *Approved Materials List* shall be used.
- D. The Inspector may require replacement of broken, damaged, or improper pipe or fittings discovered during sewer repair or replacement work.

3.5 REPAIRS TO NEW MAIN SEWERS

- A. If damage to the new main sewer pipe is identified during inspection, testing or televising, the Contractor shall repair the damage or replace the pipe as instructed by the Inspector. When repair of a damaged section of pipe is

required within 18" of a pipe joint, the replacement section shall be extended to include the joint. Repair procedures shall comply with the following:

1. VCP and DIP MAIN SEWERS – Manufacturer's recommended couplings shall be used. The damaged pipe shall be removed by squarely cutting out the damaged section. The replacement pipe shall be squarely cut approximately $\frac{1}{2}$ " shorter than the missing section. The repair couplings shall be placed onto the pipe ends, the replacement assembly inserted into the gap, the repair couplings moved to be centered over each new joint, and the fasteners or bands tightened as required.
 2. ABS TRUSS and PVC TRUSS MAIN SEWERS - A standard chemically welded coupling strap is required for each joint. Use a narrow-bladed saw to cut each coupling strap at a 45° angle to the centerline of the pipe and deburr the edges of the cuts. The replacement pipe shall be a minimum of 2 feet in length, shall be squarely cut approximately $\frac{1}{2}$ " shorter than the removed section, and its ends shall be deburred. With the 4 coupling straps placed loosely on the edges of each repair joint, apply primer and cement to the inside of the coupling strap and the outside of the pipe ends at each joint. Center the coupling strap on the joint placing the cut upward. Tighten the straps around the coupling allowing the coupling to slide such that there is a tight fit around the ABS or PVC pipe. Finally, dip fiberglass tape into primer and lay over the cut applying cement over the strip. Do not apply test pressures internally or externally for 16 hours, proceed with Paragraph B immediately.
 3. PVC MAIN SEWERS - PVC double bell repair couplings shall be used. The damaged pipe shall be removed by squarely cutting out the damaged section, and the remaining ends shall be beveled. The replacement pipe shall be a minimum of 3 feet in length and shall be squarely cut approximately $\frac{1}{2}$ " shorter than the missing section, and its ends shall be beveled. Reference lines indicating the spigot stab distance required for centering the repair coupling shall be clearly marked on all cut ends. The repair couplings shall be placed onto the pipe ends, the replacement assembly inserted into the gap, the repair couplings moved to be centered over each new joint.
- B. The Contractor shall re-bed the pipe and backfill the excavation with properly compacted bedding and backfill material in accordance with *Section 31 23 16 - Excavation, Bedding and Backfill*.

- END OF SECTION -

Section 33 31 16 - Sanitary Sewer Gravity Service Laterals

Part 1 - General

1.1 THE REQUIREMENT

- A. The Contractor shall furnish all pipe, fittings, tools, materials, and labor required to install and test sanitary sewer laterals, in accordance with these Specifications.
- B. Pipe materials and installation procedures shall be in accordance with the pipe manufacturer's recommendations unless otherwise specified in these Specifications.
- C. For a particular sewer installation, pipe and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class and size.
- D. Joining of pipe dissimilar in size and/or material shall be accomplished either by use of an Expansion Block as detailed in *DWG 21-04*, or by use of special adapters or couplings listed on the *Approved Materials List*.
- E. Where field cuts are required, the Contractor shall use tools and/or equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted.
- F. All pipe and fittings delivered to the jobsite shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements of these Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. [District Code §9.15](#)
- B. Section 4 Design Criteria
- C. Subsection 17-15 Bypassing Wastewater
- D. Part VI Standard Drawings
- E. Section 33 01 30.11 - Inspection of Sewers
- F. Section 33 05 16 - Cast-Iron Pipe (CIP)
- G. Section 33 05 19 - Ductile Iron Pipe (DIP)
- H. Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe
- I. Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe
- J. Section 33 31 00 - Sanitary Sewerage Piping

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

Contra Costa Environmental Health Division

1.4 QUALITY ASSURANCE

- A. Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. The manufacturer shall perform all tests at its own cost.

- B. All installed pipe shall be cleaned and tested in accordance with *Section 33 01 30.11 - Inspection of Sewers*.

Part 2 - Products

2.1 GENERAL

- A. Pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Section for the particular pipeline material being used and the *Approved Materials List*.
- B. See *Subsection 4-03* for additional requirements.
- C. Referenced pipe sizes are nominal pipe diameters.
- D. All side sewers materials shall be new, free from defects, and marked to identify manufacturer, material, class, and other appropriate information.

2.2 BANDED COUPLINGS

Where banded couplings are used for joining of new pipe or repair of existing pipelines, only couplings listed in the *Approved Materials List* shall be allowed.

2.2 OVERFLOW PROTECTION DEVICES (OPDs)

- A. Overflow Protection Devices (OPD) and utility boxes shall be as listed in the *Approved Materials List* and as shown on *DWG 22-05*.
- B. Utility boxes over OPDs in areas subject to vehicular traffic shall be rated for H-20 traffic service.
- C. Utility boxes over OPDs shall be fitted with a grate lid and box extensions, if required to provide proper clearances.

Part 3 - Execution

3.1 GENERAL

- A. Structures shall be designed and installed in compliance with *Subsection 4-09*.
- B. When performing work on side sewers, the Contractor shall bypass wastewater around the work area in accordance with the requirements of Subsection 17-15, or shall arrange with the Property Owner to temporarily shut down the side sewer. The Contractor shall ensure that no wastewater is discharged from side sewer to the excavation.
- C. Minimum pipe slope shall conform to *Subsection 4-03*. Wherever available slope is less than 2% or the length of the side sewer is greater than 100 feet, the side sewer shall be installed using an industrial-standard laser grade control system to confirm that the pipe is installed to the proper grade. Requirements for operation of the laser grade control system shall be as specified *Section 33 31 00 - Sanitary Sewerage Piping*.

- D. When an existing building that is sewer by a septic tank is to be connected to the Central San public sewer system, the new side sewer shall be installed in accordance with these Specifications. A cleanout and Overflow Protection Device shall be installed at the building. The existing sewer from the building to the septic tank may be used as part of the new side sewer for the building if it:
1. is of a material listed on the *Approved Materials List*;
 2. is a minimum of 4" in diameter;
 3. passes a hydrostatic or low-pressure air test; and
 4. passes a CCTV inspection.
- E. Removal of septic tanks after installation of a new side sewer connection to the Central San public sewer shall be in accordance with the requirements of the Contra Costa Environmental Health Division.
- F. When a building connected to Central San public sewer is to be demolished, an abandonment permit shall be obtained and the side sewer serving the building shall be temporarily disconnected and capped at the property or easement boundary.

3.2 OVERFLOW PROTECTION DEVICES

- A. All Property Owners shall install and maintain an OPD on any side sewer that is connected, or is intended for connection to, the Central San sewer system (see also [District Code §9.15](#)).
- B. Side Sewer Installations or Alterations or Repairs: No person shall install, alter or repair a side sewer that is connected, or is intended for connection to the Central San sewer system without installing an OPD of the type and in the manner prescribed in these Specifications. Prior to installation of coupling when repairing side sewers a maximum spacing of 1/4" shall be left between the pipe ends to allow for proper installation of coupling. See *DWG 22-08* for side sewer repair details.
- C. Maintenance Requirements: OPDs shall be maintained so as to provide for their continuing function as designed. OPDs shall be accessible at all times and shall be kept free from any obstructions including, but not limited to, rocks, soil, vegetation, grass, trees, bushes, plants, landscaping, concrete, asphalt or other ground coverings that may impair the function of and accessibility to the devices.
- D. Elevation Requirements: OPDs shall be installed at an elevation that protects the property from damage. The Property Owner is responsible to either (1) confirm that the backwater overflow prevention device is at the proper elevation; or (2) to obtain competent assistance from a licensed plumber or Contractor to confirm its proper elevation. If any subsequent modification of

the property results in the OPD being at an improper elevation, the Property Owner or Contractor shall adjust the OPD to the proper elevation.

- E. Installation of extendable backwater overflow devices shall be determined by Inspector for the given field conditions.

3.3 *INSTALLATION*

A. General

1. Sewer pipelines shall be laid upgrade from the point-of-connection to the existing sewer with the bell end at the upgrade end of each pipe length.
2. Sewer pipes, branches, stubs, or other open ends which are not to be immediately connected, shall be plugged or capped.
3. Where it becomes necessary to modify the design pipe alignment to resolve conflicts, the Contractor shall propose a revised alignment to the Inspector who may allow installation per the revised alignment or may require that the revision be submitted to the Job Engineer for consideration. Such revision may be made by the deflection of joints, by the use of fittings or by forced bending of the pipe if permitted, however, in no case shall the deflection in the pipe or at any joint exceed the maximum deflection recommended by the pipe manufacturer.
4. The Contractor shall take all necessary precautions to prevent excavated or other foreign material from getting into the pipe during the laying operations. At all times when laying operations are not in progress and at the close of the day's work, the openings of all pipe and specials, whether in the trench or in storage, shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance.

B. Lateral Sewer Location

1. Prior to a *Sewer Extension Permit* passing the final inspection, the lateral stub-outs to the properly line shall be accurately marked by the Contractor.
2. Prior to installation of lateral sewers in subdivisions, the lot corner nearest the side sewer and the lateral sewer terminus shall both be staked and flagged in the field. Where curbs, gutters and/or sidewalks exist or are to be a part of an improvement, the location of each lateral sewer shall be permanently marked by imprinting an "S" (1-1/2" size) or by chiseling an "S" (4" size) in the concrete surface vertically above the lateral sewer pipe. The "S" shall be marked on the curb, gutter or on the sidewalk.

C. Open Cut:

1. Pipe shall not be laid when the Inspector determines that the condition of the trench is unsuitable.

2. If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than the required minimum cover specified pipe material and type, the pipe shall not be laid until the area has been properly filled and compacted to a level at least equal to required minimum cover above the proposed pipe, unless otherwise authorized by the Inspector.
 3. If field conditions in areas that are potentially unstable or subject to settlement warrant, the Inspector may require that the Contractor substitute a different pipe material/type for the pipe shown on the Plans.
 4. Pipe, fittings and appurtenances shall be carefully handled and protected against damage, impact shocks, and free fall. Pipe shall be stored in a manner which will protect it from damage at the trench site or elsewhere. The Contractor shall inspect each pipe and fitting prior to installation to determine that only undamaged material is installed.
 5. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance and shall be kept clean at all times thereafter.
 6. Non-marring slings shall be used for lowering each length of pipe into the trench (chains shall not be used). The pipe shall be laid on properly compacted bedding material as specified in *Section 31 23 16 - Excavation, Bedding and Backfill*. No blocking will be permitted, and the pipe shall have full bearing for its entire length between bell holes excavated in said bedding material to prevent point loading at the bells or couplings and to allow for unobstructed assembly of all joints. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints. After jointing is completed, bell holes shall be backfilled with properly compacted bedding material, taking care not to damage, move, or lift the pipe from its bedding support.
 7. The Contractor shall prevent the pipe from floating during and after its installation.
 8. Warning Tape Installation: To mark the location of side sewers, electronically detectable marking tape shall be installed one foot below subgrade from the main sewer end of each side sewer to the connected building. See *Section 31 23 16 - Excavation, Bedding And Backfill* for warning tape requirements.
- D. Alternative Installation Method Requirements: Unless otherwise indicated on the Permit, side sewers shall be installed by the open-cut method. Alternate methods of installation may be proposed by the Applicant during the permit application process and subject to the following:
1. Section 4 Design Criteria for side sewers
 2. Horizontal Directional Drilling (HDD)

- a) Marked utilities within 10' of centerline shall be potholed.
- b) Cut stakes shall be placed at 20-foot intervals along the proposed centerline of the pipe alignment.
- c) The installed pipeline shall be within 6" horizontal and 1" vertical of the alignment indicated in the Plans at all locations. In addition, for gravity sewers the pipeline shall be free draining throughout.

3. Boring and Jacking

- a) The annular space between the carrier pipe and the casing shall be filled with grout or silica sand.
- b) Marked utilities within 10' of centerline shall be potholed.

4. Pipe Bursting

- a) Marked utilities within 10' of centerline shall be potholed.
- b) The Contractor shall fully expose the main sewer where a lateral is to be replaced to within 4' of its point-of-connection to the main sewer, so that the point-of-connection can be inspected.
- c) When the Contractor proposes to pull through bends greater than 45), the existing pipe shall be exposed to allow a minimum radius of 2 feet at bends. Realigned pipe shall be properly bedded and backfilled after bursting.
- d) The pipe shall be pulled a minimum of 2 feet beyond the planned connection to allow inspection of the condition of the pipe (e.g., for scarring or other damage) and removal of approximately 4" where bulging occurs around the bursting head.
- e) Connections to existing pipes in insertion and receiving pits shall employ fittings or couplings listed in the *Approved Materials List*. Prior to making connection at each end of an installed reach of pipe with fittings or couplings, the Contractor shall allow a minimum of 6 hours to elapse to allow pipe to relax from the tension resulting from pulling the pipe and for the pipe to equalize with ambient ground temperature.

3.4 POINT-OF-CONNECTION TO MAIN SEWERS

- A. Connections shall comply with *Subsection 4-05*.
- B. Side sewer connections where wyes, tees or laterals were not installed during main sewer construction, shall be made by installing a tap listed in the *Approved Materials List*, installing a main sewer repair spool (replacement pipe section) as specified in Paragraph 3.5 below, including a new wye branch or tee fitting, or by core drilling through an existing manhole at the top of the shelf or crown of the main/trunk sewer pipe. Installation of taps shall comply with the following requirements:

1. Only pre-qualified Contractors shall be permitted to install tap and saddle connections on VCP, CIP, DIP, RCP, PVC-Truss or ABS-Truss.
 2. Before commencing excavation for tap installation, the Contractor shall have sufficient Type I bedding and backfill material at the site to properly re-bed the main and lateral sewers, and then backfill the excavation.
 3. The excavation for the tapping work shall be a minimum of 2 feet in width, give enough length for workspace, without under-cut sides and shall be properly shored. A minimum clearance of 3" below, 6" on each side and 12" each way along the main from the point-of-connection shall be provided for tap installation.
- C. If the main sewer is damaged during excavation for or during installation of the tap, the Contractor shall install a main sewer repair spool (replacement pipe section) as specified in *Section 33 31 00 - Sanitary Sewerage Piping*, including a new wye branch or tee fitting.
- D. The outer surface of the main in this exposed area shall be thoroughly cleaned prior to tapping.

3.5 REPAIRS

- A. Repairs to side sewers shall conform to *DWG 22-08* and be made using pipe and fittings specified in:
1. Section 33 05 19 - Ductile Iron Pipe (DIP)
 2. Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe
 3. Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe
 4. Section 33 05 16 - Cast-Iron Pipe (CIP)
- B. When repair of a damaged section of pipe is within 18" of a pipe joint, the replacement section shall extend to and include the joint.
- C. Where repair couplings are permitted, only couplings listed in the *Approved Materials List* shall be used.
- D. The Inspector may require replacement of broken, damaged, or improper pipe or fittings discovered during sewer repair or replacement work.

3.6 TESTING AND TELEVISION

Laterals installed with a *Sewer Extension Permit* shall be tested as a part of the main sewer system in accordance with the requirements of *Section 33 01 30.11 - Inspection of Sewers*. New building sewers and side sewer repairs shall be subject to low-pressure air or hydrostatic testing or CCTV inspection at the discretion of the Inspector.

- END OF SECTION -

Section 33 31 26 - Multiple-User Low Pressure Sewer Systems (MULPSS)

Part 1 - General

1.1 THE REQUIREMENT

- A. The Contractor shall furnish all pipe, manholes, flushing inlets, valves, fittings, other appurtenances, tools, materials, and labor required to install and test multiple-user low-pressure sewer systems (MULPSS), in accordance with the requirements of the Plans and this Section.
- B. Extension of MULPSS shall be subject to the same rules, requirements and procedures as apply to extensions of the public gravity main sewers.
- C. Individual lot pumping systems (ILPS) connected to MULPSS shall conform to *Section 33 32 26 - Individual Lot Pumping Systems* and in addition shall:
 - 1. Utilize "grinder" pumps with nearly vertical pump curves (semi-positive displacement type pumps) discharging at less than 20 gpm;
 - 2. Incorporate a redundant curb stop (isolation valve) and check valve at each connection to a MULPSS, in addition to the isolation and check valves installed at the ILPS;
- D. Connections to the MULPSS shall be at a manhole as specified in *DWG 24-02*.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Part VI Standard Drawings
- B. Section 33 32 26 - Individual Lot Pumping Systems
- C. Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe
- D. Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe

1.3 CONTRACTOR SUBMITTALS

Upon request by Central San, the Contractor shall submit catalog cuts and/or shop drawings for any proposed MULPSS components not listed in the *Approved Materials List*.

1.4 QUALITY ASSURANCE

Leakage Test: After closing the isolation valves at each individual lot connection and fitting the lowest flushing inlet with a liquid filled pressure gauge having a full-scale reading of 160 psi, the multi-user low-pressure sewer shall be filled with water and pressurized with compressed air at its high point until the pressure gauge reads 100 psi (air-over-water). The pressure shall be allowed to stabilize for a period of at least 5 minutes immediately preceding a minimum 15-minute test period. There shall be no pressure drop during the test period.

Part 2 - Products

2.1 GENERAL

All equipment and accessories shall be standard manufactured items and shall be specifically manufactured for sewage use by a company regularly engaged in the manufacture and assembly of pumping system components.

Typical materials list for a MULPSS:

Item	Description
1	1 5/8" X 1 5/8" Unistrut P1000T-HG Pipe Supports, Or Equal: Fastened to Concrete Floor With 1/2" Zinc Plated Expansion Anchors (3" embedment-2 each strut) and Attach Pipes to Struts with "Crush-A-Clamp" Assemblies (Unistrut Part No. 027N032 for 1 1/4", or equal).
2	1 5/8" X 1 5/8" X 16" Unistrut P1000T-HG Pipe Supports, or equal: Fastened to Concrete Floor with 1/2" Zinc-Plated Expansion Anchors (3" embedment-2 each strut) And Attach Pipes to Struts with "Crush-A-Clamp" Assemblies (Unistrut Part No. 027N032 for 1 1/4". Part No. 030N034 for 1 1/2", Part No. 038n044 for 2", or equal); Thrust Restraint Struts: Attach to Adjacent Pipe Support Struts with Angle Fittings and Channel Nuts.
3	1 1/4" Compression (BN5) X 1 1/2" FIPT, Multi Fittings with White Collet & Red Insert, or equal
4	TW #10 Copper Tracer Wire, Extend to Terminal Board in each Manhole.
5	1 1/2" X 1 1/2" X 1 1/2" Schedule 80 PVC (FIPT X FIPT X FIPT), or equal
6	60" Diameter X 36" Precast Manhole Base, Or Cast- In-Place Base and 60" Diameter X 24" Precast Manhole Barrel.
7	Black HDPE 3408, IPS OD, SDR-11 (160 psi): 1 1/4" Chevron Phillips Performance Pipe Municipal & Industrial Series, or equal.
8	60" Diameter X 18" Precast Manhole Barrel
9	60" Diameter Concentric Reducer Slab
10	24" Diameter X 3" Precast Grade Ring
11	Tracer Wire Terminal Board (See Detail on DWG 24-04).
12	1 1/2" True Union PVC Swing Check Valve (FIPT X FIPT)
13	Tracer Wire Terminal Board (See Detail on DWG 24-04).
14	1 1/4" MIPT X 1" FIPT Brass Reducing Bushing
15	1" Brass Ball Valve with Stainless Steel Handle (FIPT X FIPT)
16	1 1/2" Schedule 80 PVC Pipe Nipples, MIPT X MIPT (Typ)

2.2 PIPES AND FITTINGS

- A. Casing pipe and fittings shall be C900 PVC (DR-14) of the size indicated on the Plans, conforming to *Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe*.
- B. Pressure sewer pipe shall be HDPE (SDR-11) of the size indicated on the Plans, conforming to *Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe*.
- C. Brass pipe and threaded fittings shall be 1" diameter Schedule 40 NPS.

2.3 VALVES

- A. Isolation Valves shall be true union ball valves of the size indicated on the Plans, fabricated from PVC rated for 150 psi service at 75°F.
- B. Check Valves shall be true union flap check valves of the size indicated on the Plans, fabricated from PVC rated for 150 psi service at 75°F.
- C. Combination Isolation/Check Valves shall be a combination true union ball valve and flap check valve of the size indicated on the Plans, fabricated from PVC rated for 150 psi service at 75°F.
- D. Bronze ball valves shall be 1" diameter, FIPT x FIPT, rated for a maximum working pressure of 600 psi WOG (water, oil, gas), having chromium plated balls and PTFE (Teflon) seats.

2.4 MANHOLE COMPONENTS

- A. Precast manhole components shall be as listed in the *Approved Materials List* and as shown in *DWG 24-02* through *24-05*.
- B. Standard manhole frames and covers shall be as listed in the *Approved Materials List*.

2.5 TRACER WIRE AND TERMINAL BOARDS

- A. Tracer wire shall be TW #10 copper.
- B. Terminal Boards for tracer wires shall be fabricated from three-eighths (3/8) inch HDPE sheet and 3/16" diameter brass machine screws, washers and knurled nuts.

2.6 FLUSHING NOZZLE COMPONENTS

- A. Pressure gauges shall be glycerin-filled having stainless steel cases, brass internal components, 1/4" NPT inlets and 2" diameter dials having maximum range of 300 psi and 5 psi graduations, **Grainger Stock Number 5WZ52, or equal.**
- B. Pressure relief valves shall have bronze bodies, stainless steel ball valves, 1" MNPT inlet ports, 3/4" right angle FNPT outlet ports, adjustable outlet pressure from 0 to 400 psi and maximum outlet flow of 4 gpm; **Dayton Model Number 3YB67, or equal.**

Part 3 - Execution

3.1 GENERAL

- A. Casing pipes and structures (manholes and flushing inlets) for MULPSS shall be installed in accordance with the requirements of these Specifications pertaining to installation of gravity sewers, except where otherwise required in this Section.

- B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.2 *INSTALLATION OF PRESSURE MAIN SEWER*

- A. After installing the casing pipe and manhole bases, pull HDPE pressure main sewer pipe of the size indicated on the Plans into the casing.
- B. The Contractor may pull more than one reach of adjacent HDPE pressure main sewer pipe of the same size through intermediate manholes.

3.3 *PLUMBING AT MANHOLES*

- A. Plumbing for pressure main sewers and laterals shall be configured and firmly attached to galvanized metal struts as shown on the Plans and in *DWG 24-02* through *24-05*.
- B. At most, 4 private pressure lateral sewers shall be connected to the public pressure main sewer at each manhole. Connection tees shall be located as near to the center of the manhole as is practical to provide adequate space for initial assembly and disassembly/assembly for future maintenance.

3.4 *TRACER WIRE*

- A. Pull tracer wire into pipe casing when installing the HDPE pressure main sewer in the casing.
- B. Terminate the tracer wires on a terminal board at each manhole. Test each tracer wire for continuity after installation.

3.5 *FLUSHING INLET ASSEMBLIES*

The Contractor shall install a flushing inlet assembly as shown on *DWG 24-03* at each Flushing Inlet shown on the Plans.

- END OF SECTION -

Section 33 32 26 - Individual Lot Pumping Systems

Part 1 - General

1.1 THE REQUIREMENT

- A. Design and construction of private individual lot pumping systems shall be in conformance with applicable Cal/OSHA regulations, electrical, plumbing, and building codes, and the requirements of this Section.
- B. Pumping systems for single residential units may be either simplex (single pump) or duplex (two pumps). Systems to serve multiple residential units or nonresidential uses service shall be duplex systems (two pumps).
- C. Flow Rates: Pumping systems shall produce a velocity in the pressure sewer (force main) of 3 to 7 ft/s when pumping against the non-surcharged head at sump Low Water Level (LWL).
 - 1. Connection to House Plumbing: Systems connected to the house plumbing shall employ grinder pumps that discharge at a maximum flow rate of 30 gpm.
 - 2. Connection to Side Sewer: Systems connected to side sewers shall discharge at a maximum flow rate of 70 gpm.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Part VI Standard Drawings
- B. Section 4 Design Criteria
- C. Section 03 30 00 - Cast-In-Place Concrete
- D. Section 03 34 13 - Controlled Low-Strength Material (CLSM)
- E. Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe
- F. Section 33 05 33.13 - High Density Polyethylene (HDPE) Pipe

1.3 CONTRACTOR SUBMITTALS

- A. The Contractor shall submit a complete *Individual Lot Pumping System Application* including manufacturer's Specifications for pumps, electrical controllers, sumps, and alarms to Central San and receive favorable review prior to purchasing any pumping system components or commencing construction work.
- B. The Contractor shall submit a copy of the electrical permit signed off as approved by the local building code enforcement agency to the Inspector prior to startup testing of the pumping system.

1.4 QUALITY ASSURANCE

- A. Leakage Test: After closing the isolation valve at the pump station, the pump discharge pressure sewer shall be filled with water and pressurized with compressed air to 150% of the operating pressure or 60 psi, whichever is greater, at its point-of-connection to the gravity sewer system (air-over-water). The pressure shall be allowed to stabilize for a period of 5 minutes

immediately preceding a 10-minute test period. To pass the test, there shall be no pressure drop during the test period.

- B. Electrical Permit and Inspection: The Property Owner or the Contractor shall obtain an electrical construction permit for the electrical control and alarm work from the local building code enforcement agency and shall show evidence of favorable inspection of the system prior to functional testing of the pumping system.
- C. Functional Test: When the pumping system installation is complete and favorable inspection of the electrical work has been obtained, the Contractor shall call Central San's Inspector for functional testing of the system. The Contractor shall arrange for a supply of water for use in the functional testing. The Inspector will witness the Contractor's operation of the system during the functional test, which shall include running through more than one normal automatic pumping cycle; hand (manual) switching of pumps; alternation of pumps in duplex systems; activation, silencing and resetting of alarms (visual and audible); and activation of all other switches and system features.

Part 2 - Products

2.1 GENERAL

All equipment and accessories shall be standard manufactured items and shall be specifically manufactured for sewage use by a company regularly engaged in the manufacture and assembly of pumping system components.

2.2 PUMPS

- A. Pump systems shall be reviewed by Central San. Pumps shall be approved for residential sewage service by a Nationally Recognized Testing Entity (NRTE) such as Underwriters Laboratories (UL Listed) and/or Canadian Standards Association (CSA), and shall carry a certification label for this use, and shall be one of the types described below:
 - 1. Submersible, centrifugal, non-clog pumps: Impeller shall be a non-clog type and shall be capable of passing a 2" sphere. The pump discharge shall be at least 2" in diameter.
 - 2. Submersible, centrifugal or positive displacement grinder pumps: The grinder pump shall be constructed of long-lasting, low maintenance material that is capable of reducing all components in normal domestic sewage (including "foreign objects", such as paper, wood, plastic, glass, rubber, etc.) to finely divided particles which will pass freely through the passages of the pump, force main, and fittings. The pump discharge shall match the manufacturer's recommended discharge size but shall be at least 1-1/4" in diameter.
- B. For duplex systems (two pumps), an alternator shall be provided to automatically alternate between the pumps on each operating cycle so that each pump is assured of near-equal operating time. For duplex systems, the

High-Water Alarm (HWA) shall be activated in the event that the lead (first) pump is unable to maintain proper level and the lag (second) pump is called to run.

2.3 PUMP SUMPS

- A. The pump sump shall include integral anti-flotation flanges, and shall be fabricated from one of the following materials:
 - 1. Asphalt-coated steel (minimum 3/16" plate), with interior and exterior surfaces protected with a minimum of 0.10" thick corrosion barrier acceptable to Central San.
 - 2. Filament wound fiberglass, minimum 1/4" wall thickness with tank interior surface protected with a minimum of 0.10" thick, resin-rich corrosion barrier.
 - 3. Reinforced concrete pipe or manhole barrel sections with a corrosion barrier of PVC "T-lock" or other material or coating acceptable to Central San.
 - 4. High density polyethylene (HDPE).
 - 5. A Central San-approved alternative.
- B. The sump shall have a 4" minimum inlet and an outlet at least the size of the pump discharge. The invert of the inlet shall be at least 6" above the First Pump On set-point elevation.
- C. The pump sump cover shall be epoxy coated steel plate (1/2" minimum thickness), heavy cast iron, or the pump system manufacturer's standard molded plastic, and shall be designed to support reasonably anticipated dead and live loads, including impact (H-20 required for traffic areas).

2.4 MOTORS

- A. Motors for column-type pumps shall be a drip-proof vertical type, totally enclosed, weather protected, and shall conform to the standards of NEMA.
- B. Only explosion proof pump and motor assemblies approved by an NRTE and listed as explosion proof for Class 1, Division 1, Groups C and D locations shall be used in non-residential applications.
- C. Pumps constructed with separate thermal overload protection and moisture-sensing seal failure probes shall have these devices connected to sensors and to an alarm in the control panel according to the manufacturers' recommendations.

2.5 MOTOR LEVEL CONTROLS AND PANELS

- A. The pump's level controls shall employ either: 1) a ball and rod mechanical float switch mounted above the cover; 2) a weighted mechanical-type float

switch sealed within a polypropylene shell with a neoprene-covered cable; or a Central San approved alternate.

- B. Each pump level control switch shall be wired directly and independently to terminals in the control panel.
- C. Each pump and the level control/alarm system shall be on separate electrical circuit breakers.
- D. The following level control scheme shall be provided:
 - 1. A "High Water Alarm (HWA)" switch set to alarm a minimum of 3" below the invert elevation of the gravity inlet sewer and to start the "lag" pump in a duplex system.
 - 2. The single pump in a simplex system and the "lead" pump in a duplex system shall be set to start at least 6" below the gravity inlet sewer (High Water Level (HWL)).
 - 3. Pump(s) shall turn off at least 3" above the LWA or 3" above the pump suction if an LWA is not included. The distance between the HWL and pump turning off shall be great enough to allow the pump to run for at least thirty (30) seconds during each pump cycle.
 - 4. An optional "Low Water Alarm" (LWA) switch set to alarm at an elevation above the pump suction inlet and wired to a redundant pump shut off.

2.6 INTRINSICALLY SAFE CIRCUITS

Level control and alarm system circuit wiring connected to level switches in the tank shall be listed as intrinsically safe by an NRTE. The circuits shall reduce the power to the pilot devices and alarms to a value incapable of releasing sufficient thermal or electrical energy to ignite an explosive environment. Separate conduits for the control and motor power wiring shall be run between the sump and the control panel. Both conduits shall be provided with seals to prevent sewer gases from migrating to the control panel.

Part 3 - Execution

3.1 GENERAL

- A. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.
- B. Installation of pumping system components shall conform to the manufacturer recommendations.
- C. A standard clean out with an Overflow Protection Device shall be installed between the served building(s) and the sump inlet.

- D. The gravity sewer between the building(s) and the sump shall meet the cover requirements in *Subsection 4-08*.

3.2 PUMP SUMP

- A. Ballast consisting of material specified in *Section 03 30 00 - Cast-In-Place Concrete* or *Section 03 34 13 - Controlled Low-Strength Material (CLSM)*, and weighing at least 1-1/2 times the calculated buoyant force on the sump assuming the groundwater surface is one (1) foot below finish grade shall be provided. The required minimum volume of ballast material will be cited on the approved Central San pump curve data sheet.
- B. The top of the cover shall be at least 3" above the surrounding ground surface in non-traffic areas. The sump cover shall be securely attached to the pump sump with stainless steel bolts, and all joints between the component parts and openings shall be sealed with gas tight gaskets.

- C. The sump shall be vented to atmosphere, either: 1) to the building drain-waste-roof vent; or 2) through an integral vent in the cover.

3.3 CONTROL PANEL, ALARM SYSTEM AND ELECTRICAL WORK

- A. The Control Panel shall be mounted outside the pump sump on a post or building wall, or inside the served building. The panel shall have a NEMA 1 classification when mounted inside a building or a minimum NEMA 3R classification when mounted outside the building.
- B. The Alarm Panel, or a remote alarm indicator, shall be mounted within the building that is served by the pump and shall provide a visible pilot light and audible alarm with silencer to alert the building occupants to alarm events. The alarm system shall be on a separate electrical circuit from pump motor power. When activated by a high water or low water condition, the alarm system shall remain latched until manually acknowledged and cleared.
- C. Electrical work shall conform to the technical and permitting requirements of the local building code enforcement agency.

3.4 DISCHARGE LINE

- A. The pressure portion of the discharge line, including the isolation valve, check valve and mechanical couplings shall be the same size as or larger than the pump discharge line. The valves and discharge line connecting the isolation valve, check valve, cleanout and mechanical couplings inside the sump shall be DWV (drain, waste, vent) brass, copper, PVC (Schedule 40 or 80), or a Central San approved alternate material. The isolation valve shall be operable from grade and shall be placed in a utility box if outside the sump.
- B. The portion of the pressure discharge line between the sump and its connection to the private gravity side sewer shall be PVC conforming to *Section 33 05 31.11 - Polyvinyl Chloride (PVC) Gravity Pipe*; or High Density Polyethylene (SDR-11) conforming to *Section 33 05 33.13 - High Density*

Polyethylene (HDPE) Pipe; and shall meet depth and bedding requirements for side sewers as specified in *Section 4*.

- C. A standard tee or wye branch with cleanout shall be placed where the discharge line connects to the private gravity side sewer as shown in *DWG 24-01*. The discharge line may connect to an existing building lateral downstream of the building cleanout with a wye connection. If physical limitations prevent at least five feet of gravity lateral from being installed the pressure pipe may be connected directly to the gravity main through a 4" wye with a 4x2 reducer; no tee connection shall be allowed.

- END OF SECTION -

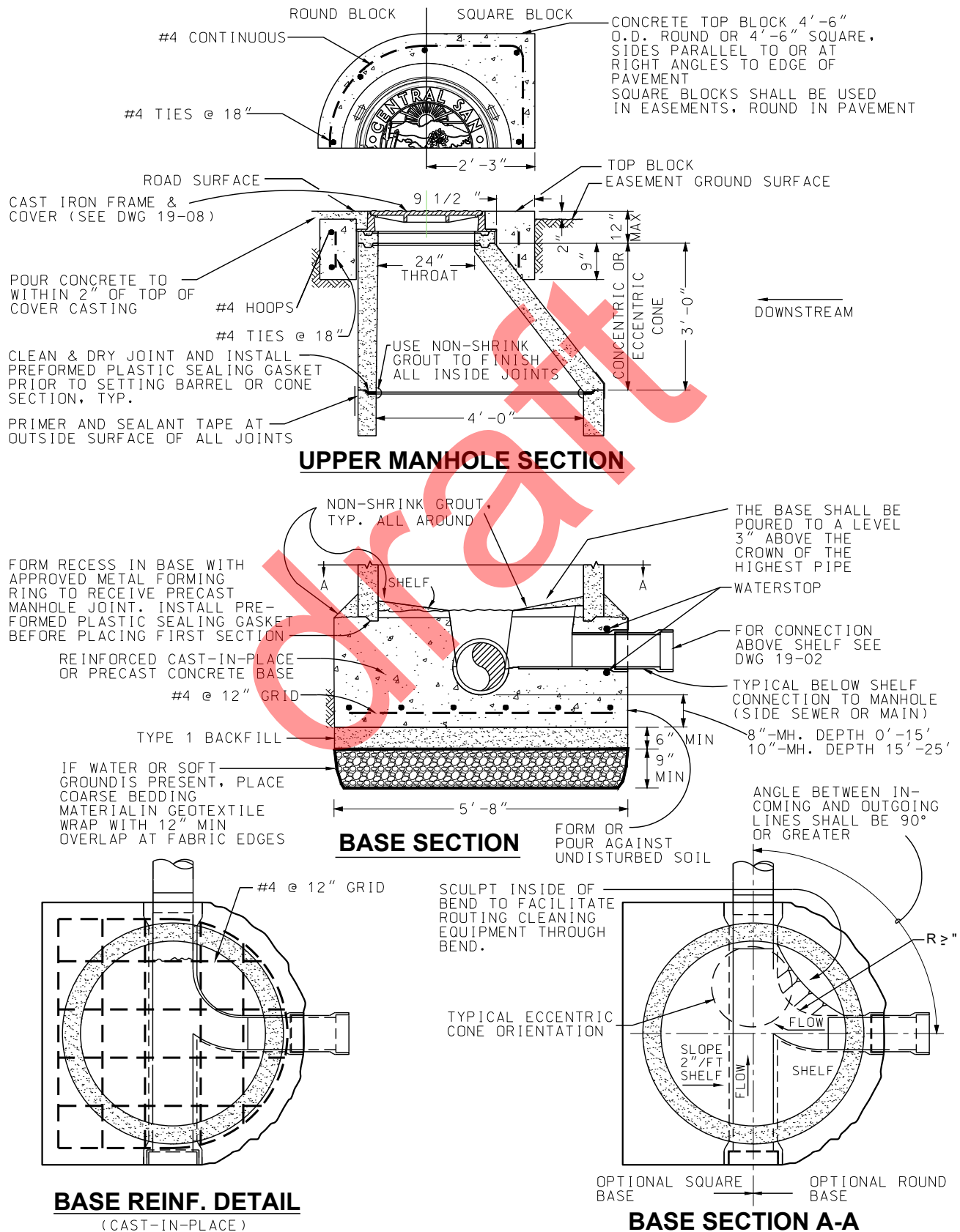
draft

Part VII. Standard Drawings

draft

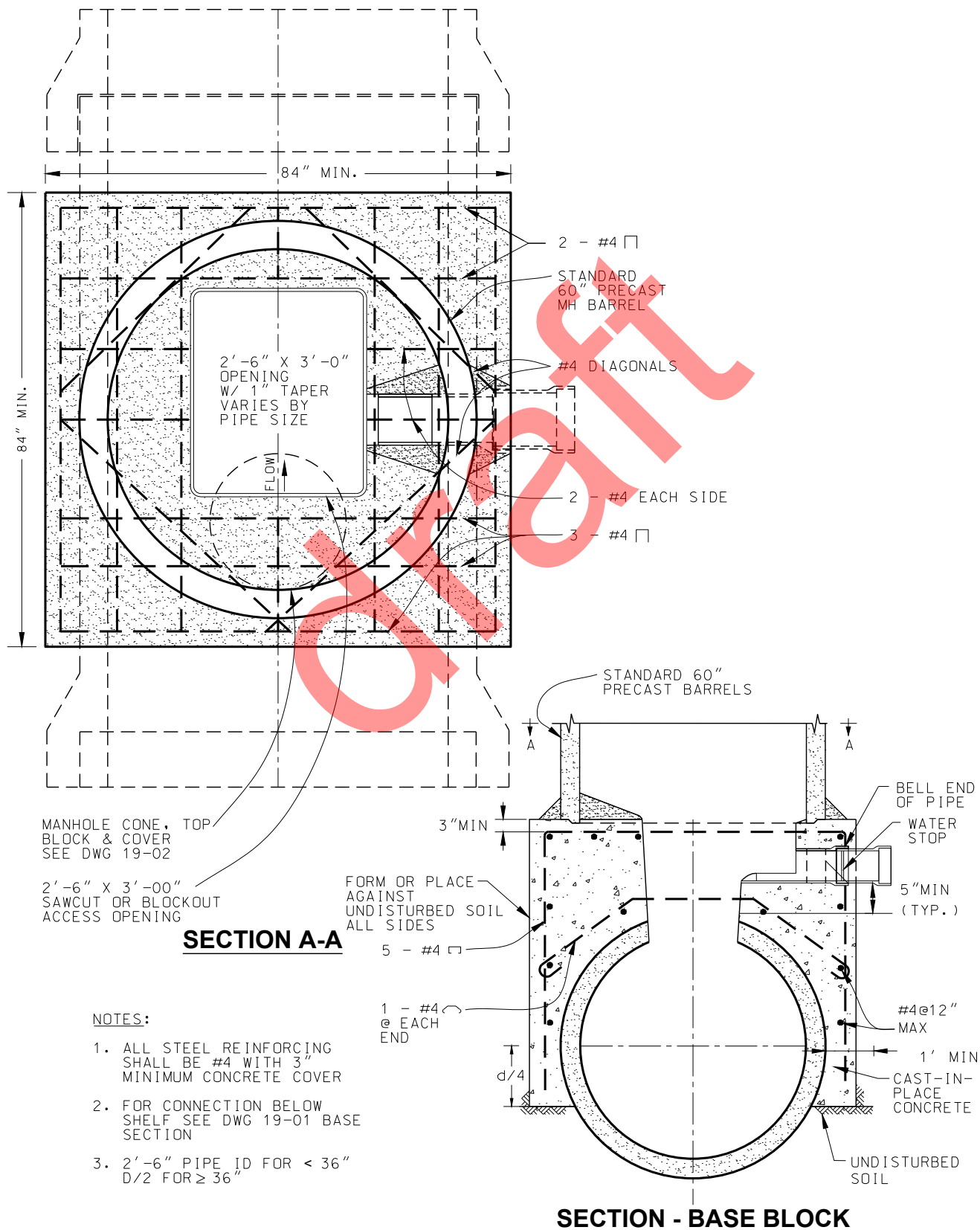
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

STANDARD MAIN MANHOLE



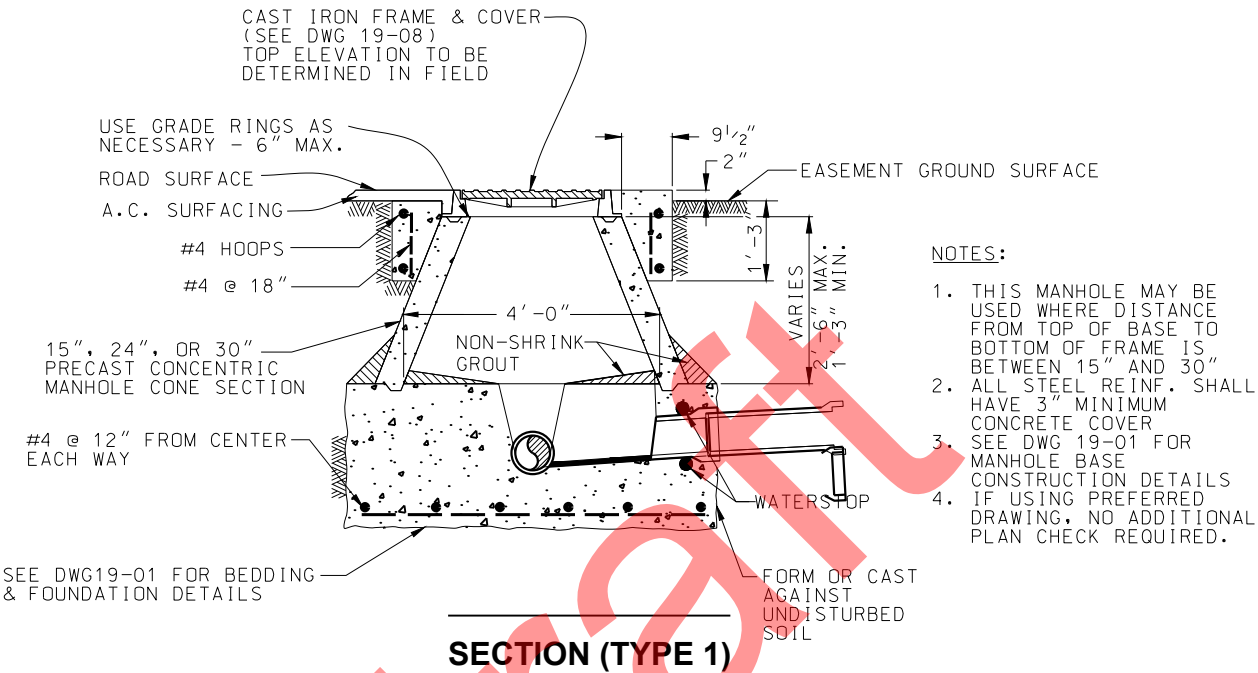
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

SPECIAL TRUNK MANHOLE (VARIANCE REQUIRED)

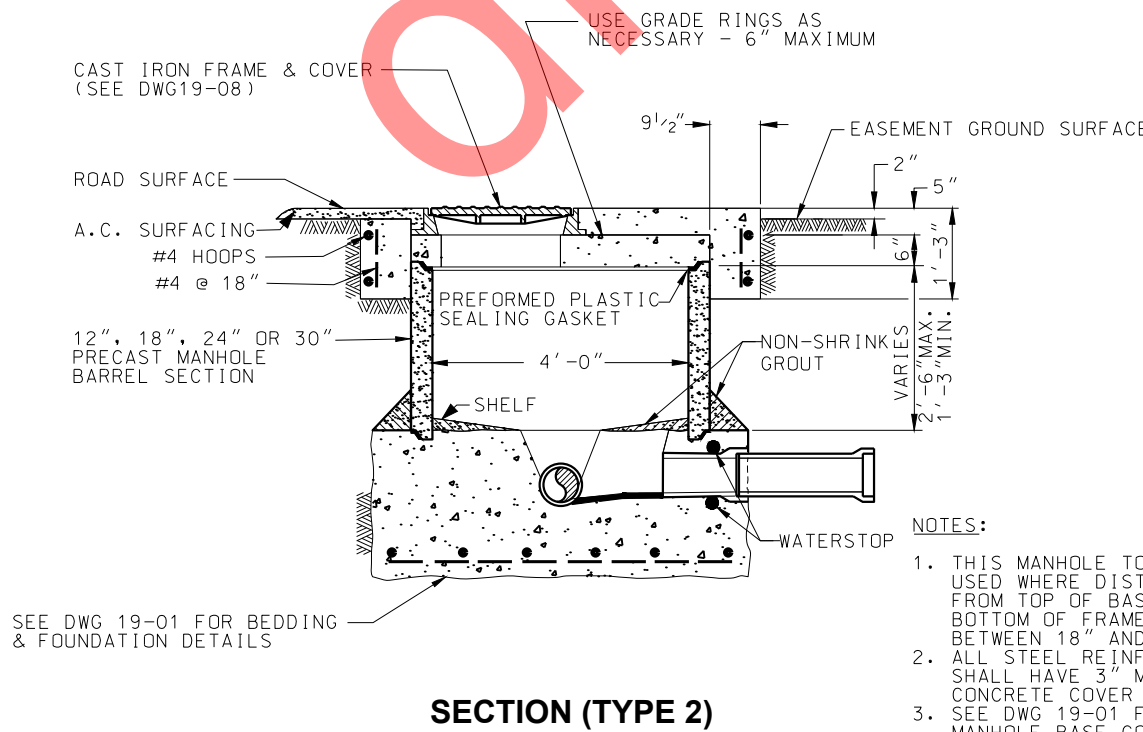


CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

SHALLOW MANHOLE: TYPE 1 & 2
(VARIANCE REQUIRED)



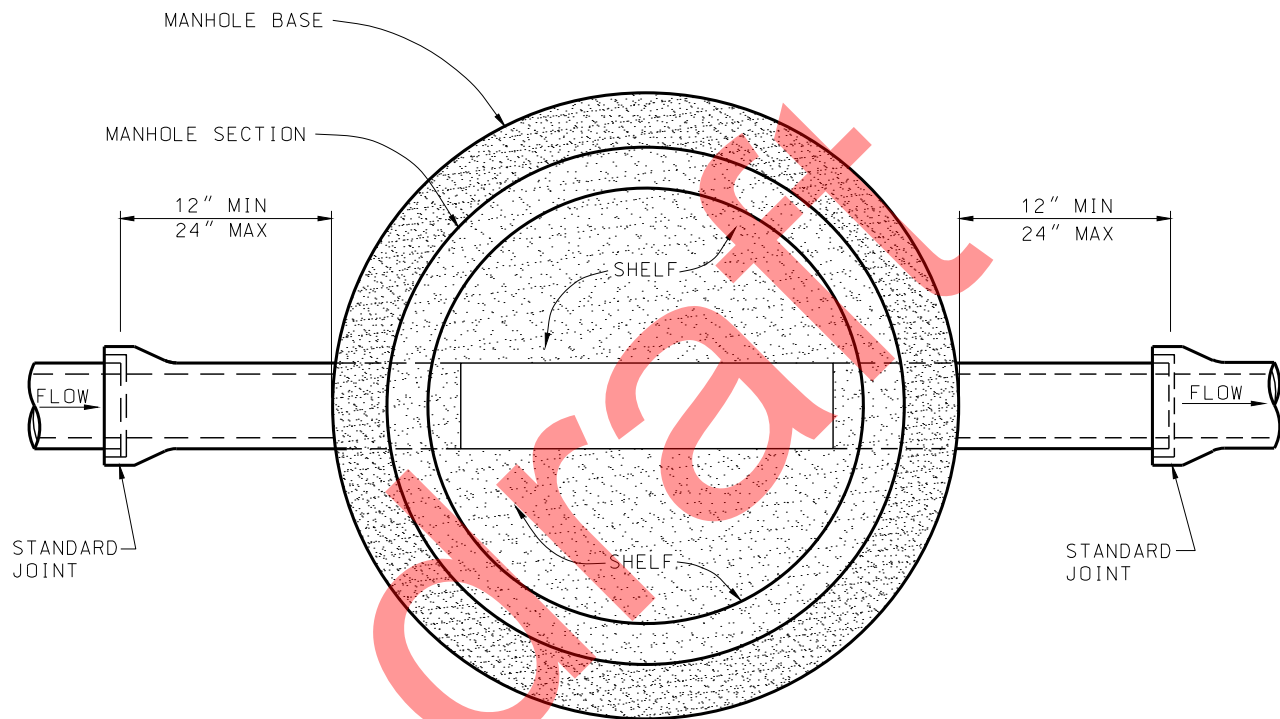
- NOTES:**
1. THIS MANHOLE MAY BE USED WHERE DISTANCE FROM TOP OF BASE TO BOTTOM OF FRAME IS BETWEEN 15" AND 30"
 2. ALL STEEL REINF. SHALL HAVE 3" MINIMUM CONCRETE COVER
 3. SEE DWG 19-01 FOR MANHOLE BASE CONSTRUCTION DETAILS
 4. IF USING PREFERRED DRAWING, NO ADDITIONAL PLAN CHECK REQUIRED.



- NOTES:**
1. THIS MANHOLE TO BE USED WHERE DISTANCE FROM TOP OF BASE TO BOTTOM OF FRAME IS BETWEEN 18" AND 36"
 2. ALL STEEL REINF. SHALL HAVE 3" MINIMUM CONCRETE COVER
 3. SEE DWG 19-01 FOR MANHOLE BASE CONSTRUCTION DETAILS
 4. IF USING FLAT TOP, ADDITIONAL APPROVAL AND PLAN CHECK REQUIRED.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

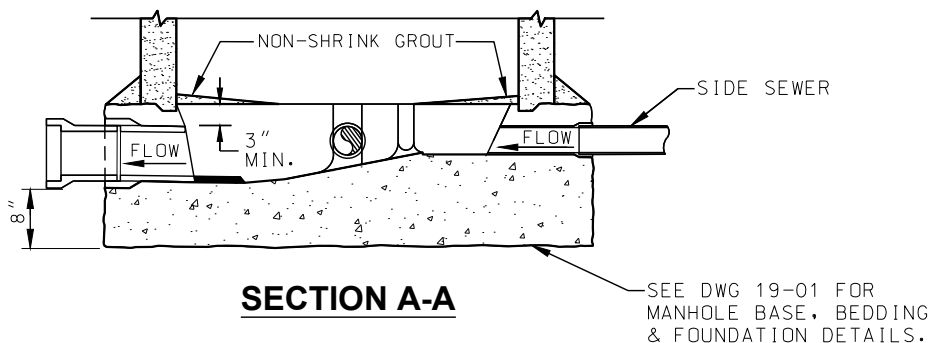
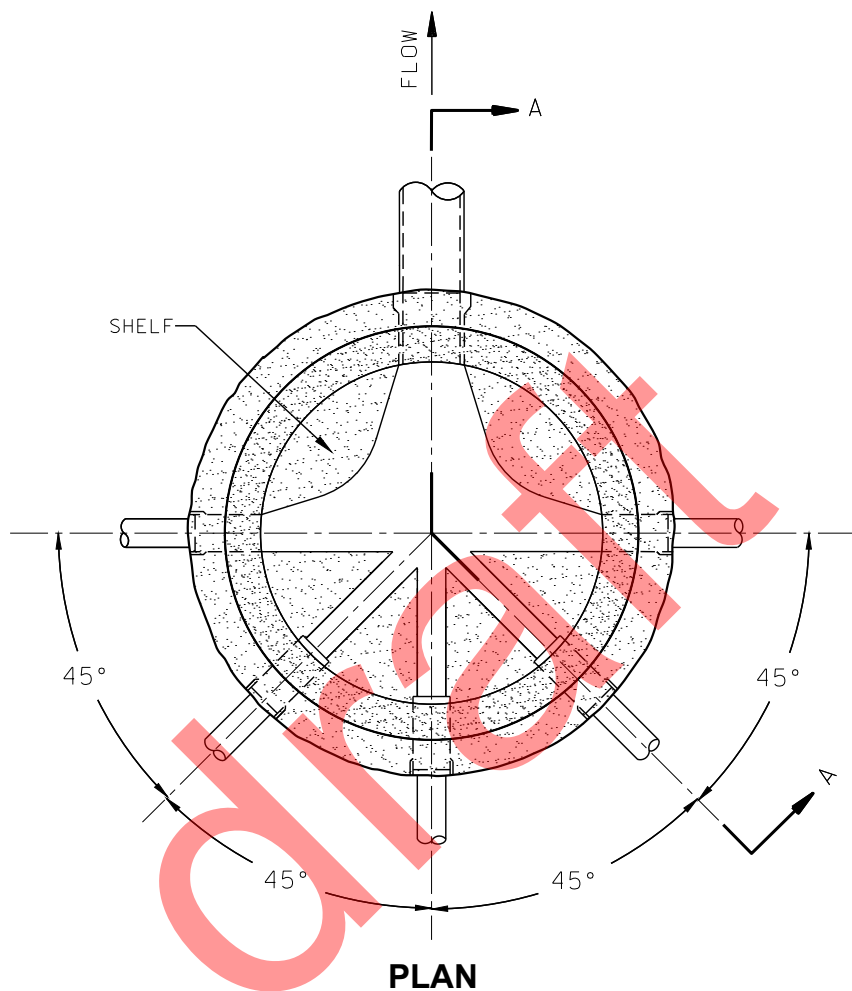
MANHOLE BASE: PIPE JOINT REQUIREMENTS FOR THROUGH PIPES



NOTE: 1. JOINT LOCATIONS APPLICABLE TO ALL
INCOMING AND OUTGOING PIPELINES,
EXCEPT THAT THE 24" MAXIMUM DIMENSION
SHALL NOT APPLY TO PVC PIPE LAID
THROUGH A MANHOLE.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MANHOLE BASE: SPECIAL DETAIL FOR LINES TERMINATING IN A CUL-DE-SAC

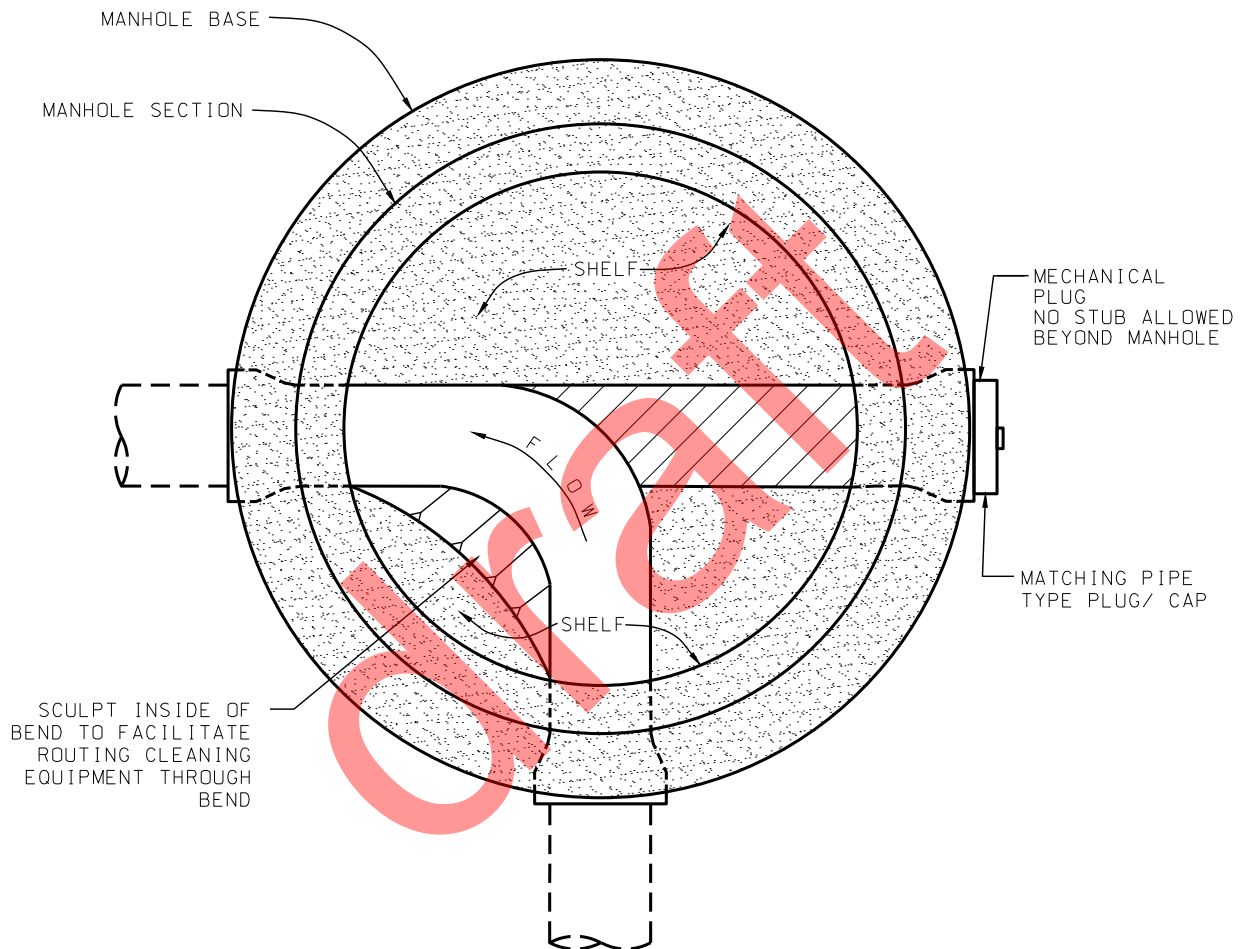


NOTES:

1. NO LATERAL CONNECTIONS SHALL BE MADE IN DOWNSTREAM HALF OF MANHOLE.
2. MAXIMUM NUMBER OF SIDE SEWERS ALLOWED = 5.
3. TOP OF SIDE SEWERS SHALL BE NO LOWER THAN TOP OF OUTLET PIPE.
4. SEE DWG 20-05 FOR REQUIRED JOINT LOCATIONS.
5. PIPE CONNECTION INTEGRALLY CAST INTO THE PRECAST BASE BY THE MANUFACTURE.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MANHOLE BASE: FUTURE CONNECTION

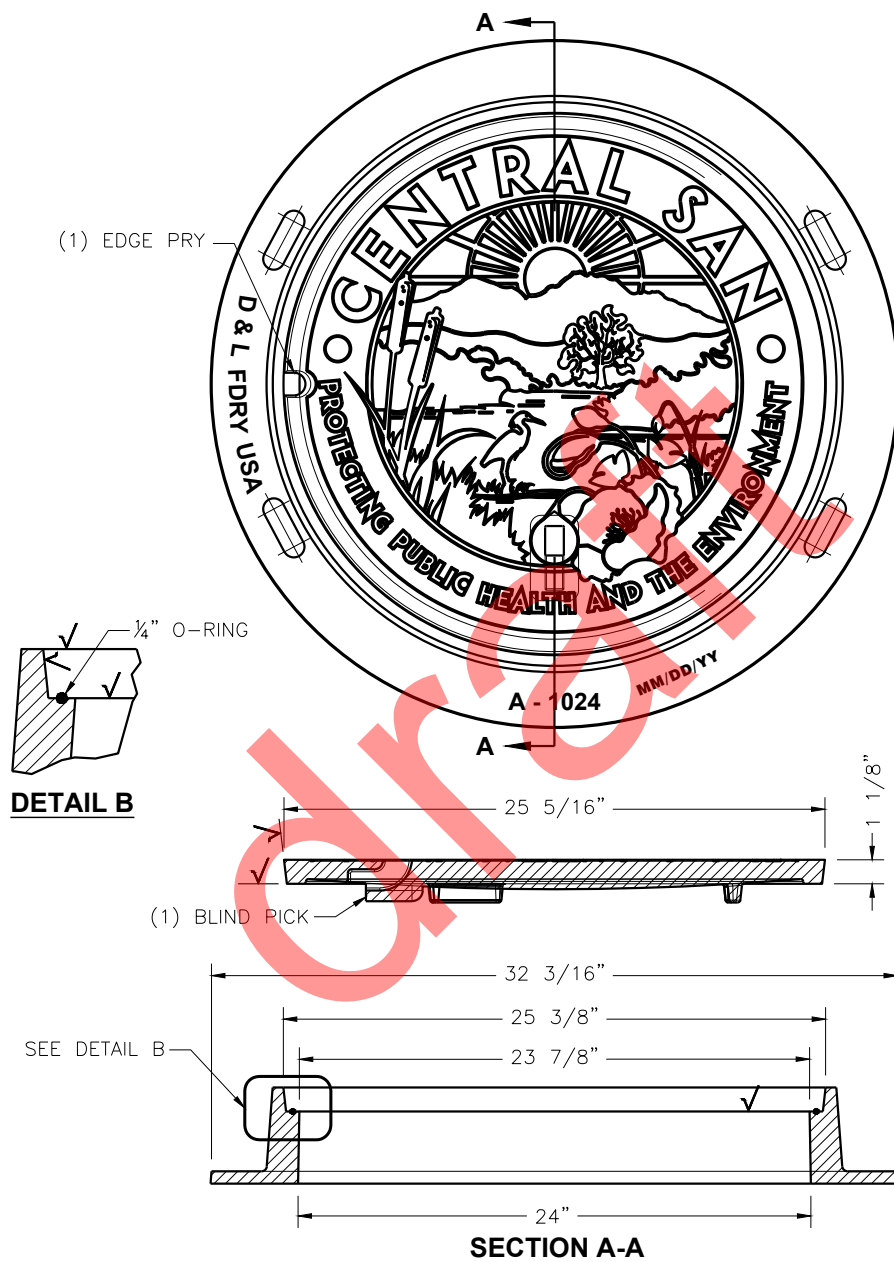


MANHOLE BASE DETAIL

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

STANDARD MANHOLE FRAME & COVER



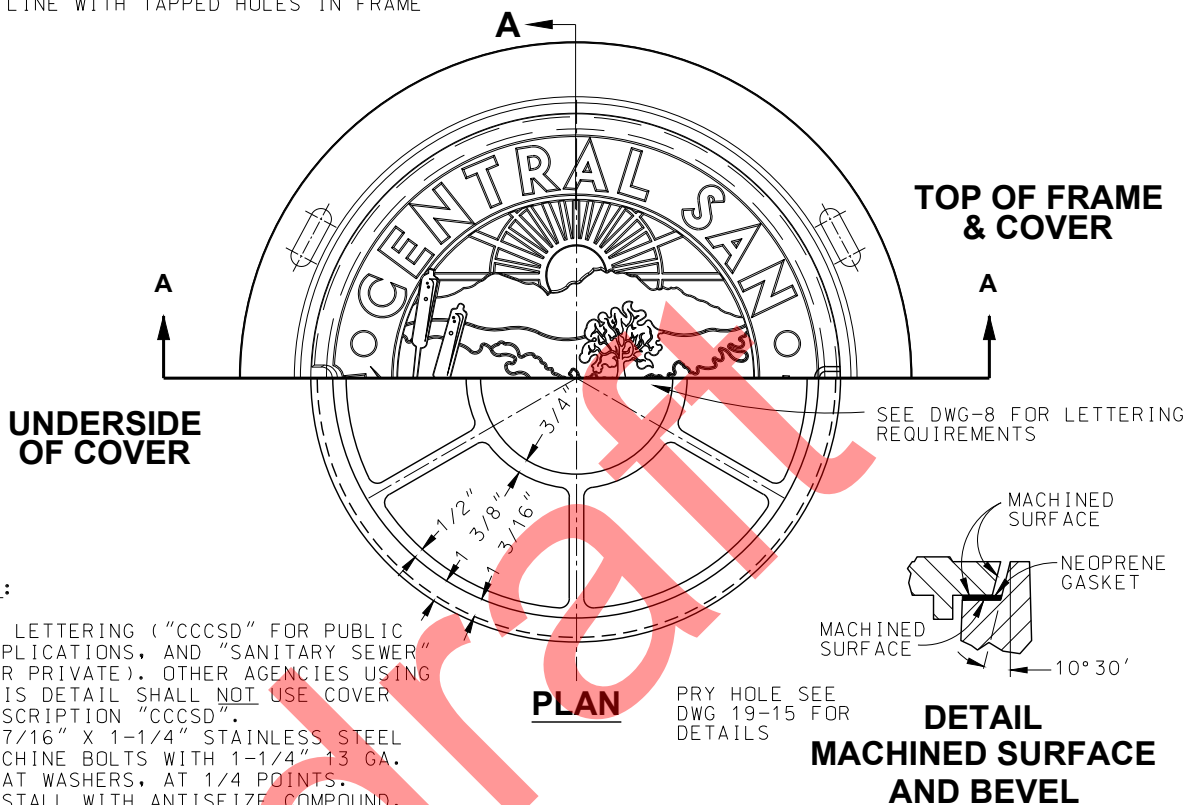
NOTES:

1. COVER SHALL BE DESIGNED FOR H-20 HIGHWAY LOADING.
2. PICK HOLE SHALL BE OPEN AND FIT A STANDARD PICK.
3. PRY HOLE SHALL BE LOCATED AT BOTTOM CENTER OF THE MANHOLE COVER AS SHOWN.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

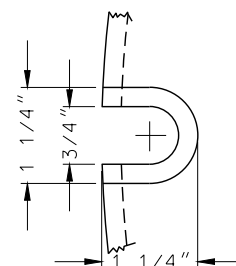
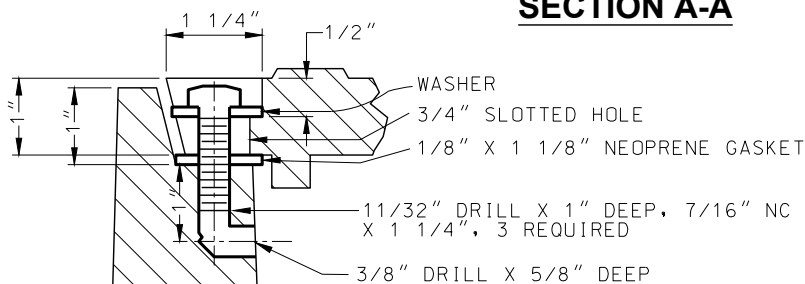
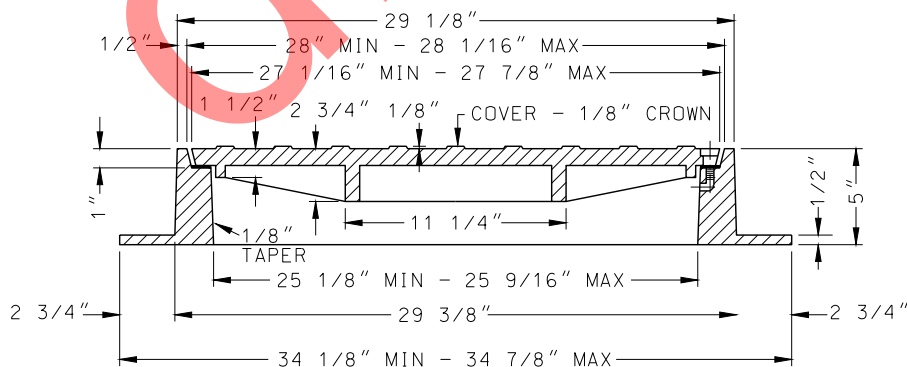
BOLT - DOWN MANHOLE FRAME & COVER

SCORE TOP EDGE OF FRAME RADIALLY
IN LINE WITH TAPPED HOLES IN FRAME



NOTES:

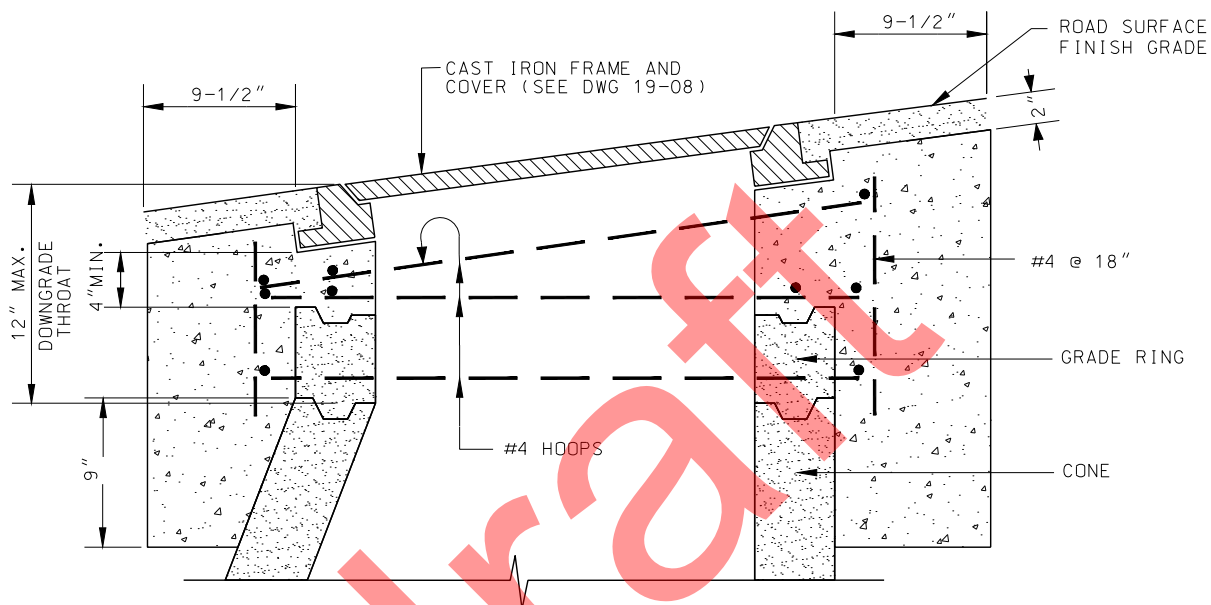
1. 2" LETTERING ("CCCSD" FOR PUBLIC APPLICATIONS, AND "SANITARY SEWER" FOR PRIVATE). OTHER AGENCIES USING THIS DETAIL SHALL NOT USE COVER INSCRIPTION "CCCSD".
2. 4-7/16" X 1-1/4" STAINLESS STEEL MACHINE BOLTS WITH 1-1/4" 13 GA. FLAT WASHERS, AT 1/4 POINTS. INSTALL WITH ANTISEIZE COMPOUND.



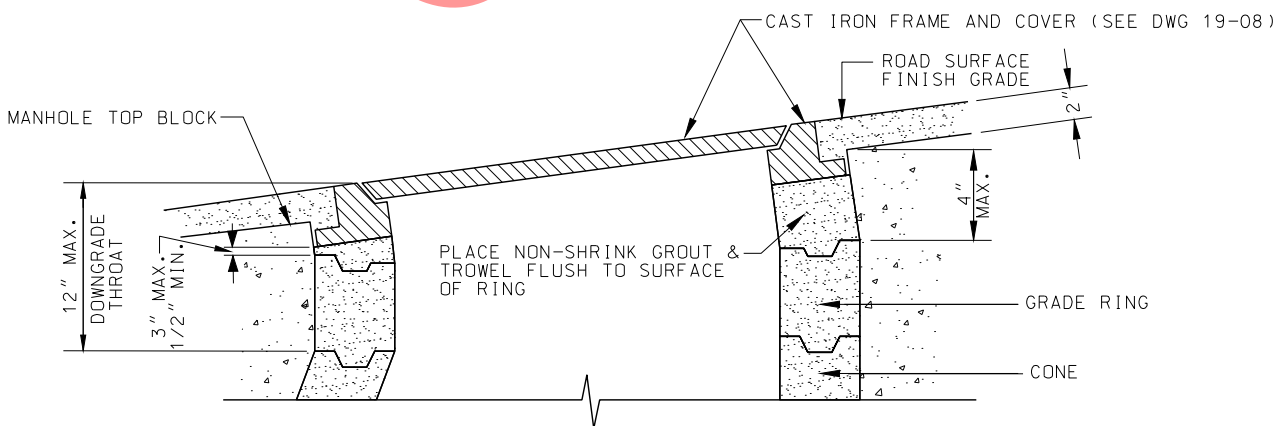
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MANHOLE ADJUSTMENT TO FINISH GRADE

PAVED AREAS



GREATER THAN 13% GRADE



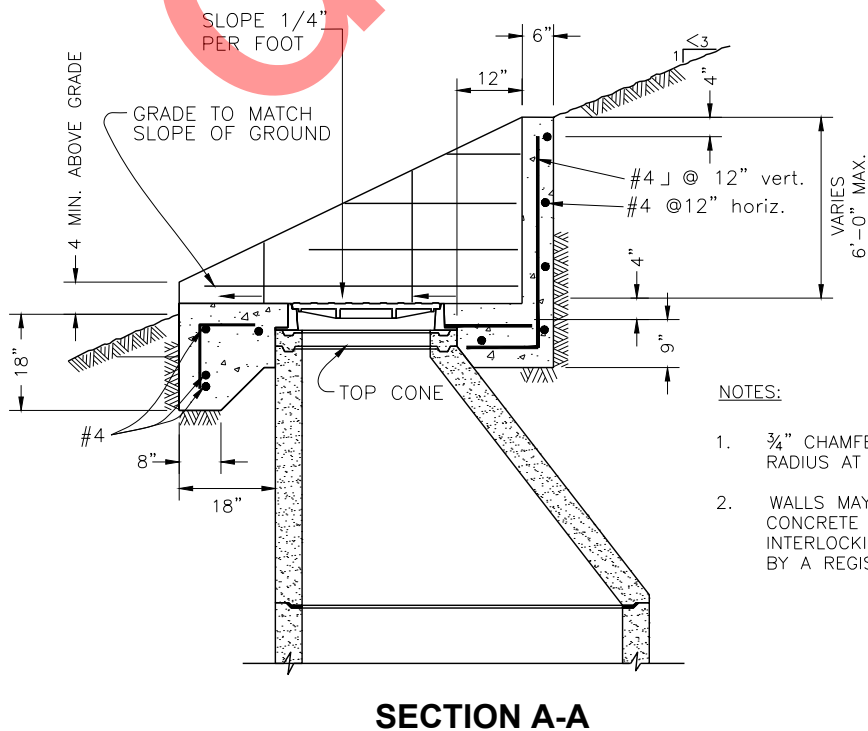
NOTE:

1. SEE DWG 19-01 FOR TOP BLOCK DETAILS

13% GRADE OR LESS

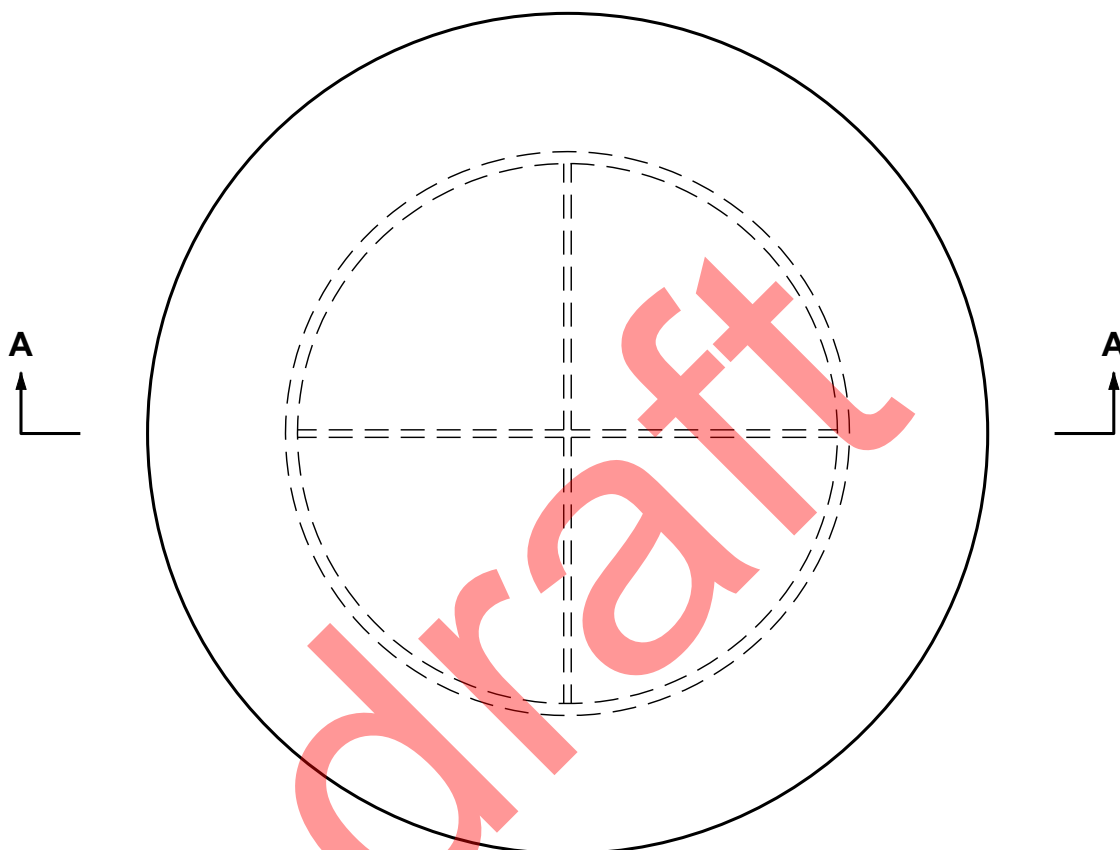
MANHOLE PROTECTION WALL & TOP BLOCK

(REQUIRED FOR CROSS SLOPE STEEPER THAN 3:1)

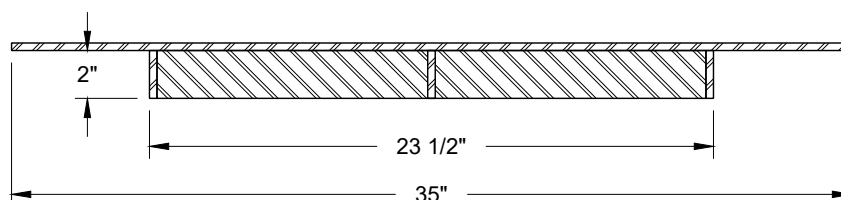


CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

TEMPORARY: MANHOLE COVER



PLAN



SECTION A-A

NOTE:

1. FABRICATE FROM 5/16" STEEL PLATE USING 1/4" FILLET WELDS TO BOTH SIDES OF EACH JOINT.

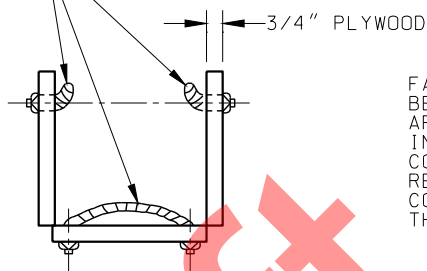
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

TEMPORARY: MANHOLE FALSE BOTTOM

INSTALLATION

FALSE MANHOLE BOTTOM SHALL BE FURNISHED AND INSTALLED IN ALL MANHOLES CONSTRUCTED IN ADVANCE OF PAVING. THESE FALSE MANHOLE BOTTOMS WILL BE INSTALLED AT A TIME DIRECTED BY THE ENGINEER BUT WILL USUALLY BE AFTER ALL WORK IS COMPLETED ON THE WASTEWATER SYSTEM INCLUDING THE AIR TEST, BUT PRIOR TO THE FINAL INSPECTION.

NYLON ROPE HANDLES

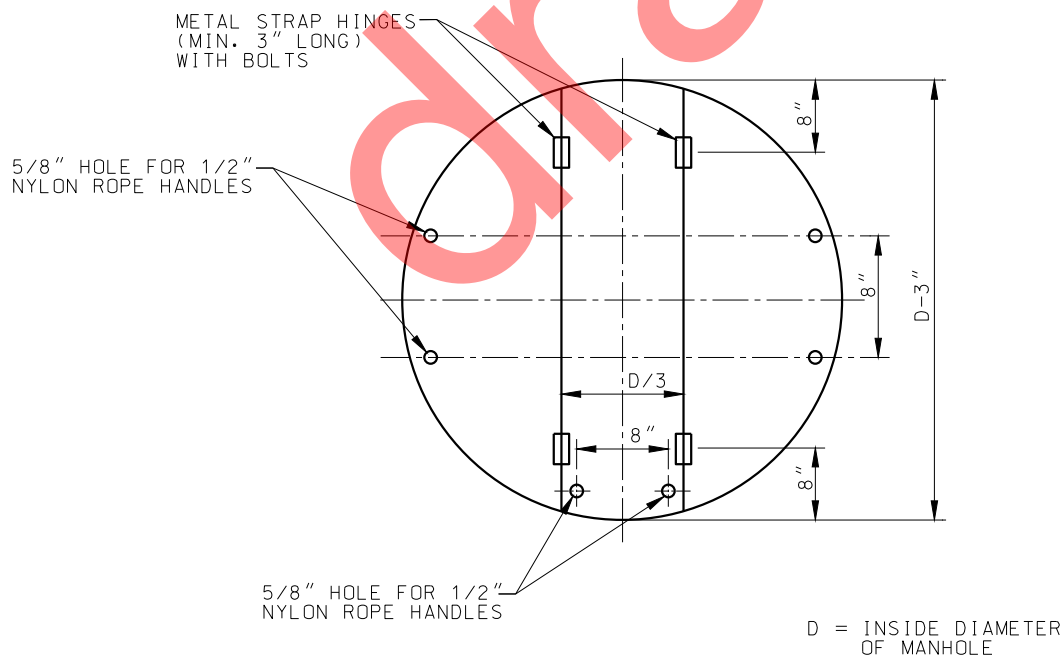


REMOVAL

FALSE MANHOLE BOTTOM SHALL BE REMOVED AFTER THE FINAL APPURTENANCE ADJUSTMENT INSPECTION. THE PAVING CONTRACTOR AND OWNER'S REPRESENTATIVE WILL COORDINATE THE REMOVAL OF THE FALSE MANHOLE BOTTOMS.

INSTALLATION AND REMOVAL POSITION

NOT TO SCALE

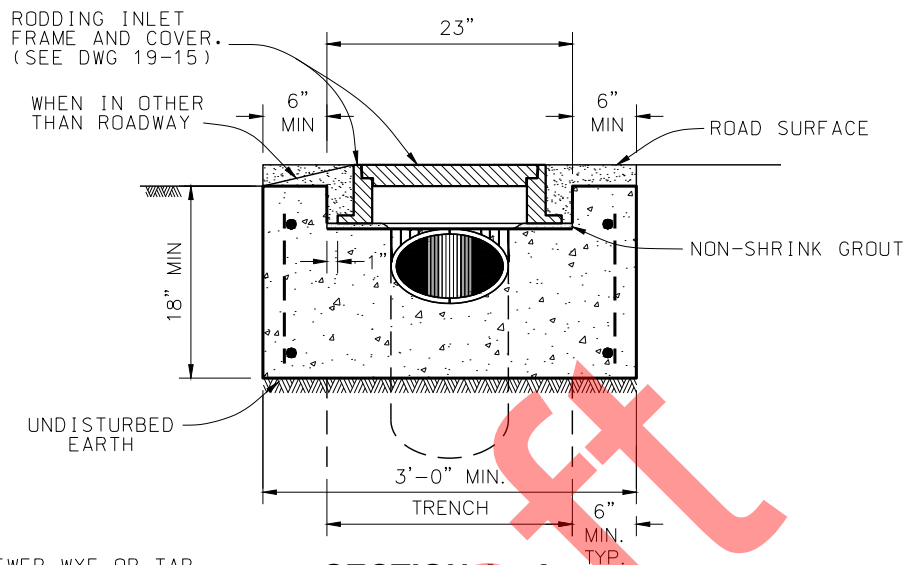


PLAN VIEW

NOT TO SCALE

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

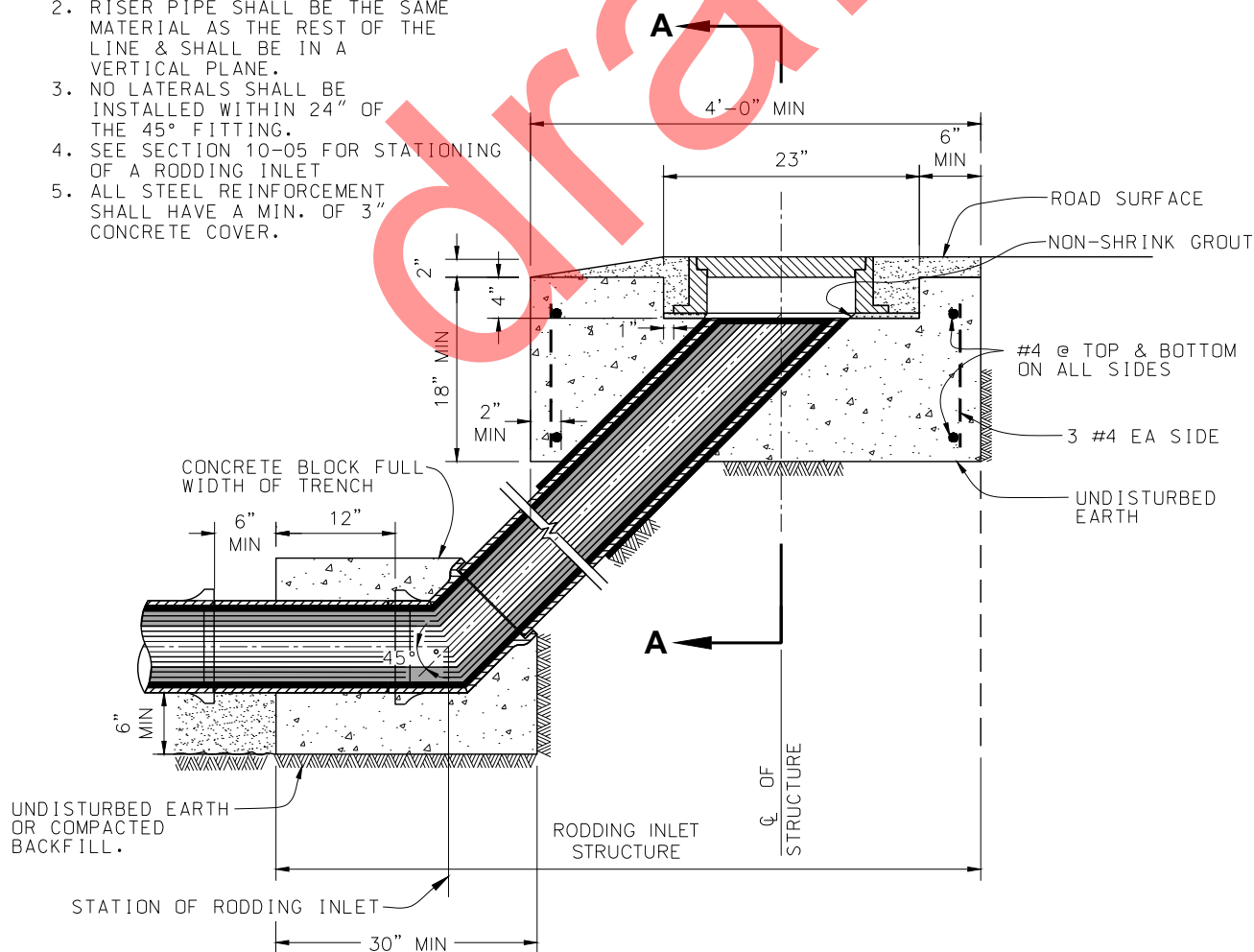
RODDING INLET



NOTES:

1. NO SIDE SEWER WYE OR TAP CONNECTIONS WILL BE PERMITTED IN RISER PIPE.
2. RISER PIPE SHALL BE THE SAME MATERIAL AS THE REST OF THE LINE & SHALL BE IN A VERTICAL PLANE.
3. NO LATERALS SHALL BE INSTALLED WITHIN 24" OF THE 45° FITTING.
4. SEE SECTION 10-05 FOR STATIONING OF A RODDING INLET
5. ALL STEEL REINFORCEMENT SHALL HAVE A MIN. OF 3" CONCRETE COVER.

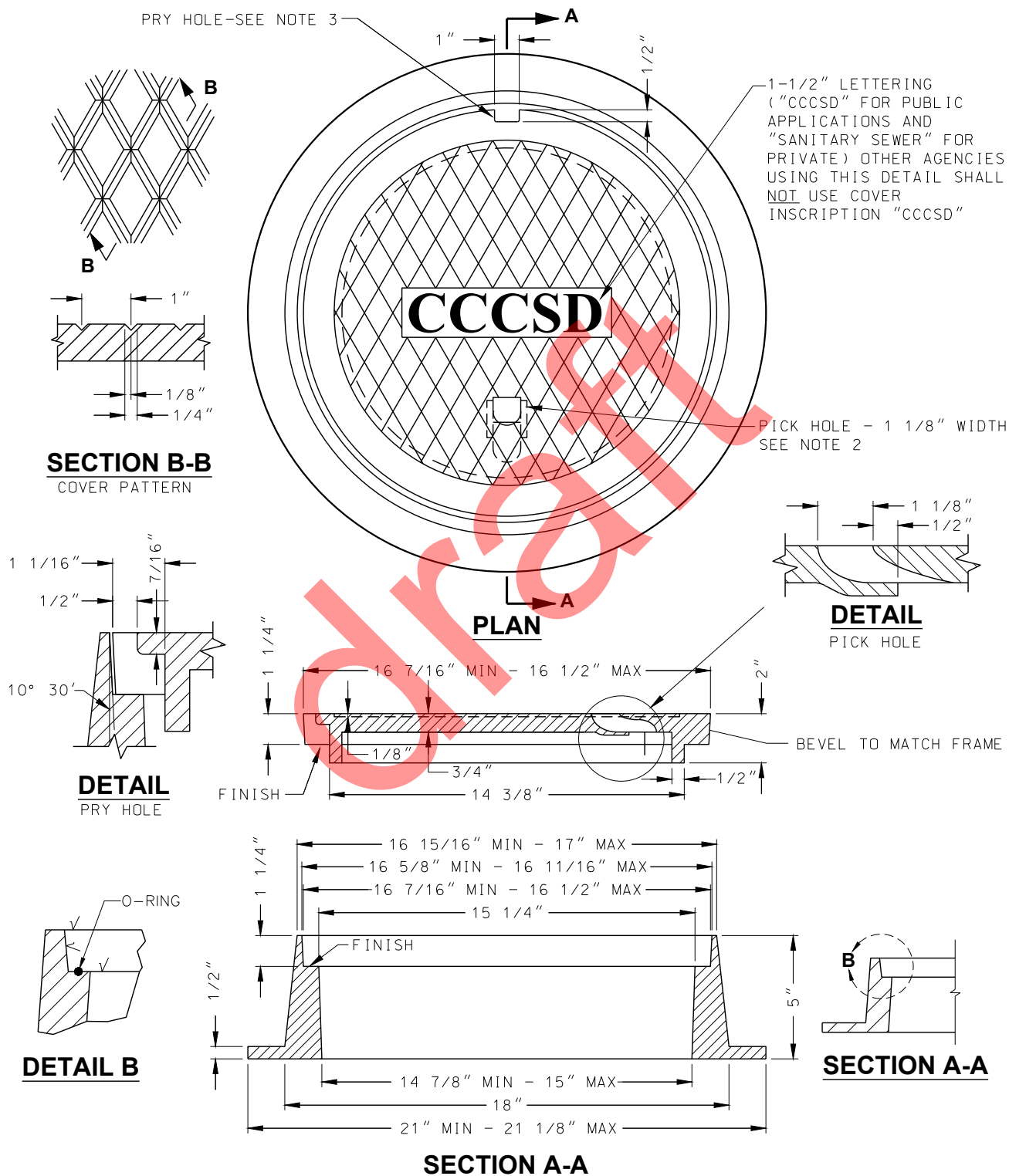
SECTION A - A



VERTICAL SECTION

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

RODDING INLET FRAME & COVER



NOTES:

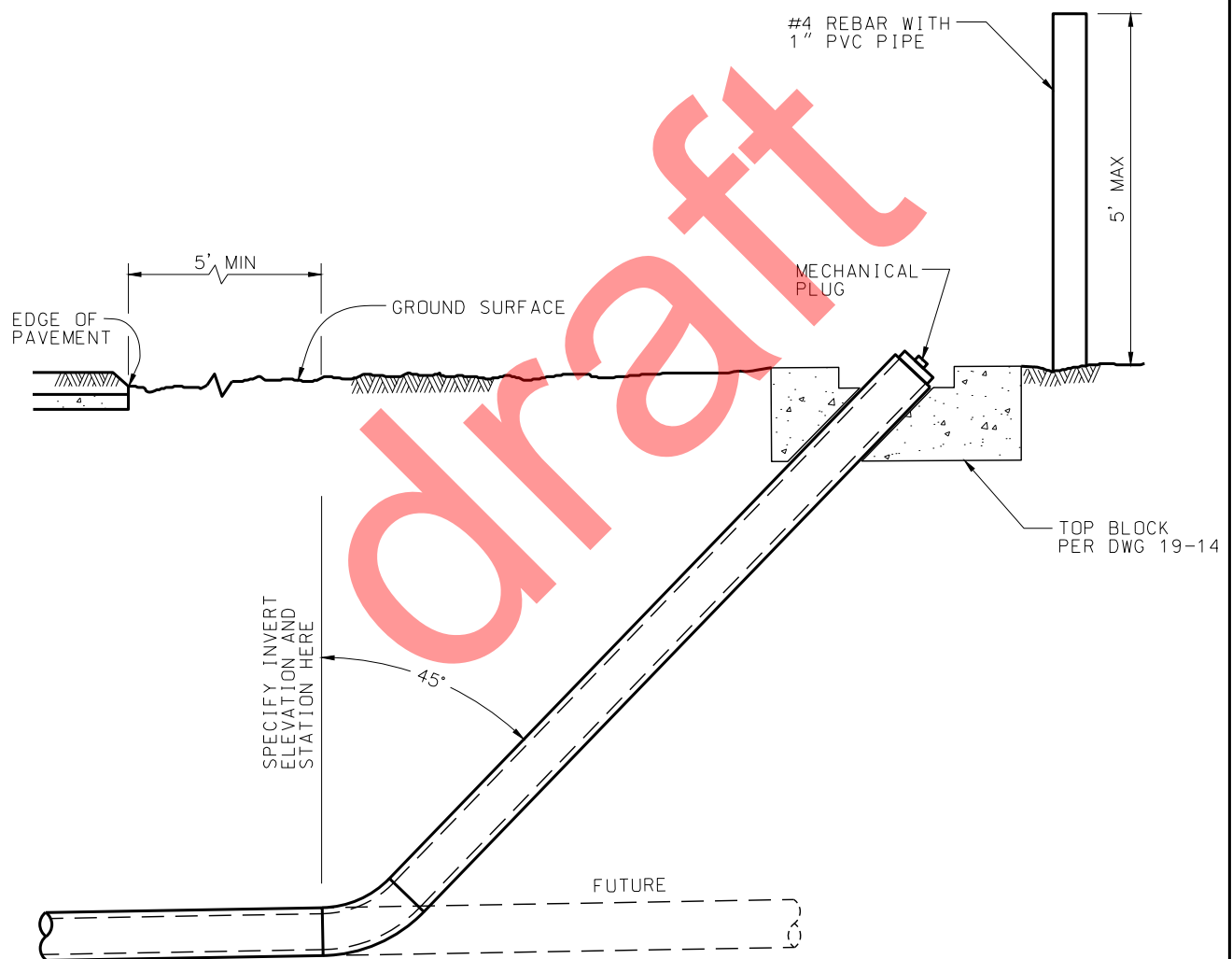
1. COVER SHALL BE DESIGNED FOR H-20 HIGHWAY LOADING.
2. PICK HOLE SHALL BE OPEN AND FIT A STANDARD PICK.
3. PRY HOLE SHALL BE LOCATED AT TOP CENTER OF THE RODDING INLET COVER AS SHOWN.

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

TEMPORARY: ACCESS STRUCTURE

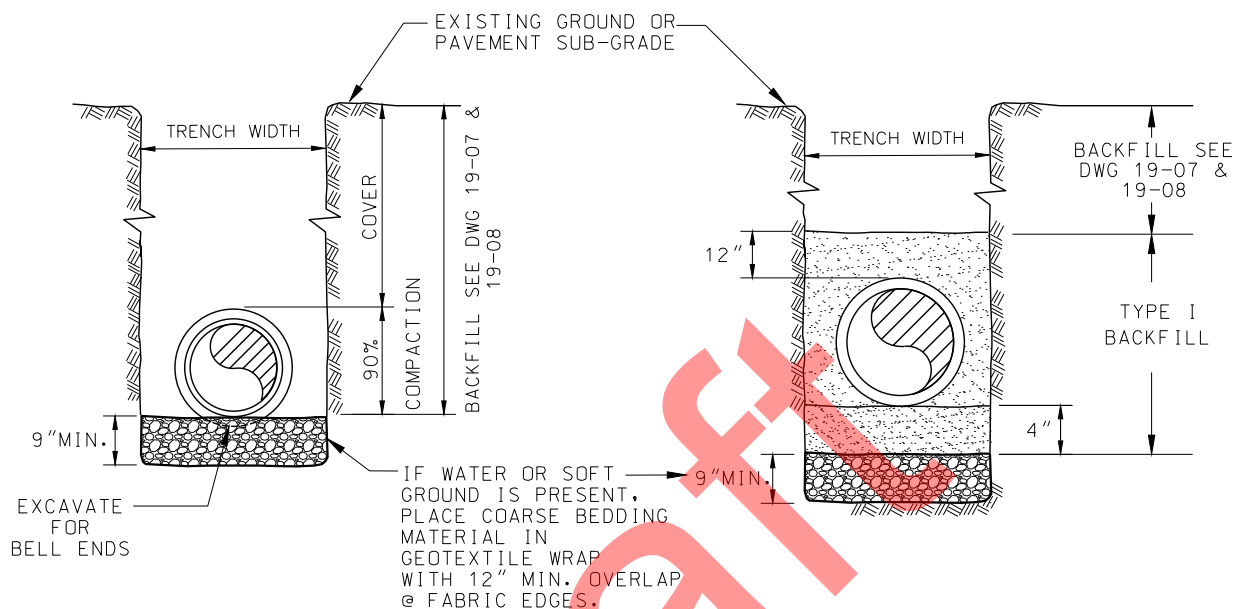
(FOR CLEANING AND TESTING OF SANITARY SEWER
MAINS TO BE EXTENDED IN THE FUTURE)



CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

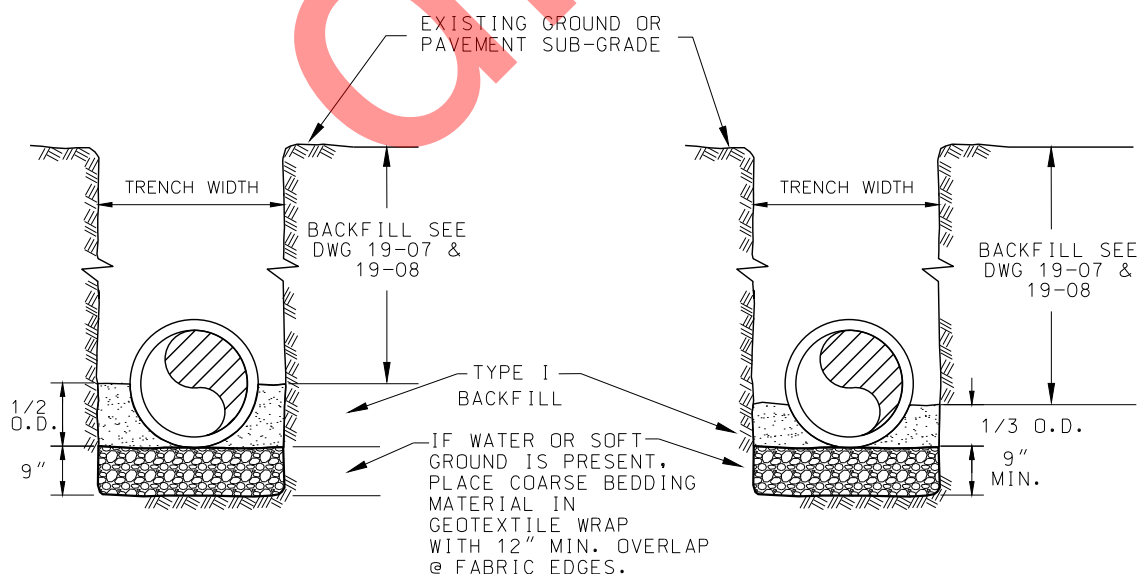
STANDARD TRUNK SEWER TRENCH DETAILS

FOR 12" AND LARGER PIPE



**FOR D.I. PIPE
INSTALLATIONS ONLY**
(N.T.S.)

**FOR ALL V.C., P.V.C.
PIPE INSTALLATIONS**
(N.T.S.)



**FOR R.C. AND STEEL PIPE
INSTALLATIONS
UP TO 42"**
(N.T.S.)

**FOR R.C. PIPE
INSTALLATIONS
48" AND LARGER**
(N.T.S.)

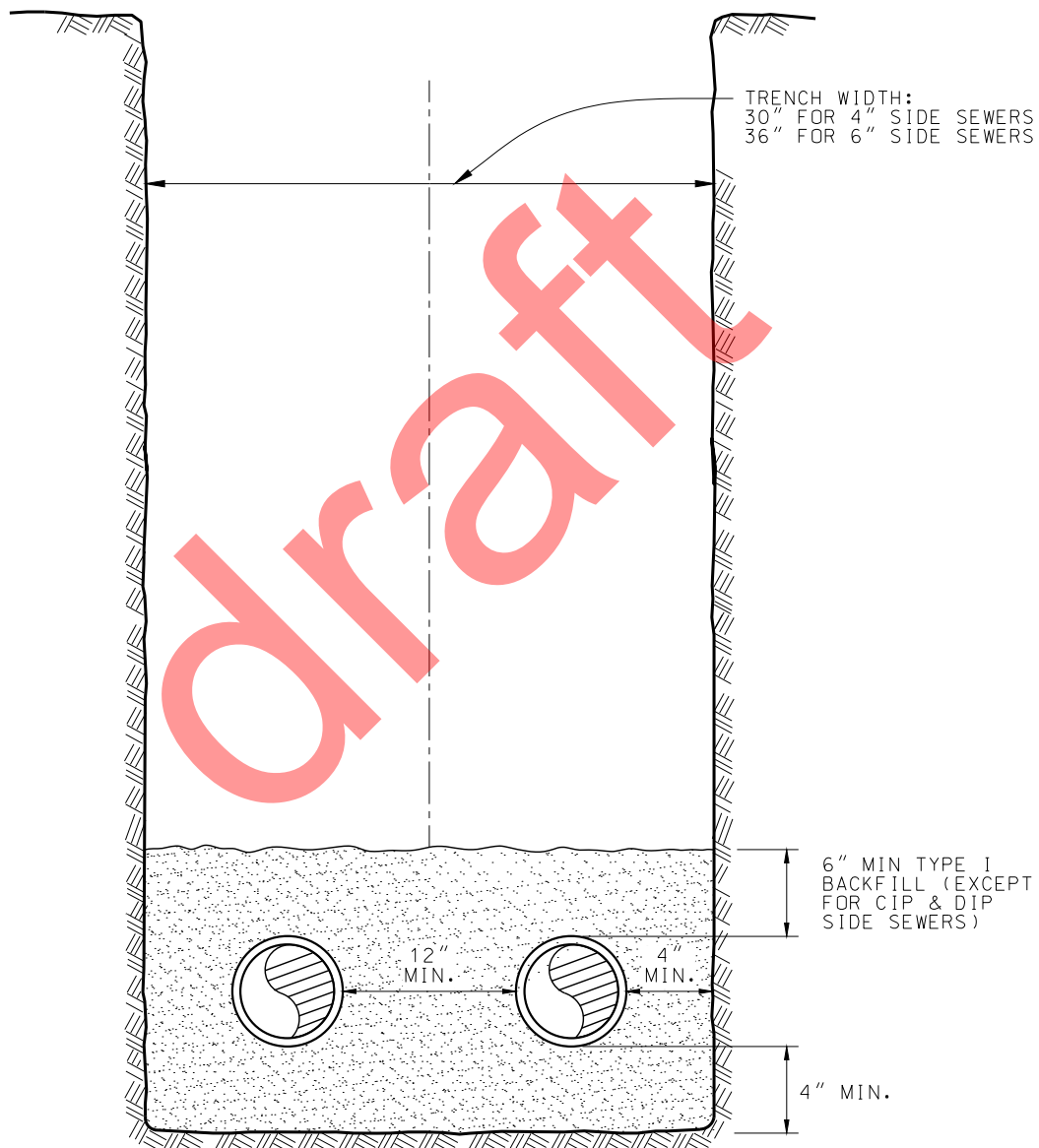
NOTES: 1. PIPE BEDDING AND BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SECTION 31 23 16.
2. WARNING TAPE REQUIRED AT TOP OF THE PIPE ZONE.

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

SHARED TRENCH DETAIL FOR SIDE SEWERS

**TWO SIDE SEWERS IN ONE TRENCH
(SPECIAL APPROVAL REQUIRED)**



NOTES:

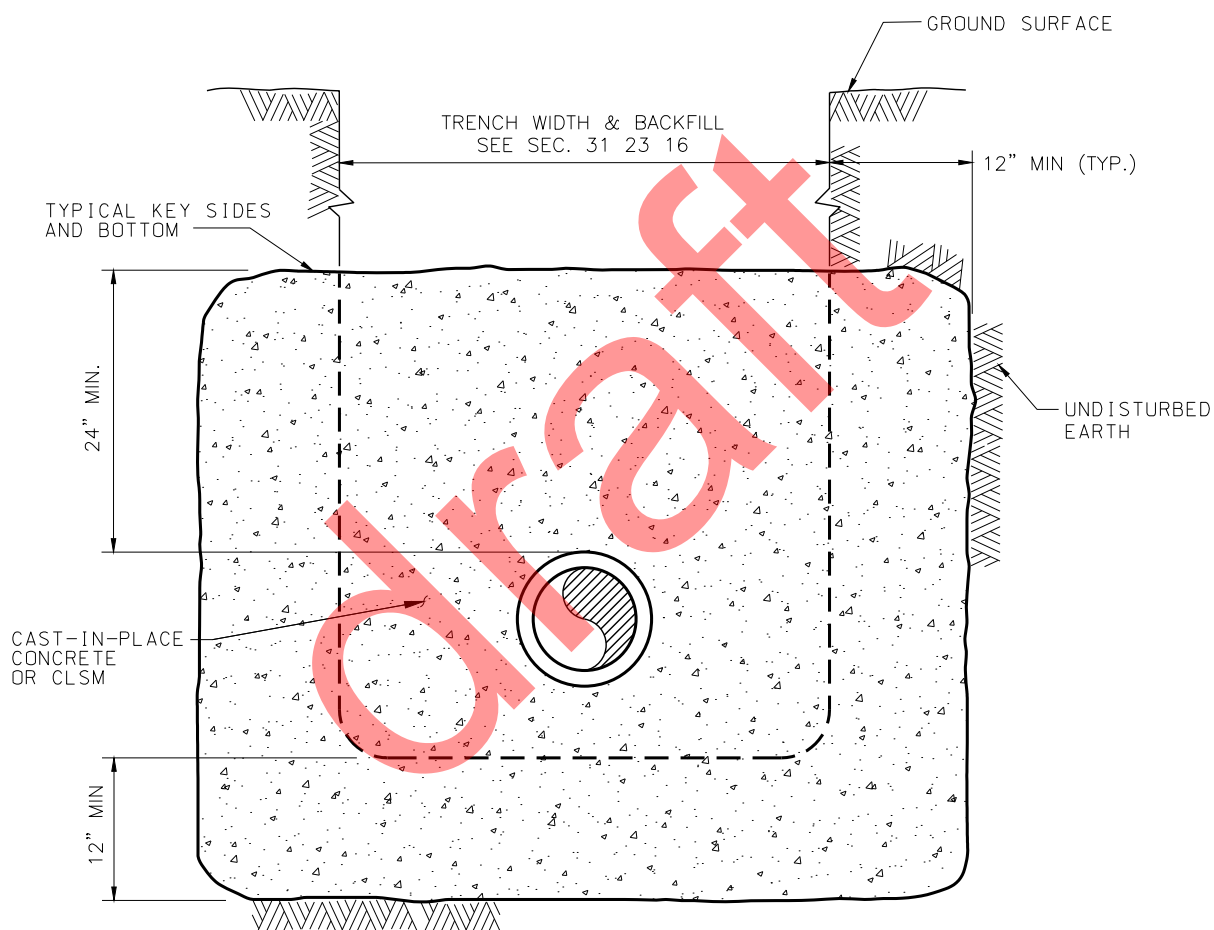
1. TRENCH WIDTH, PIPE BEDDING AND BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SECTION 31 23 16.
2. IN THE EVENT THAT SIDE SEWERS ARE TO BE CONNECTED TO A VC MAIN BY TAPPING, SUCH TAPS SHALL BE SPACED A MINIMUM OF 5 FEET APART.

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

TRENCH DAMS

LOCATED AS SHOWN ON THE PLANS
OR AS DIRECTED BY THE ENGINEER



SECTION

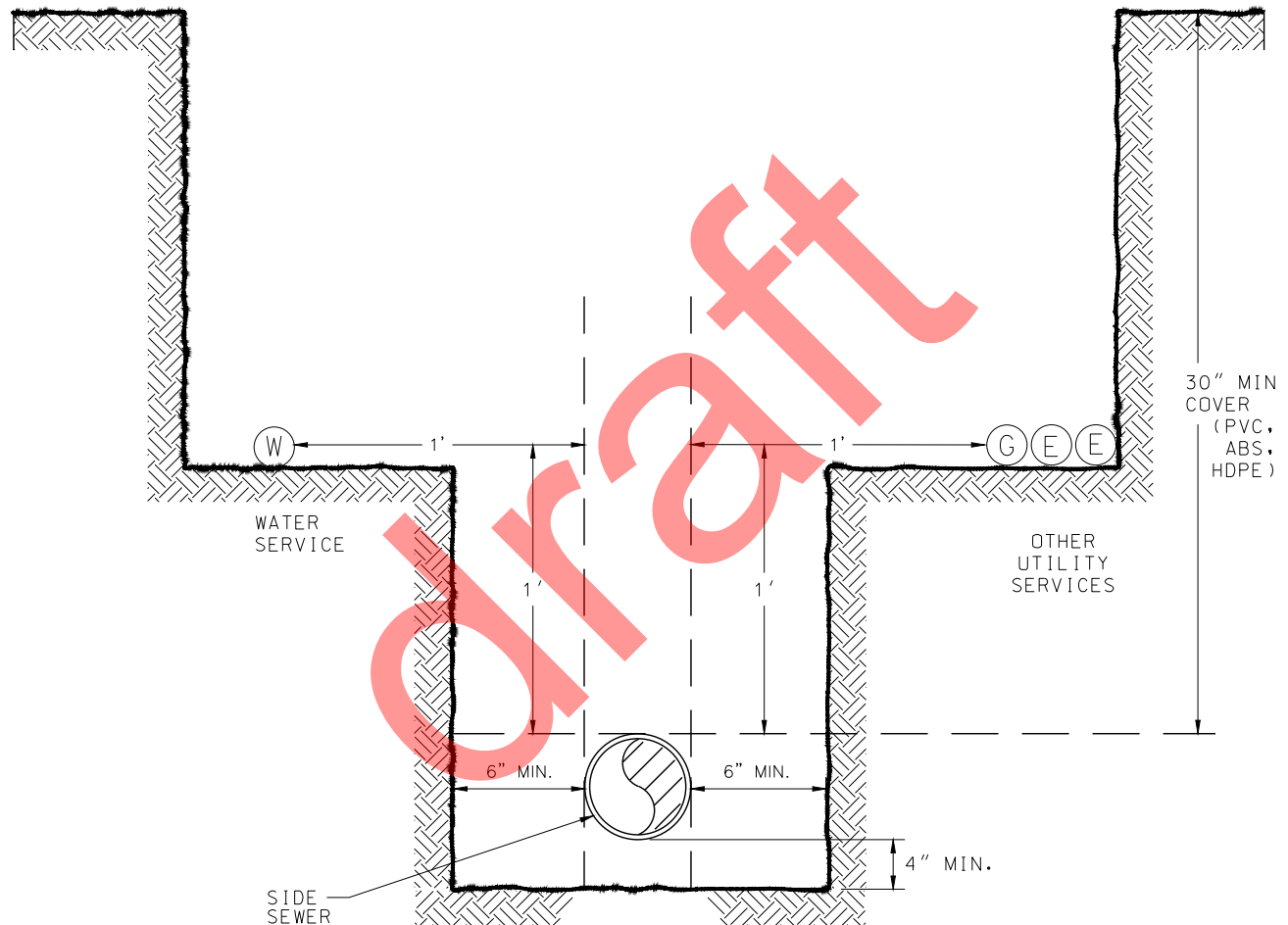
NOTES:

1. SEE SECTIONS 03 30 00 AND 03 34 13 FOR CAST-IN-PLACE CONCRETE & CLSM REQUIREMENTS.
2. TRENCH DAM TO HAVE 12" MIN. THICKNESS (ALONG TRENCH).

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

JOINT UTILITY TRENCH SEPARATION DETAIL

SIDE SEWER AND OTHER UTILITIES IN SAME TRENCH



NOTES:

1. PIPE BEDDING AND BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SECTION 31 23 16.
2. REFER TO SECTION 4-08 FOR PIPE COVER REQUIREMENTS.
3. THESE ARE MINIMUM REQUIREMENTS. CONTRACTOR SHALL CONTACT UTILITY AGENCIES TO CONFIRM REQUIRED SEPARATION REQUIREMENTS.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

CRITERIA FOR THE SEPARATION OF WATER MAIN AND SANITARY SEWERS

(REFERENCE: CALIFORNIA DOHS GUIDANCE
MEMO NO. 2003-02)

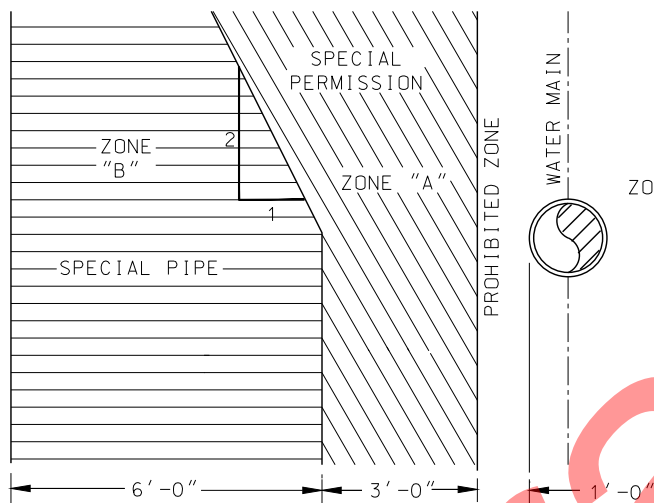
ZONE "A": SEWER LINES NOT PERMITTED
WITHOUT APPROVAL OF WATER AGENCY

ZONE "B": PERMITTED MATERIALS
-VC PIPE WITH COMPRESSION JOINTS
-PVC PIPE WITH RUBBER RING JOINTS
(ATSM 3034)
-CI OR DI PIPE WITH COMP. JOINTS
-RC PRESSURE PIPE WITH COMP. JOINTS
-HDPE PIPE WITH FUSION WELDED
JOINTS (AWWA C906-99)
-SPIRALLY-REINFORCED HDPE PIPE WITH
GASKETED JOINTS (ASTM F-984)

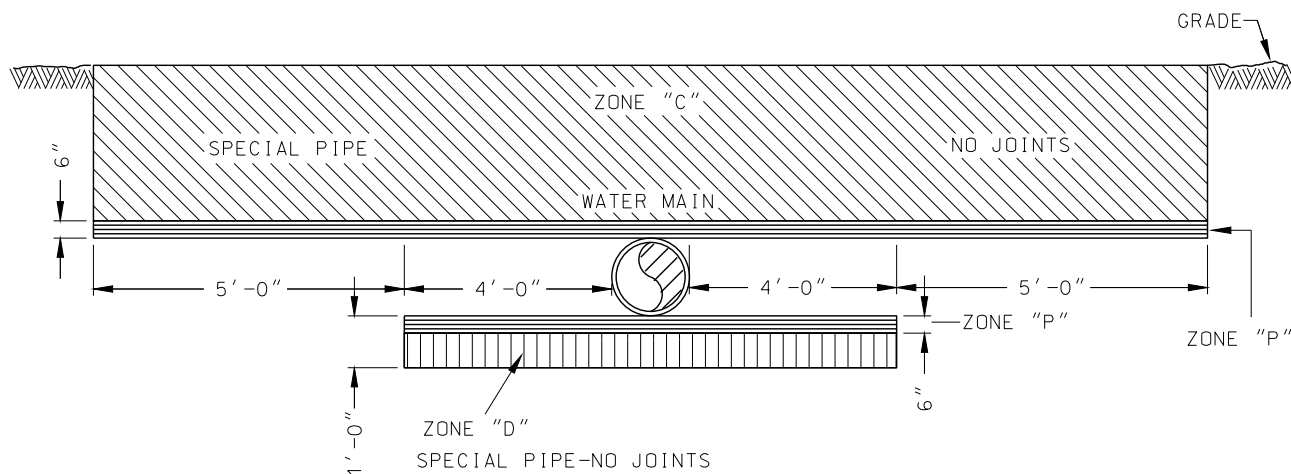
ZONE "C": PERMITTED MATERIALS
-DI PIPE WITH HOT DIP BITUMINOUS
COATING
-C-900 PVC (DR 14). CONTINUOUS SECTION
CENTERED OVER PIPE BEING CROSSED
-RC PRESSURE PIPE. CONTINUOUS
SECTION CENTERED OVER PIPE BEING
CROSSED
-ANY SEWER PIPE WITHIN A CONTINUOUS
SLEEVE
-HDPE PIPE WITH FUSION WELDED
JOINTS (AWWA C906-99)

ZONE "D": PERMITTED MATERIALS
-DI PIPE WITH HOT DIP BITUMINOUS
COATING AND MECHANICAL JOINTS
-HDPE PIPE WITH FUSION-WELDED
JOINTS (AWWA C906-99)
-C-900 PVC (DR 14) CONTINUOUS SECTION
CENTERED OVER PIPE BEING CROSSED
-RC PRESSURE PIPE CONTINUOUS SECTION
CENTERED OVER PIPE BEING CROSSED
-ANY SEWER PIPE WITHIN A CONTINUOUS
SLEEVE

ZONE "P": NOT PERMITTED



PARALLEL CONSTRUCTION

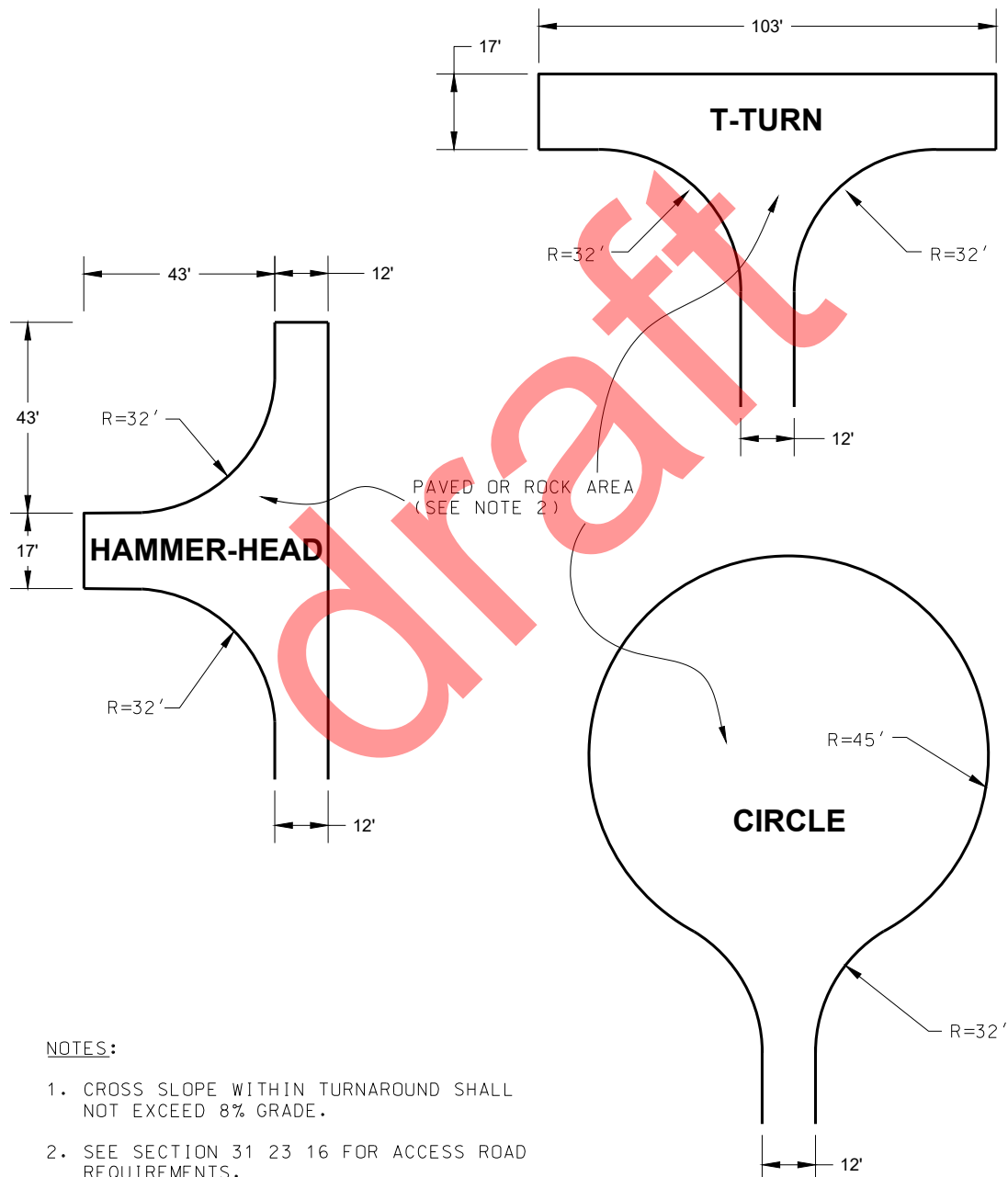


CROSSING

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

ALL-WEATHER ACCESS ROAD TURNAROUNDS



NOTES:

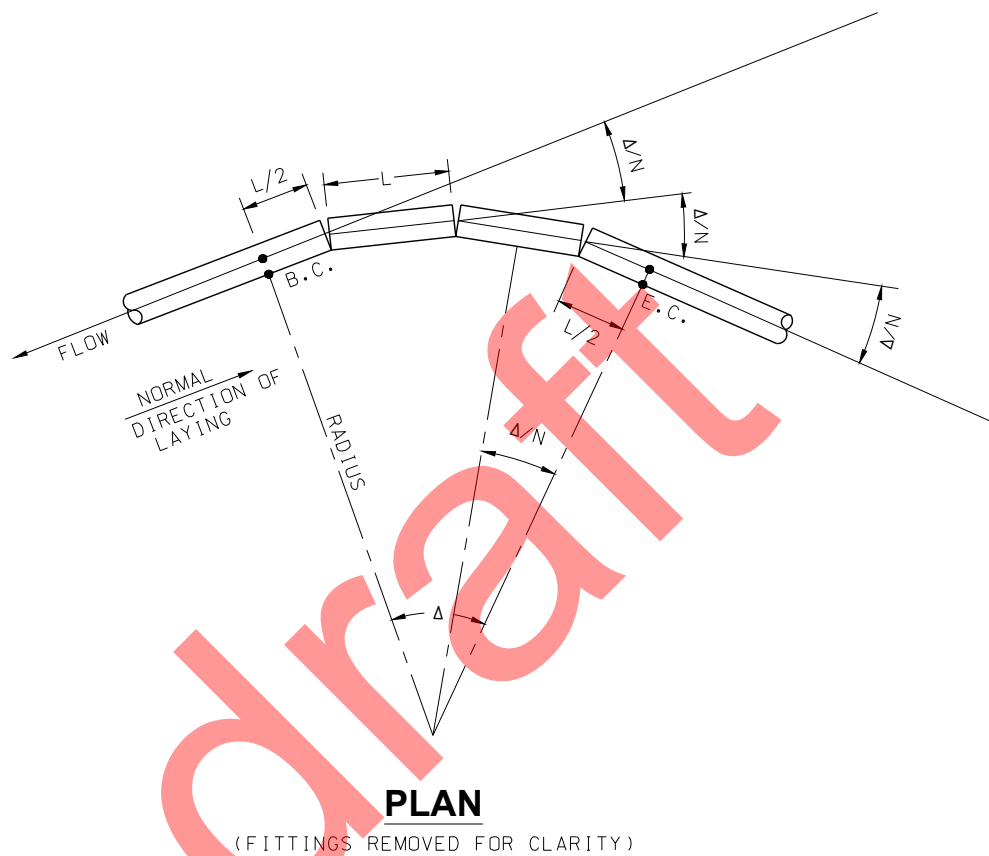
1. CROSS SLOPE WITHIN TURNAROUND SHALL NOT EXCEED 8% GRADE.
2. SEE SECTION 31 23 16 FOR ACCESS ROAD REQUIREMENTS.
3. ALL DIMENSIONS ARE MINIMUM REQUIREMENTS.

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

LAYOUT OF CURVED ALIGNMENT

USING STRAIGHT PIPE SEGMENTS WITH JOINT DEFLECTIONS OR FITTINGS



THE LAYING LENGTH (L), RADIUS (R), AND INCLUDED ANGLE (Δ) ARE COMPUTED BY THE EQUATIONS:

$$\begin{aligned} L &= 2 \times R \times \tan(\Delta/2N) \\ R &= L / (2 \times \tan(\Delta/2N)) \\ \Delta &= 2 \times N \times \tan^{-1}(L/2R) \end{aligned}$$

WHERE:

R = RADIUS OF CURVATURE, FEET

L = LAID LENGTH OF EACH PIPE SEGMENT
MEASURED ALONG THE CENTERLINE, FEET

Δ = TOTAL DEFLECTION ANGLE OF CURVE, DEGREES

N = NUMBER OF DEFLECTED JOINTS

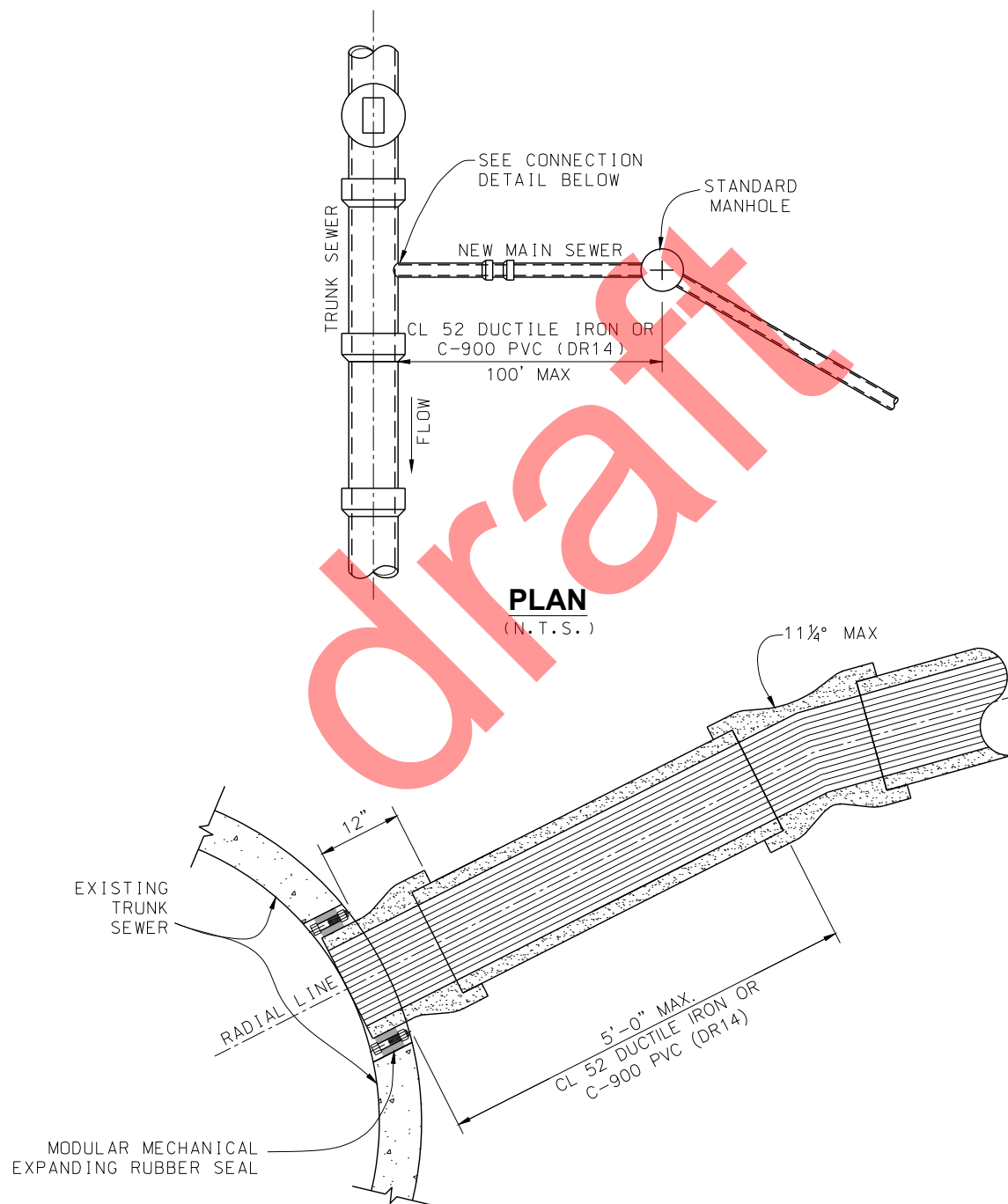
Δ/N = TOTAL DEFLECTION AT EACH JOINT, DEGREES

NOTE: "L" SHALL BE EQUAL TO OR GREATER THAN 5 FEET.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MAIN SEWER CONNECTION TO TRUNK SEWERS

**48" AND LARGER
(SPECIAL APPROVAL REQUIRED)**



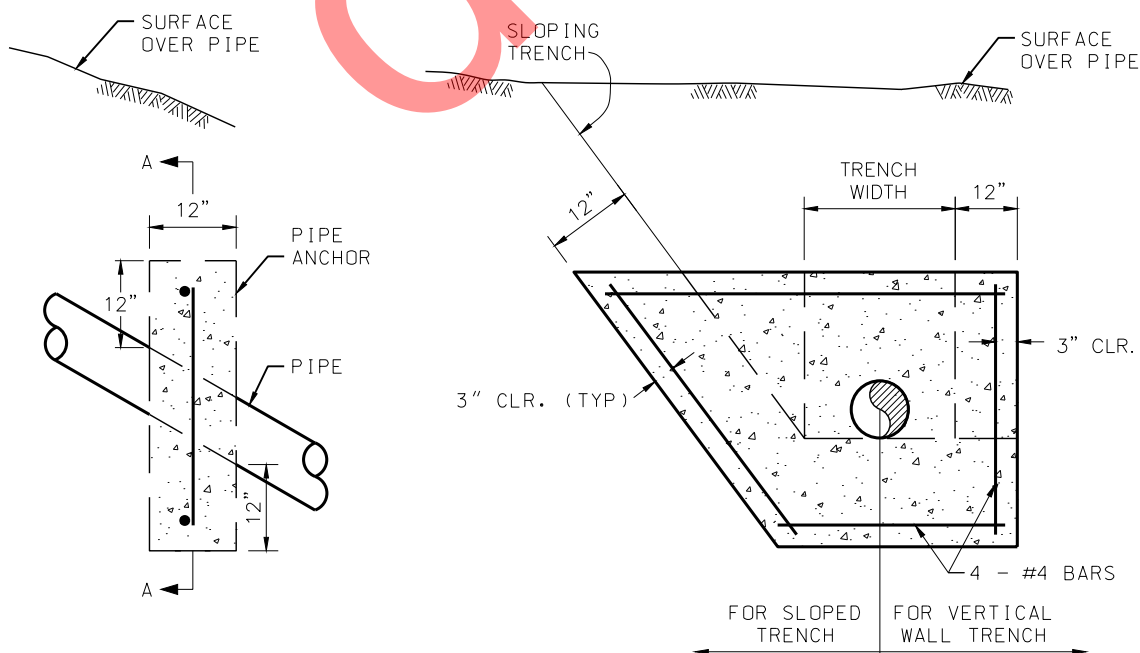
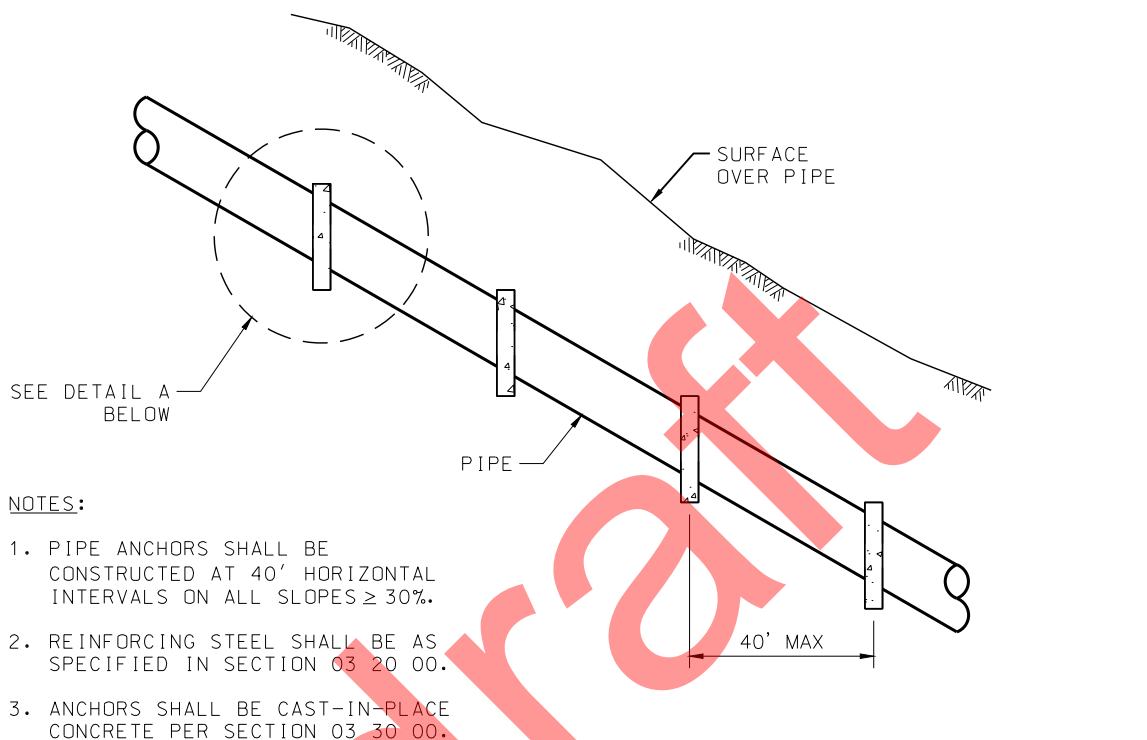
NOTES:

1. TAP SHALL BE CORE DRILLED, RECOVER CORED PLUG.
2. USE CLSM BACKFILL WITHIN 5' OF TRUNK.

CONNECTION DETAIL

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

PIPE ANCHOR DETAIL

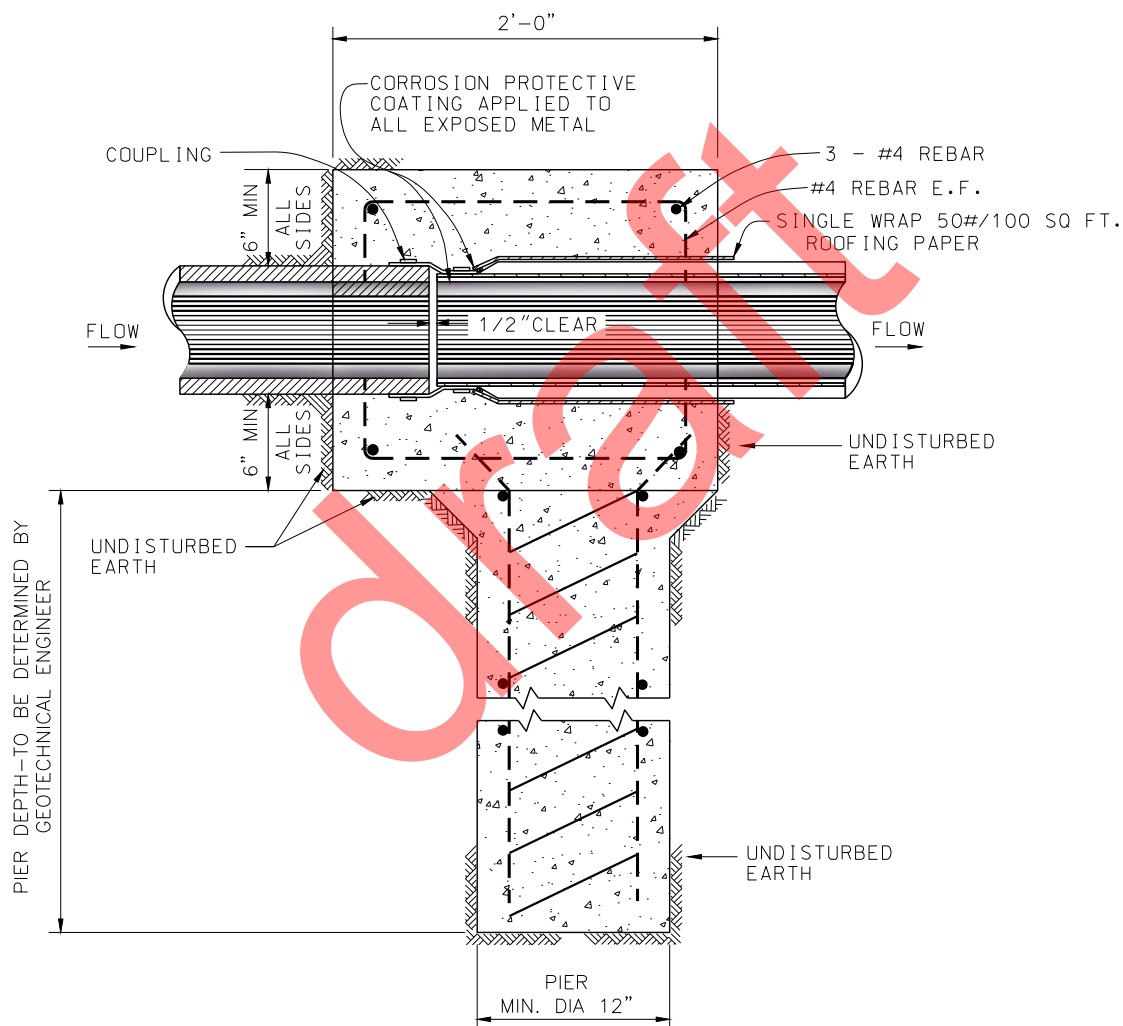


DETAIL A

SECTION A-A

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

JUNCTION SUPPORT EXPANSION BLOCK (SPECIAL APPROVAL REQUIRED)



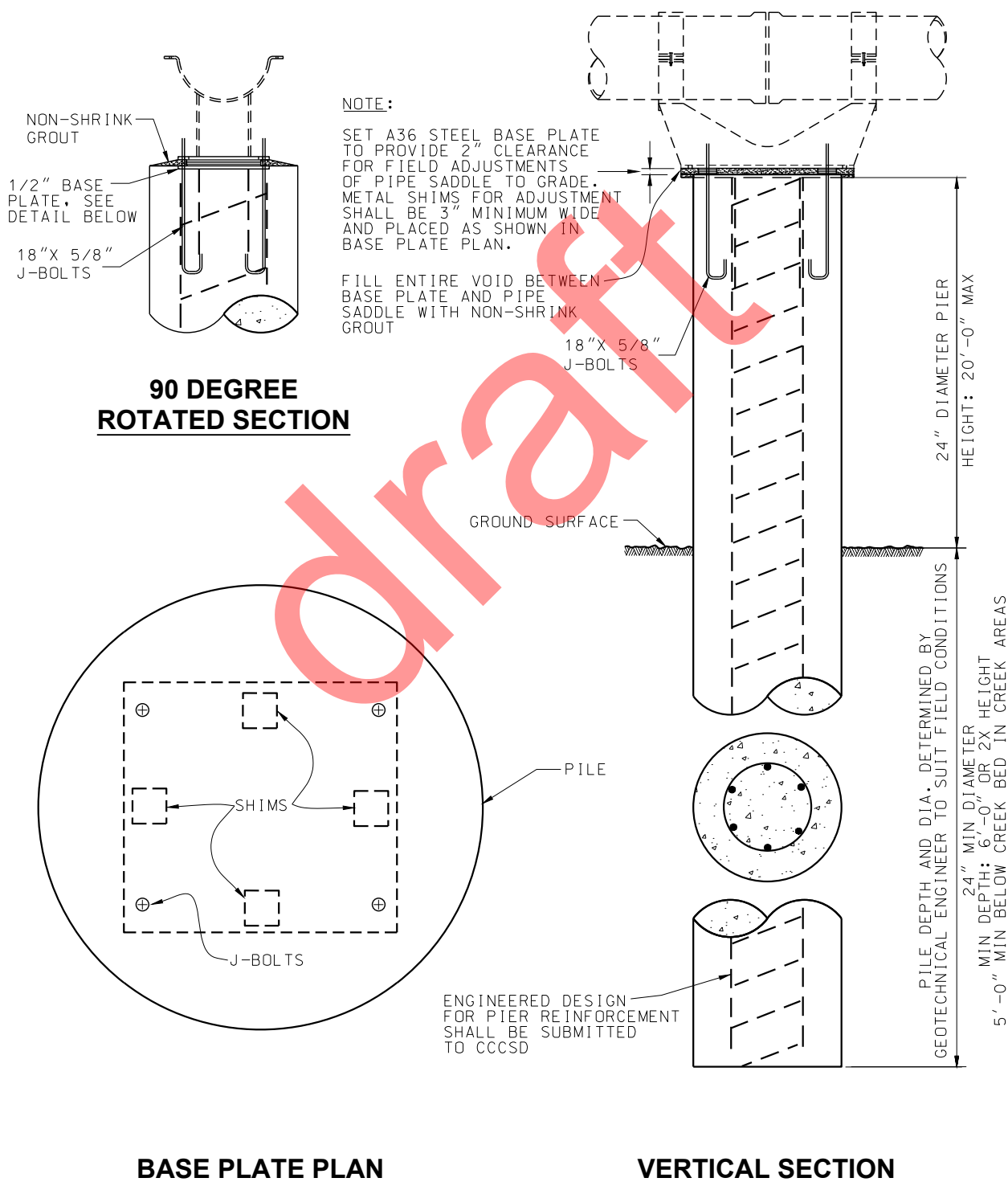
VERTICAL SECTION

NOTES:

1. ENGINEERED DESIGN FOR PIER REINFORCEMENT SHALL BE SUBMITTED TO CCCSD.
2. ALL STEEL REINFORCEMENT SHALL HAVE 3" MINIMUM CONCRETE COVER.

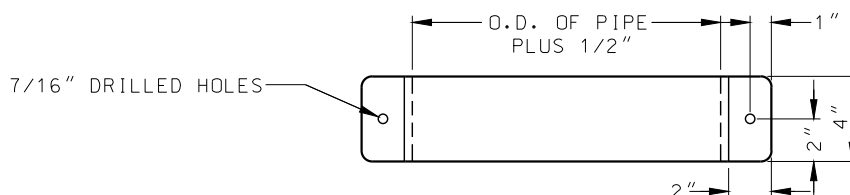
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

CONCRETE PIER SUPPORT FOR USE WHERE HEIGHT IS 1 TO 20 FEET (SPECIAL APPROVAL REQUIRED)



CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

PIPE SADDLE FOR USE ON CONCRETE PIER SUPPORT AND TRESTLE BENT



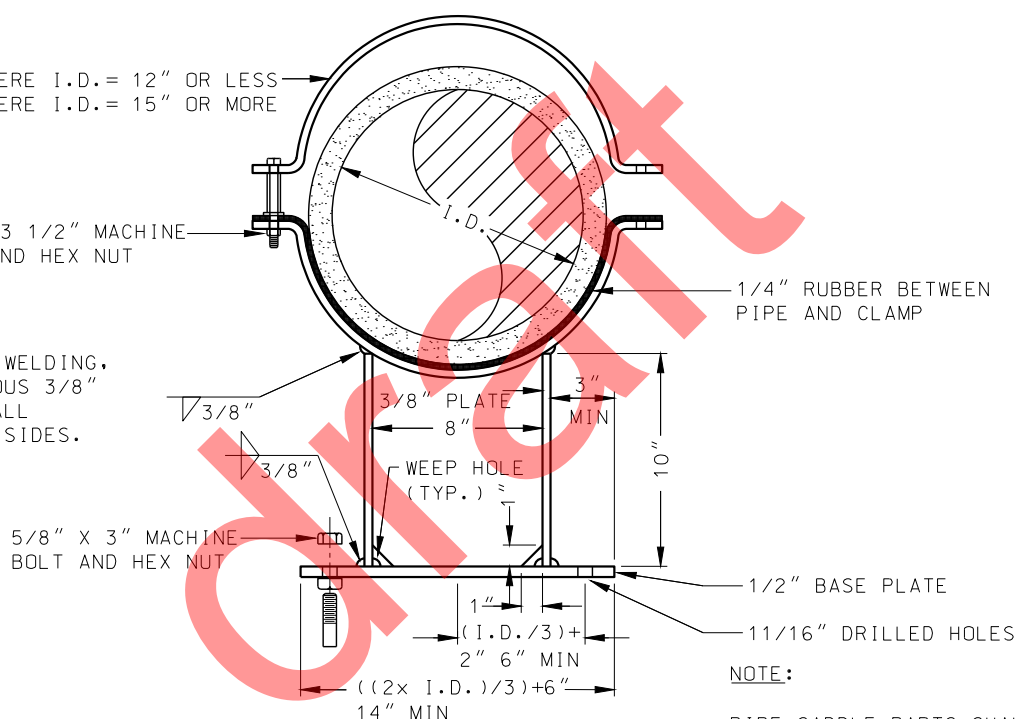
TOP VIEW OF CLAMP

3/8" PLATE WHERE I.D. = 12" OR LESS
1/2" PLATE WHERE I.D. = 15" OR MORE

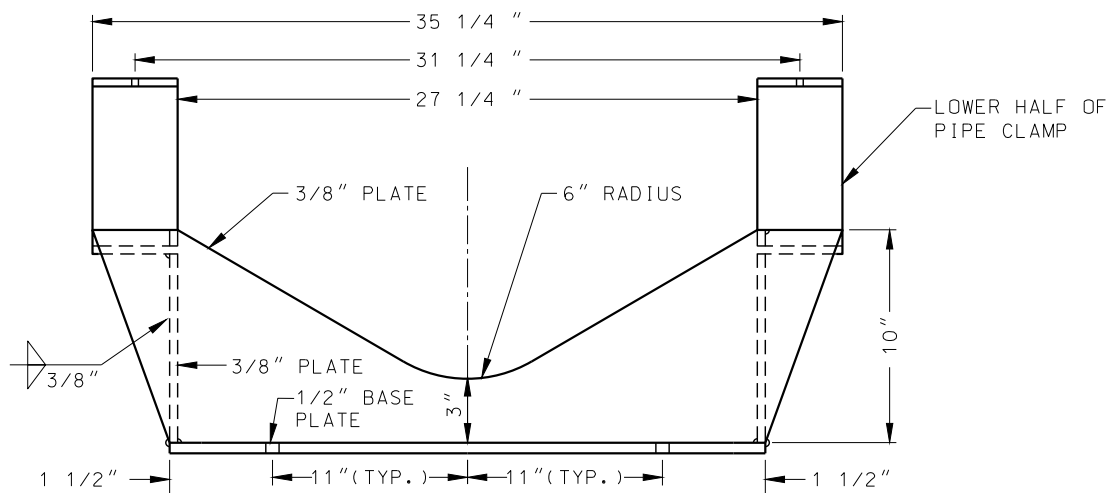
3/8" X 3 1/2" MACHINE
SCREW AND HEX NUT

NOTE:

FABRICATE BY WELDING,
WITH CONTINUOUS 3/8"
FILLET WELD, ALL
JOINTS, BOTH SIDES.



END VIEW



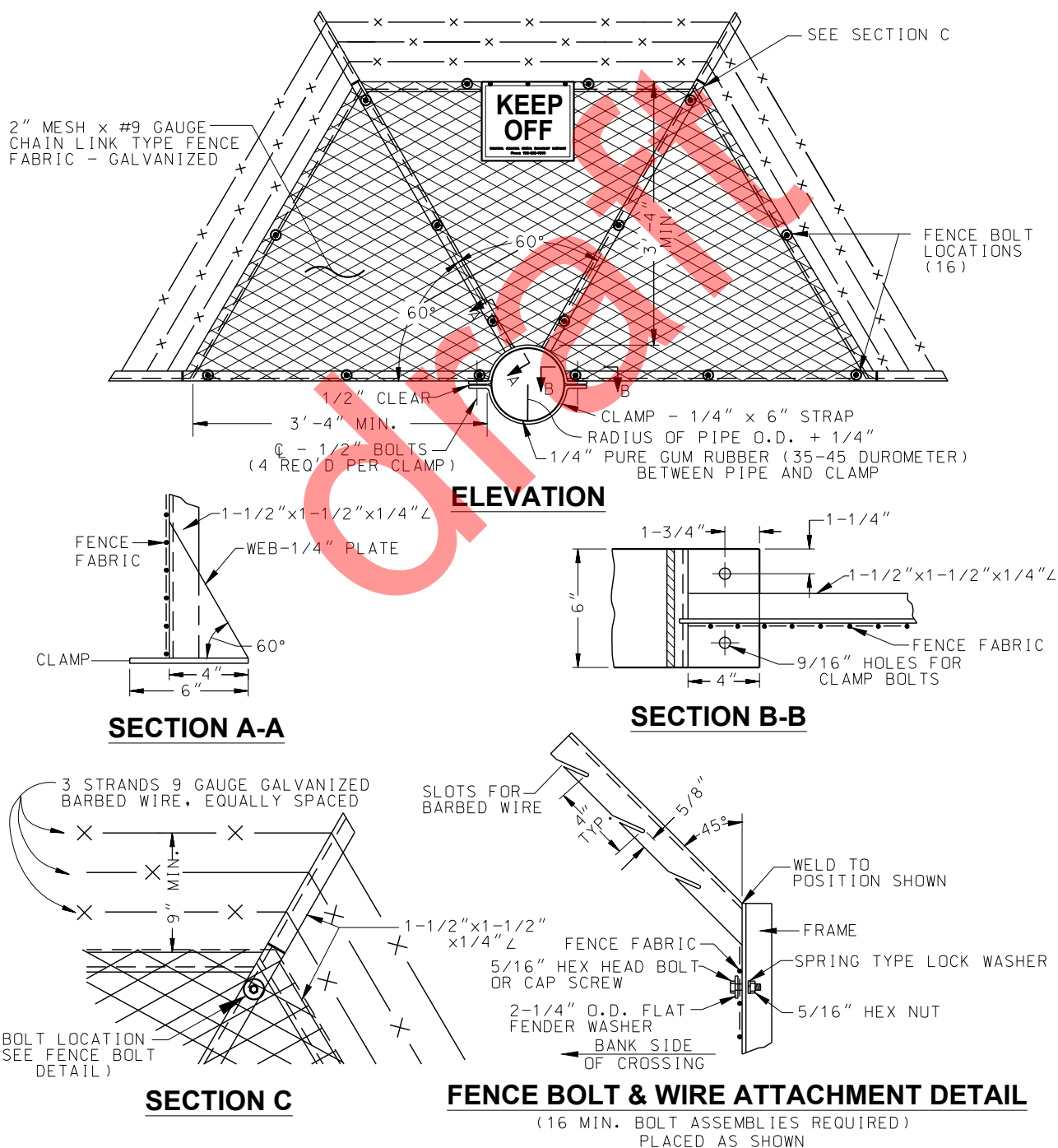
SIDE VIEW

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

GUARD FENCE FOR CREEK CROSSING

NOTES:

1. ALL GUARD FENCE PARTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
2. EACH GUARD FENCE SHALL HAVE A 12" x 14" 20 GAUGE MINIMUM SIGN PERMANENTLY ATTACHED IN LOCATION SHOWN (FURNISHED BY CCCSD).

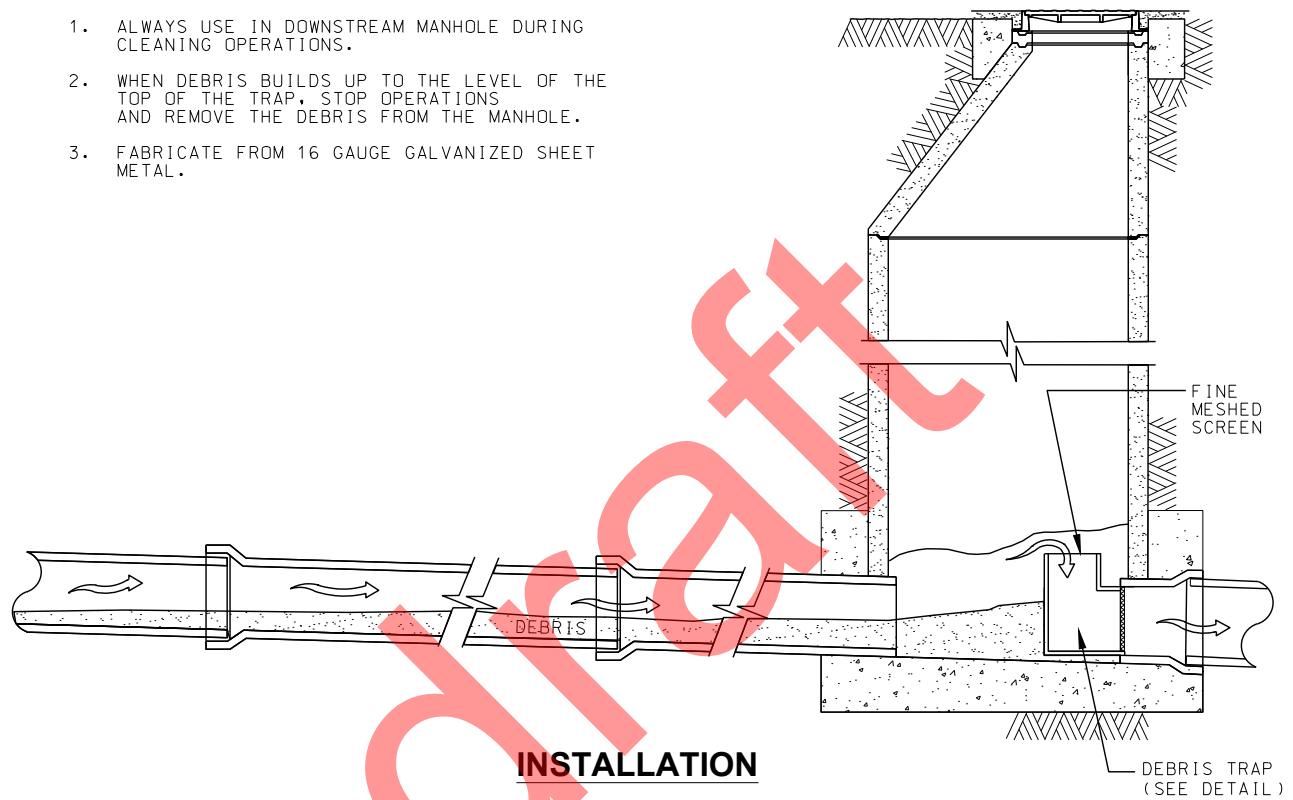


CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

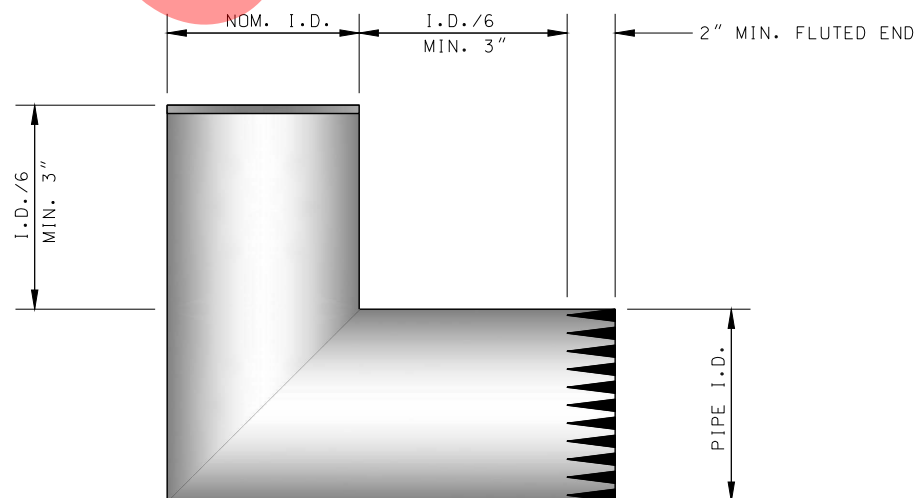
DEBRIS TRAP FOR CLEANING PURPOSES

NOTES:

1. ALWAYS USE IN DOWNSTREAM MANHOLE DURING CLEANING OPERATIONS.
2. WHEN DEBRIS BUILDS UP TO THE LEVEL OF THE TOP OF THE TRAP, STOP OPERATIONS AND REMOVE THE DEBRIS FROM THE MANHOLE.
3. FABRICATE FROM 16 GAUGE GALVANIZED SHEET METAL.



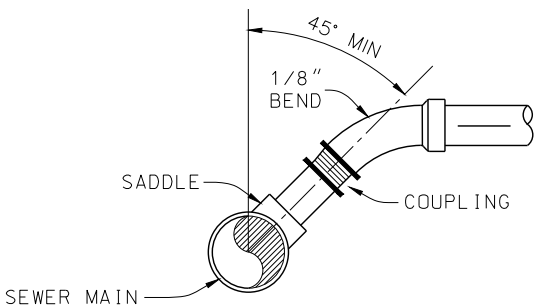
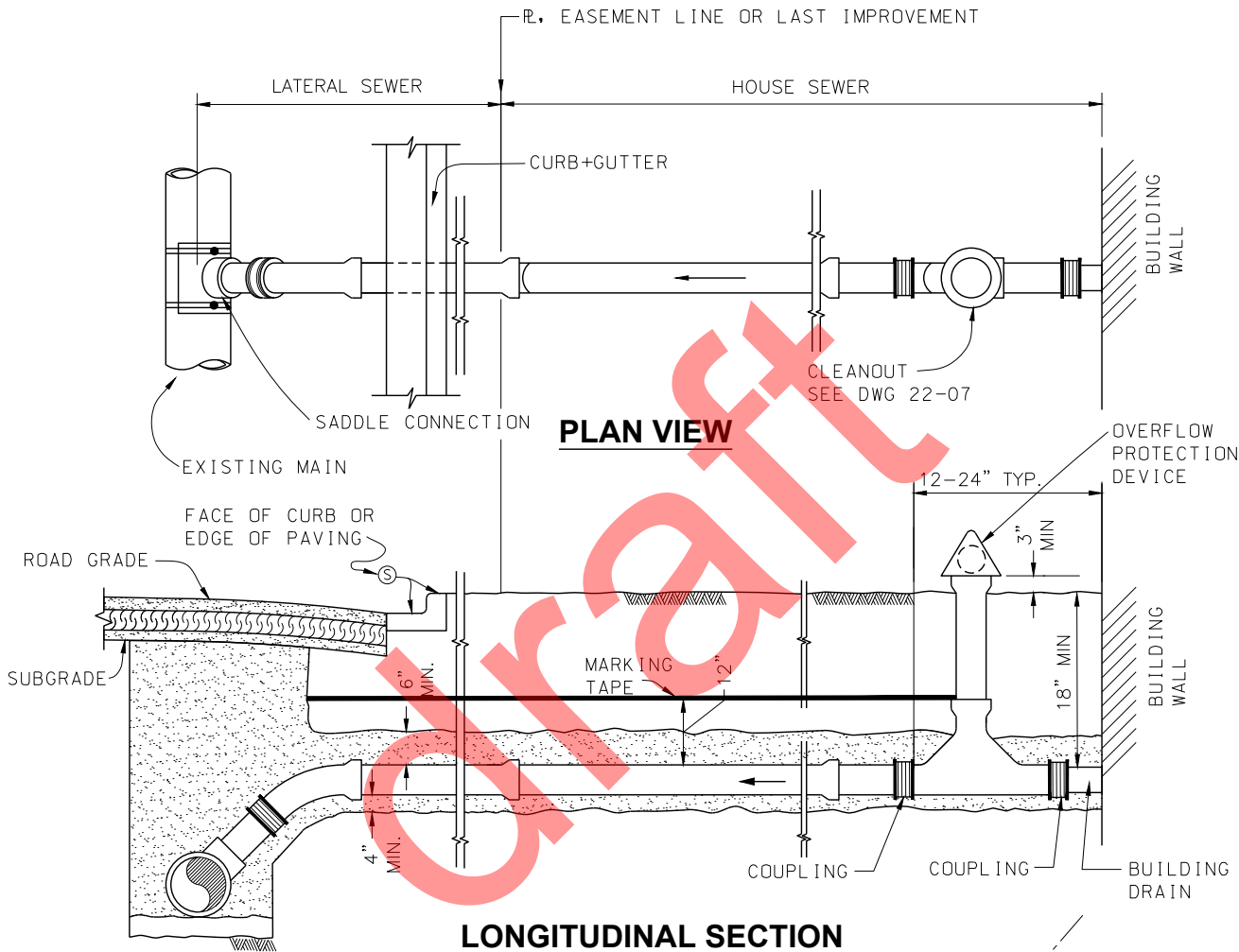
INSTALLATION



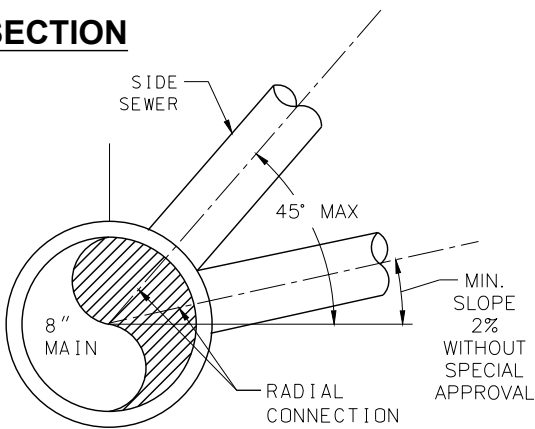
DETAIL

CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

SIDE SEWER LAYOUT
(CONNECTION TO EXISTING MAIN)



SADDLE CONNECTION DETAIL



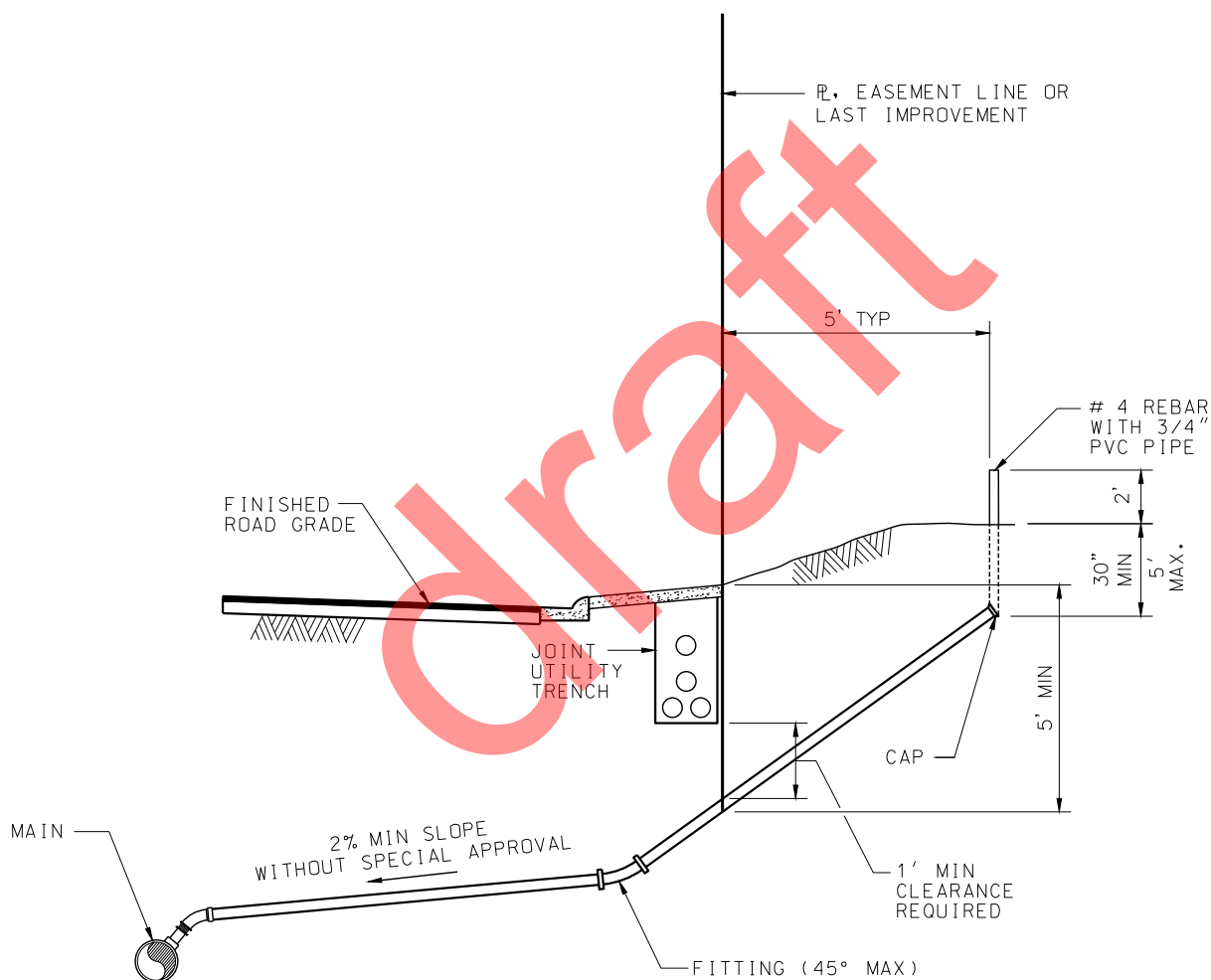
CONNECTION AT MAIN

NOTES:

1. WHEN A LATERAL SEWER IS INSTALLED IN ADVANCE OF THE BUILDING SEWER, IT SHALL BE TERMINATED WITH A CAP OR PLUG 5' PAST THE PROPERTY LINE, EASEMENT LINE OR LAST IMPROVEMENT AND THE CONTRACTOR SHALL MARK THE LOCATION OF THE CAPPED/PLUGGED END WITH A 2X4 PRESSURE TREATED STAKE PAINTED GREEN.
2. REFER TO SECTION 31 23 16 FOR BEDDING AND BACKFILL REQUIREMENTS.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

SIDE SEWER LAYOUT (CONNECTION TO NEW MAIN)



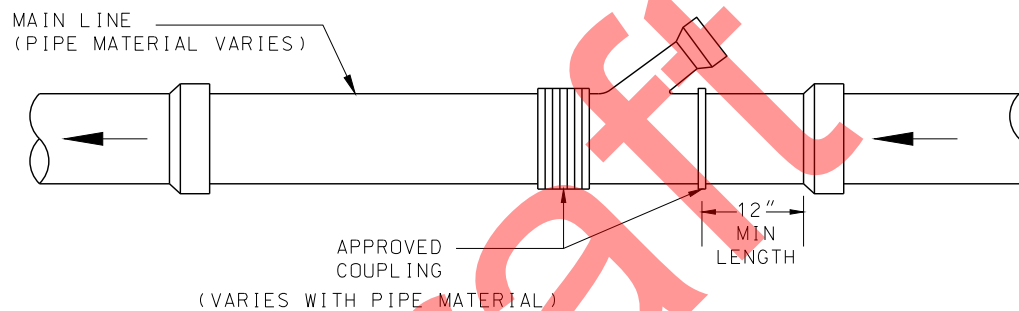
NOTES:

1. REFER TO SECTION 31 23 16 FOR BEDDING AND BACKFILL REQUIREMENTS.
2. MINIMUM COVER FROM THE POINT OF CONNECTION TO THE BUILDING WASTE PLUMBING (WITHIN TWO FEET OF THE FOUNDATION) SHALL BE 18 INCHES. COVER REQUIREMENTS FROM THE PROPERTY LINE TO A POINT WITHIN 8 FEET OF THE BUILDING WASTE SHALL BE IN CONFORMANCE WITH SECTION 4.

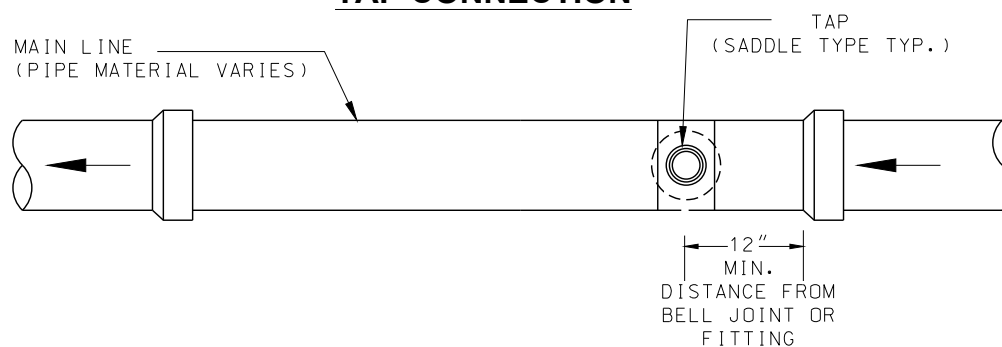
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

TAP AND WYE CONNECTION TO EXISTING MAIN

WYE CONNECTION



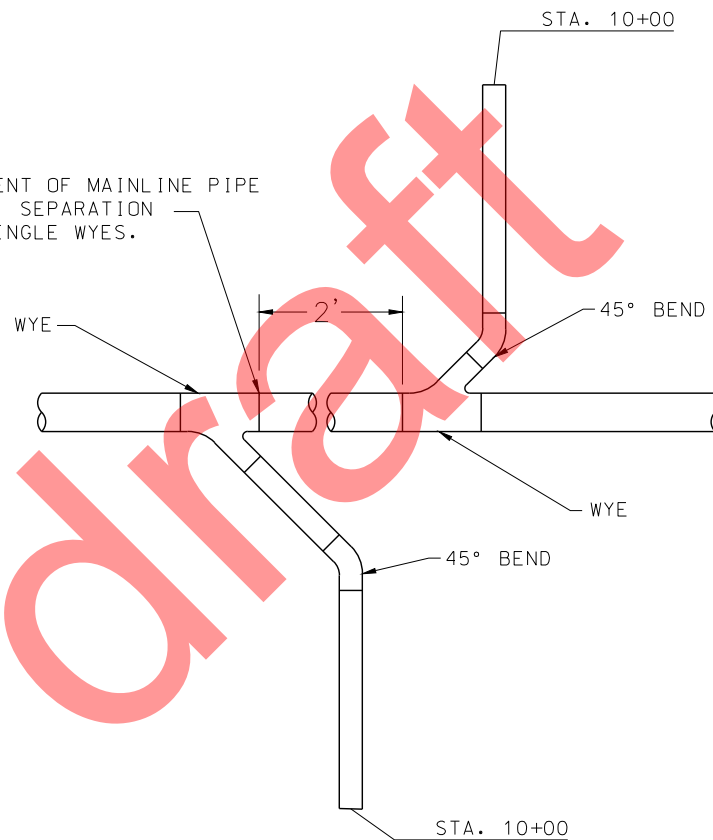
TAP CONNECTION



CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

MINIMUM LAYOUT OF WYES ALONG MAIN

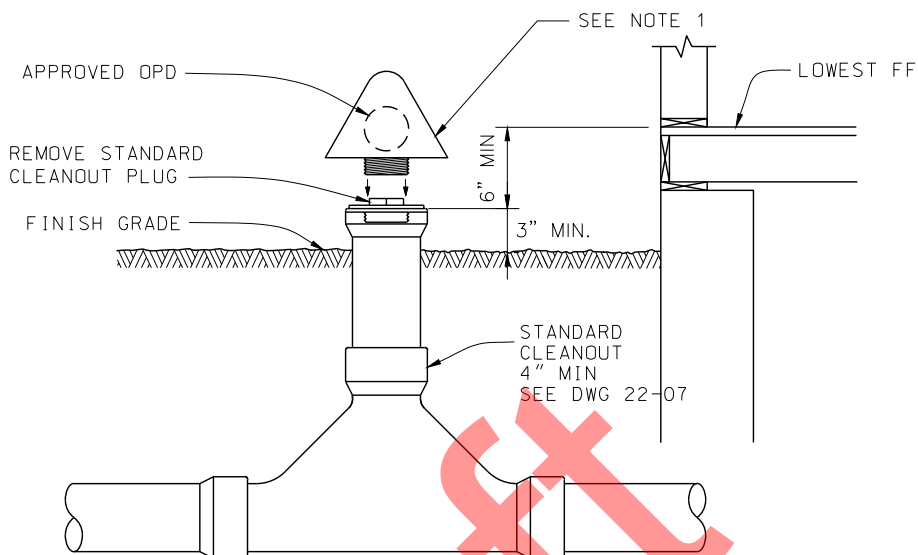
PROVIDE STRAIGHT SEGMENT OF MAINLINE PIPE
TO ACHIEVE, MINIMUM 2' SEPARATION
REQUIRED IN-BETWEEN SINGLE WYES.



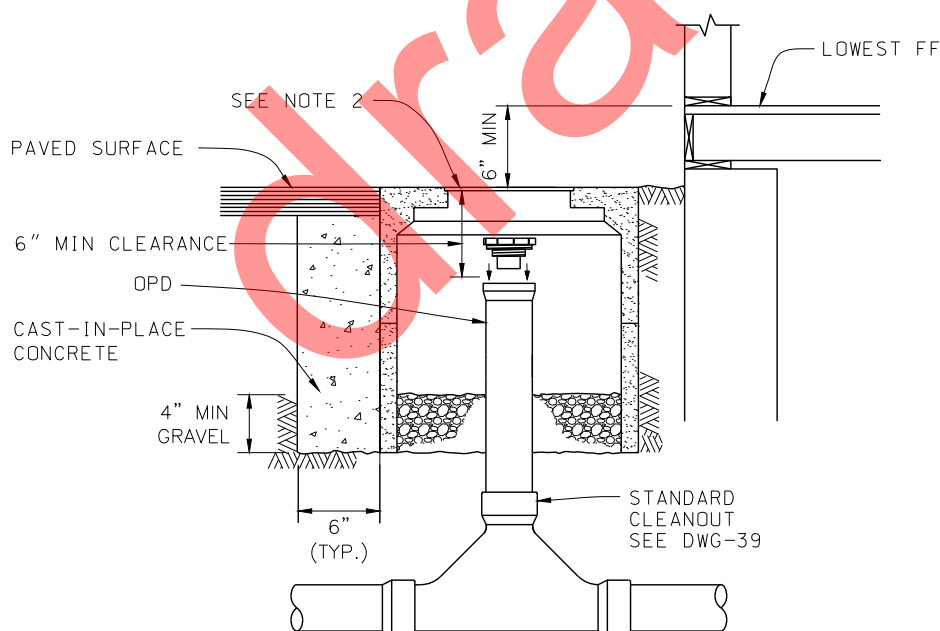
SINGLE WYE CONNECTION
NTS

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

OVERFLOW PROTECTION DEVICES



(TYPE 1)



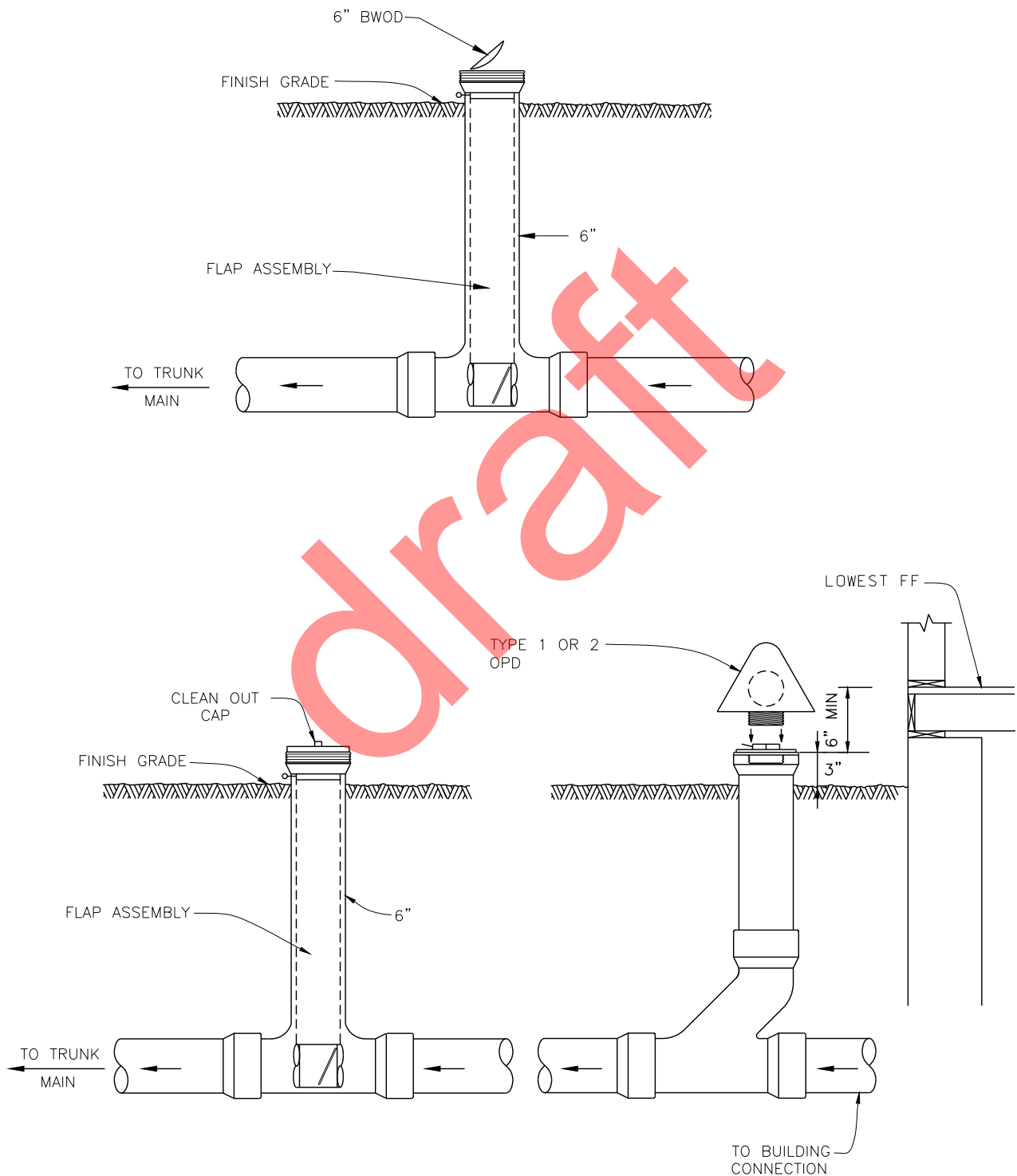
(TYPE 2)

NOTES:

1. AN OVERFLOW PROTECTION DEVICE, PER CCCSD'S APPROVED MATERIALS LIST, IS REQUIRED ON ALL SIDE SEWERS. SPECIFIC LOCATION SHALL BE DETERMINED BY THE CONTRACTOR AND THE PROPERTY OWNER.
2. SEE APPROVED MATERIALS LIST FOR TRAFFIC AND NON-TRAFFIC AREA PRECAST UTILITY BOXES AND GRATED LIDS.

CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

CLEAN CHECK PROTECTION DEVICE



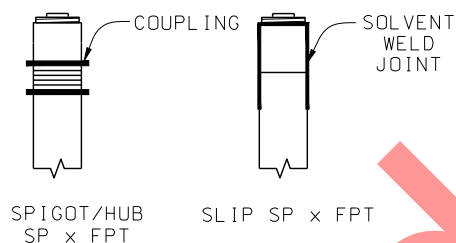
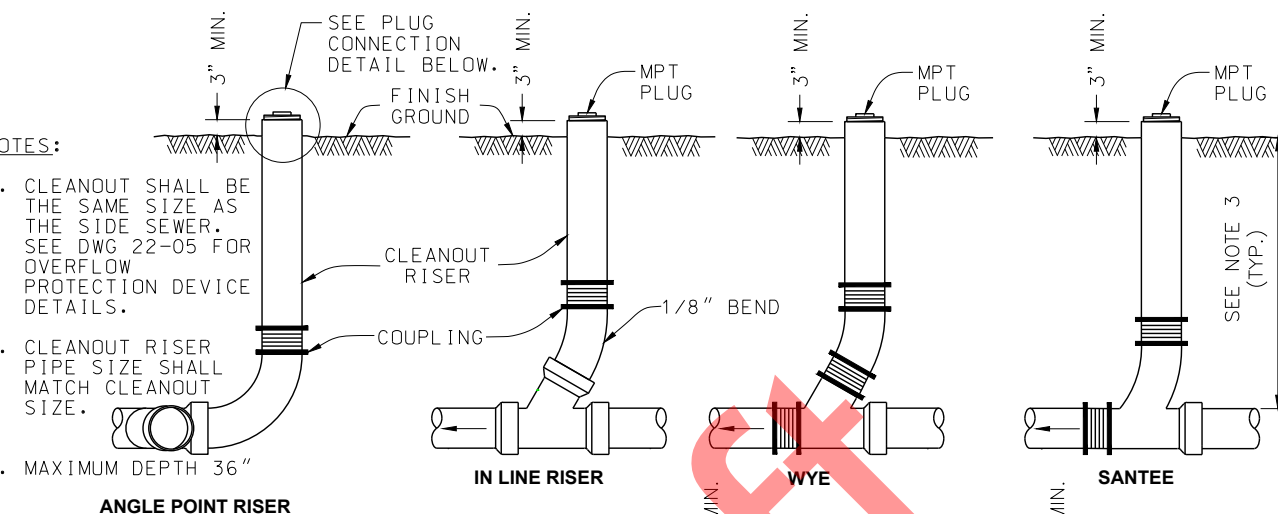
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

CLEANOUT RISERS

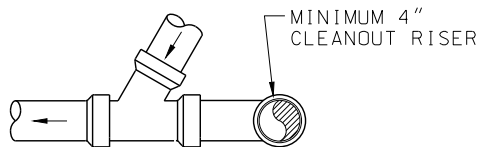
NOTES:

1. CLEANOUT SHALL BE THE SAME SIZE AS THE SIDE SEWER. SEE DWG 22-05 FOR OVERFLOW PROTECTION DEVICE DETAILS.
2. CLEANOUT RISER PIPE SIZE SHALL MATCH CLEANOUT SIZE.
3. MAXIMUM DEPTH 36"

ANGLE POINT RISER



PLUG CONNECTION DETAIL

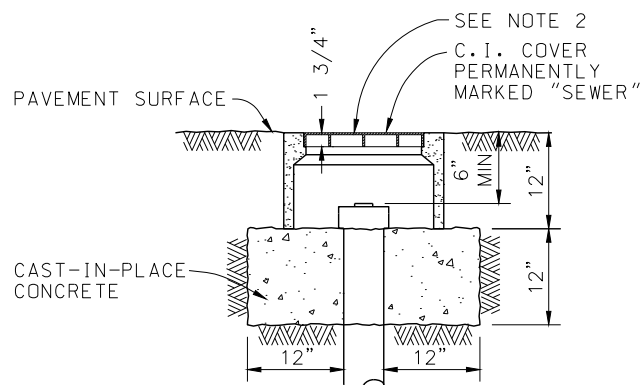
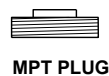


ANGLE POINT CLEANOUT

PLAN VIEW

NOTES:

1. ANGLE POINT CLEANOUT REQUIRED IF SIDE SEWER DEFLECTIONS EQUALS OR EXCEEDS 90°.
2. SEE APPROVED MATERIALS LIST FOR TRAFFIC AND NON-TRAFFIC AREA PRECAST UTILITY BOXES AND GRATED LIDS.
3. 6" SEWER LINES REQUIRE 6" CLEANOUTS

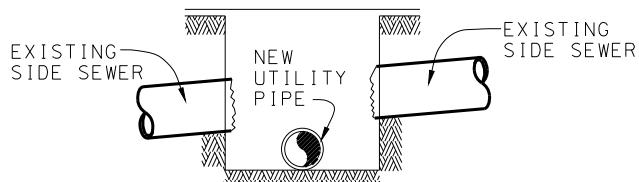


CLEANOUT RISER IN PAVED AREA

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

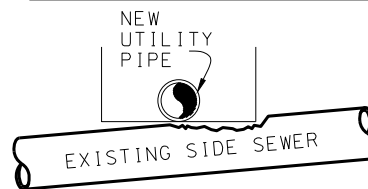
SIDE SEWER REPAIRS

SIDE SEWER BREAK NO CONFLICT IN GRADE



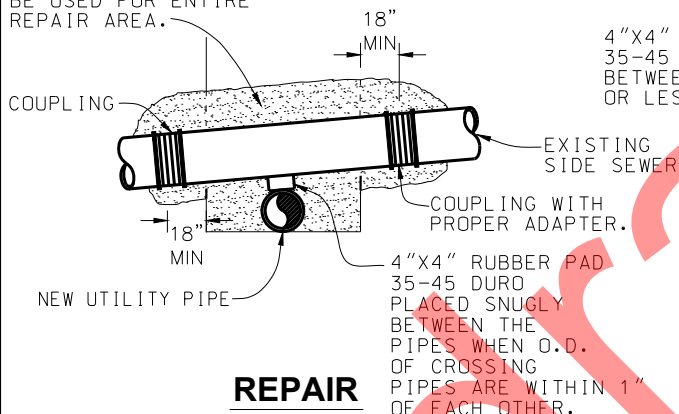
BREAK

SIDE SEWER BREAK NO CONFLICT IN GRADE



BREAK

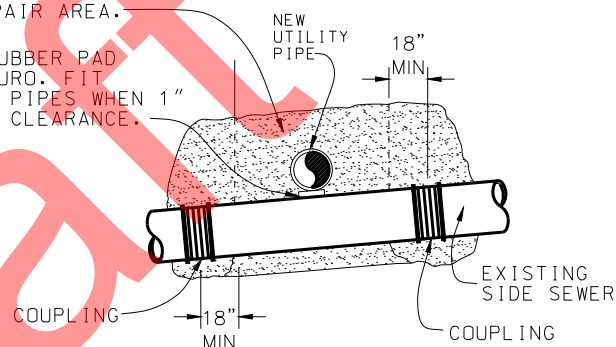
TYPE 1 BACKFILL SHALL BE USED FOR ENTIRE REPAIR AREA.



REPAIR

TYPE 1 BACKFILL SHALL BE USED FOR ENTIRE REPAIR AREA.

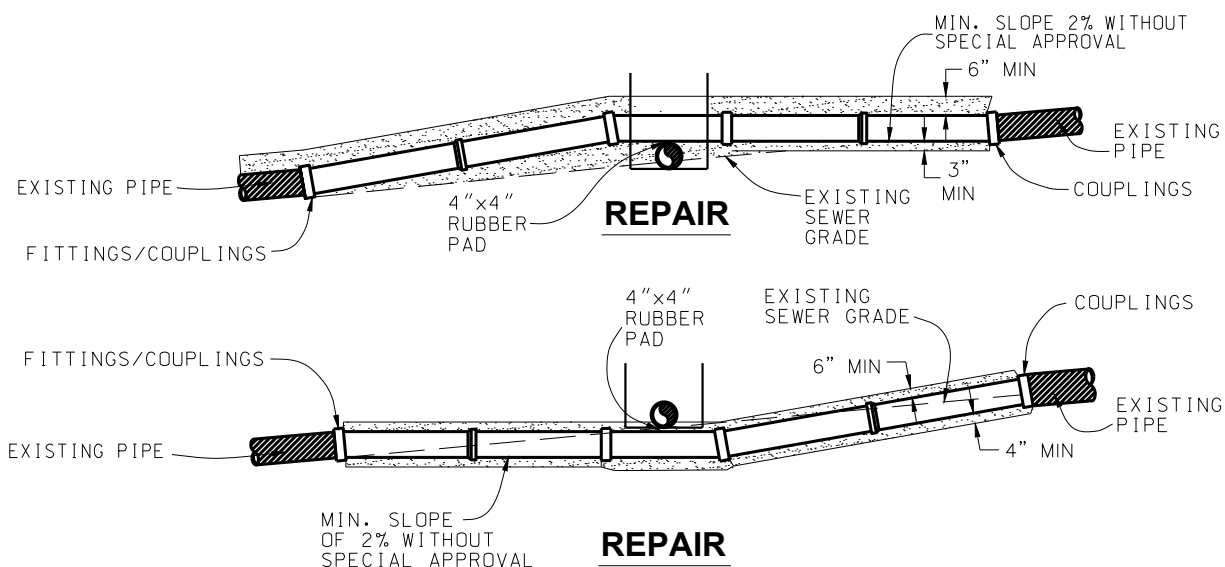
4"x4" RUBBER PAD 35-45 DURO. FIT BETWEEN PIPES WHEN 1" OR LESS CLEARANCE.



REPAIR

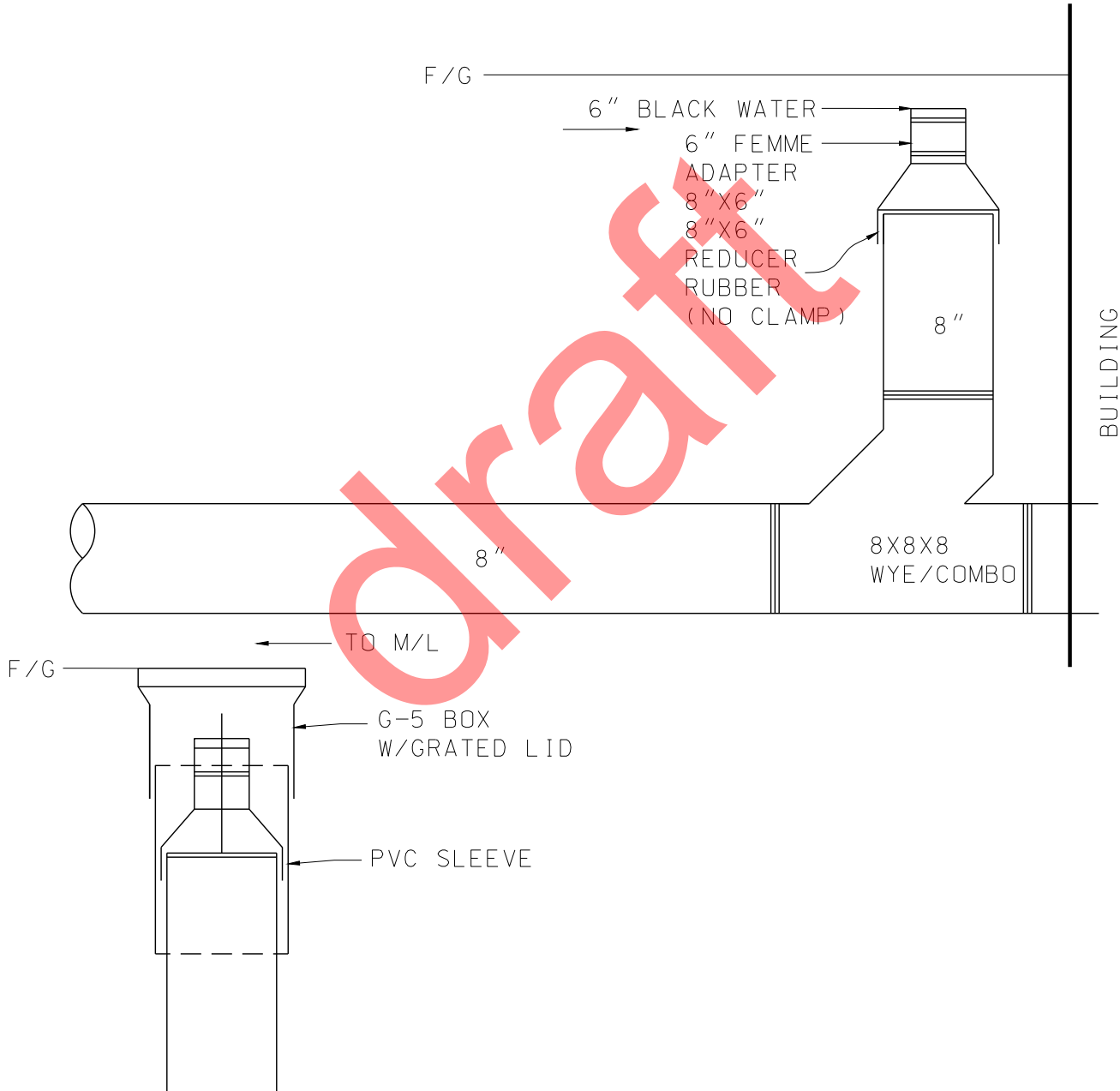
- NOTES:** 1. REFER TO SECTION 33 31 16 LATERALS AND BUILDING SEWERS FOR SIDE SEWER DETAILS.
2. ALL EXCAVATIONS FOR REPAIRS SHALL BE EQUAL TO THE REQUIRED TRENCH WIDTH PLUS 18" ON EACH SIDE.

SIDE SEWER WITH CONFLICT IN GRADE



CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

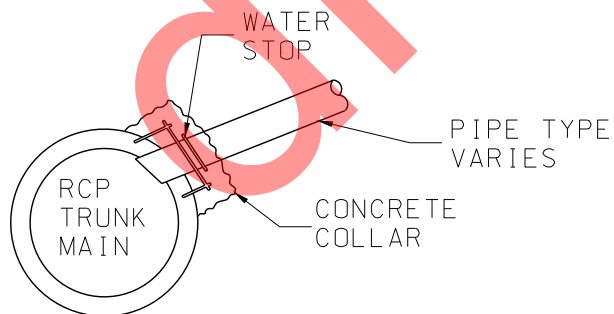
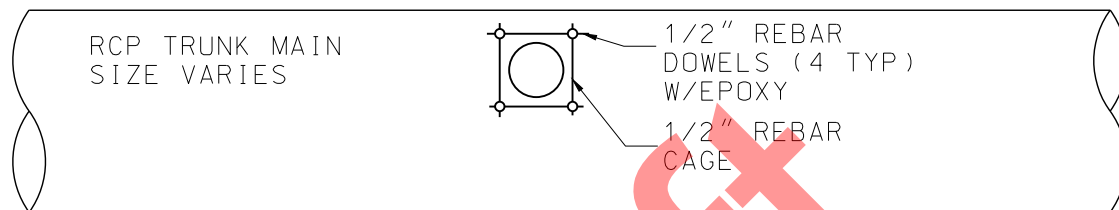
CLEANOUT MODIFICATION FOR 8" LATERAL



CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

SIDE SEWER TAP TO RCP TRUNK SEWER (VARIANCE REQUIRED)

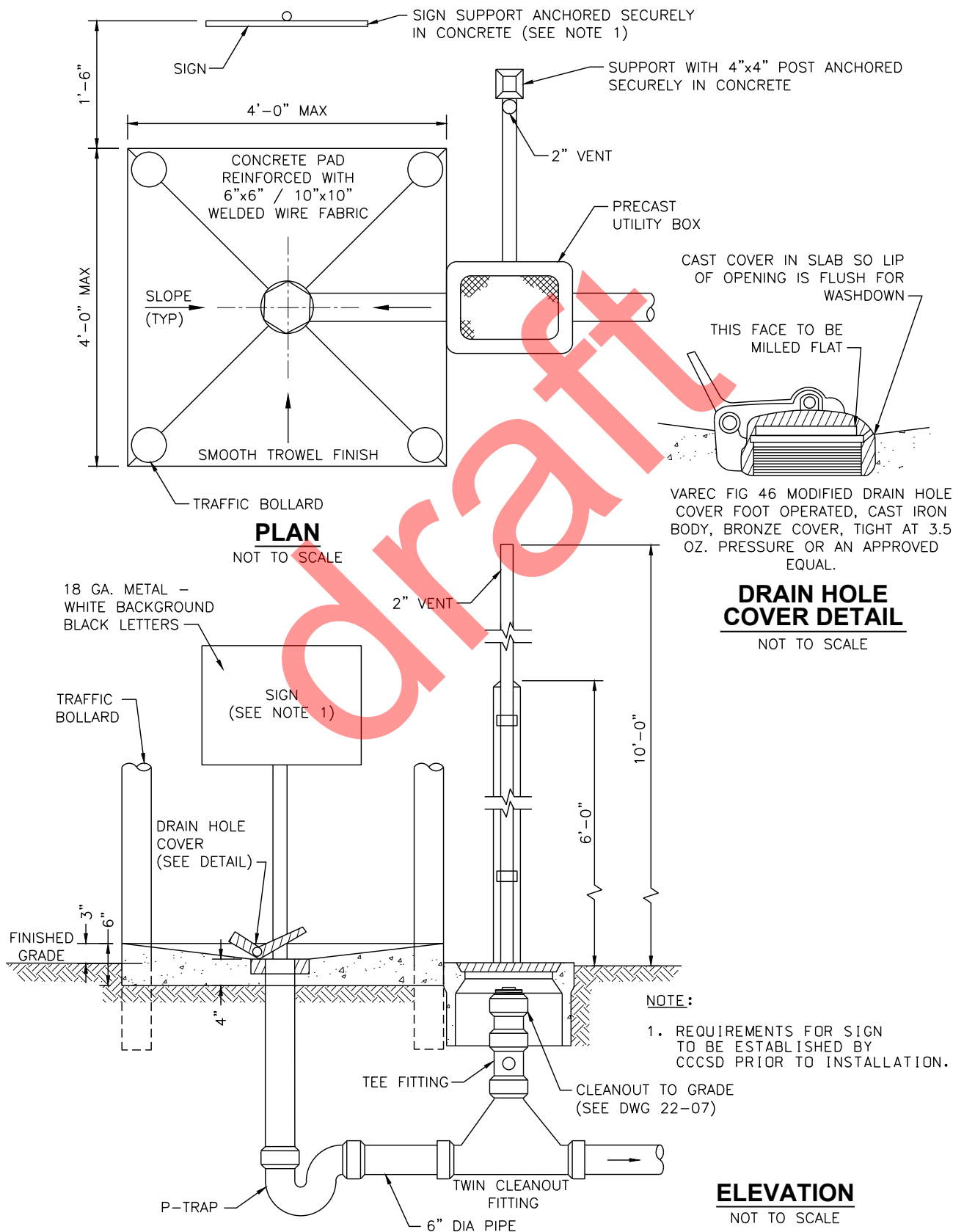


NOTES:

- CORE DRILL ONLY
- EPOXY REBAR DOWELS INTO PIPE
- WATER STOP IS REQUIRED

CENTRAL CONTRA COSTA SANITARY DISTRICT
MARTINEZ, CALIFORNIA

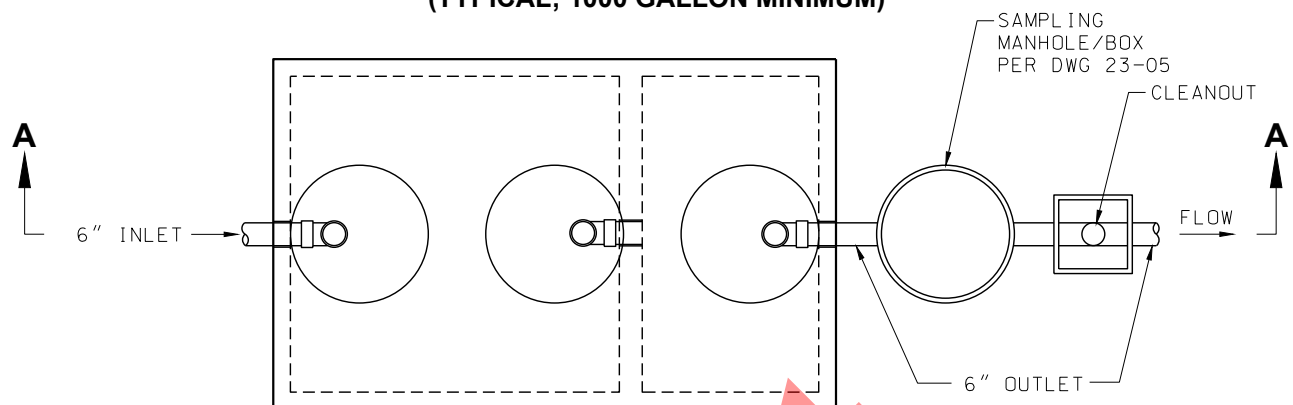
RV/TRAILER HOLDING TANK DISPOSAL FACILITY



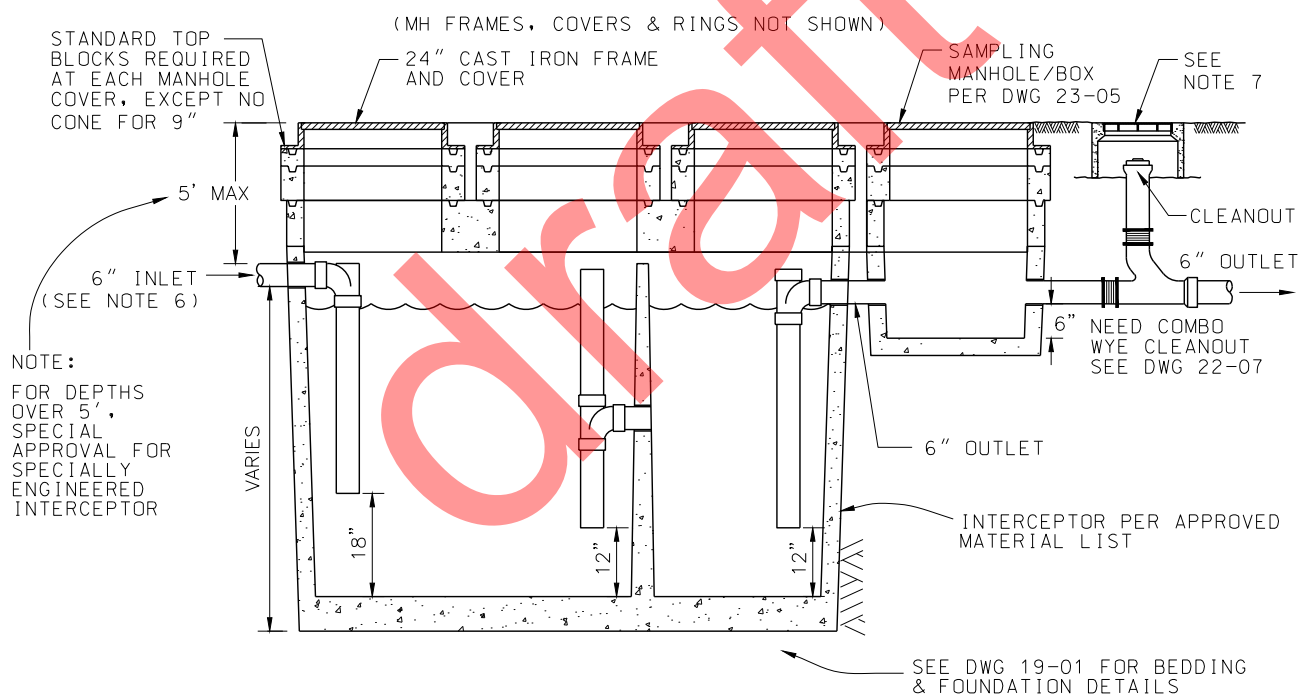
18-May-2020 K:\Projects\standardSpecs\colsys\23-01_RVTrailerHoldingTankDisposalFacility.dwg

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

GREASE INTERCEPTOR (TYPICAL; 1000 GALLON MINIMUM)



PLAN VIEW



SECTION A-A

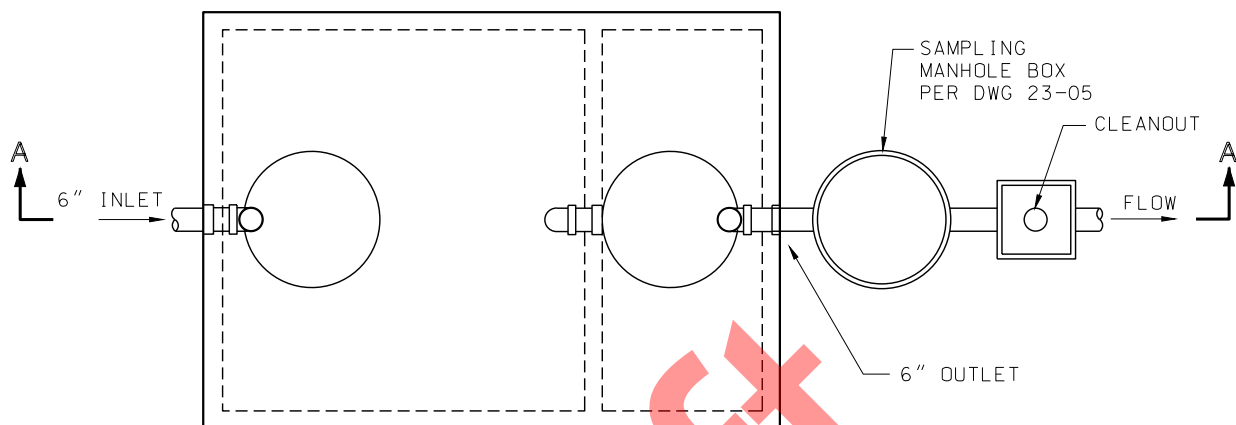
NOTES:

1. INTERCEPTOR SHALL BE PLACED ON A MINIMUM OF 6" TYPE I BEDDING MATERIAL, COMPACTED TO 95% RC.
2. ALL ELEVATIONS SHALL BE APPROVED BY CCCSD PRIOR TO INSTALLATION.
3. GREASE INTERCEPTORS ARE NOT INTENDED FOR THE INTRODUCTION OF DOMESTIC SEWAGE. LOCATION AND TRIBUTARY DISCHARGE SOURCES SHALL BE APPROVED BY CCCSD PRIOR TO INSTALLATION.
4. INTERCEPTOR LOCATED IN AN AREA SUBJECT TO TRAFFIC MUST BE H-20 TRAFFIC RATED. NON-PRECAST INTERCEPTORS ACCEPTED UPON SPECIAL APPROVAL.
5. ALL INLET AND OUTLET PIPES SHALL BE 6" DIAMETER.
6. THE USE OF CAST IRON SOIL PIPE FOR GREASE INTERCEPTOR APPLICATIONS IS PROHIBITED.
7. SEE APPROVED MATERIALS LIST FOR TRAFFIC AND NON-TRAFFIC AREA PRECAST UTILITY BOXES AND GRATED LIDS. SEE DWG 19-08 & 19-09 FOR COVER REQUIREMENTS.

CENTRAL CONTRA COSTA SANITARY DISTRICT

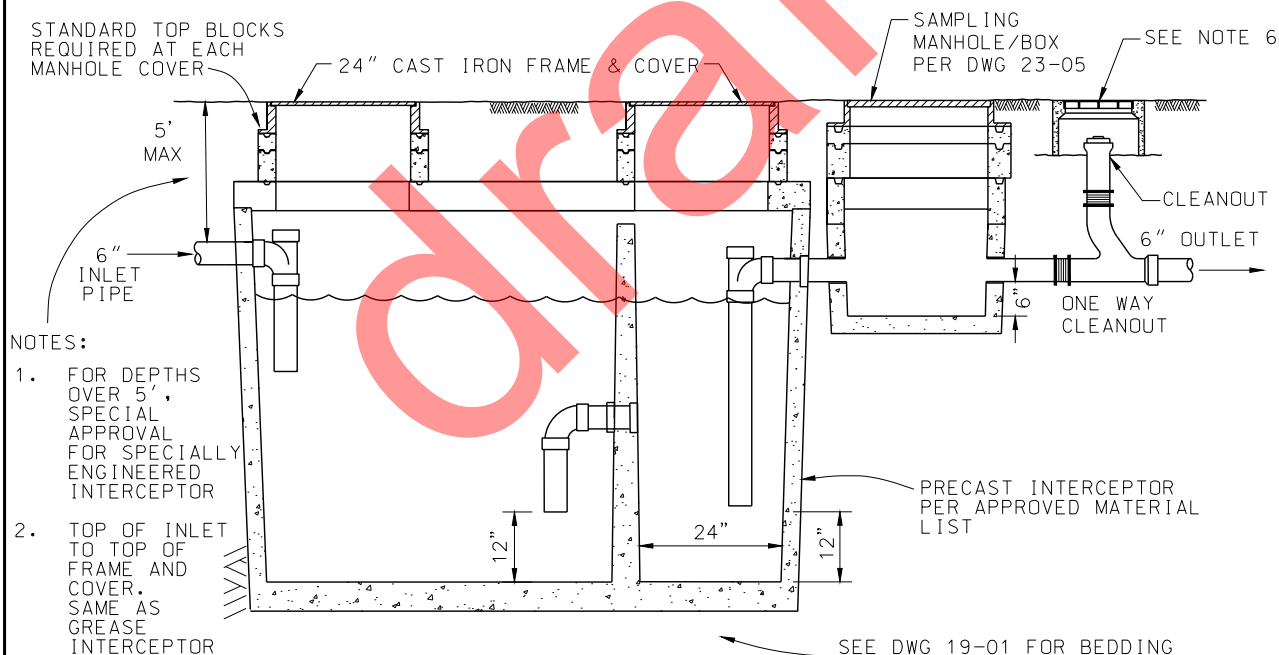
MARTINEZ, CALIFORNIA

SAND-OIL INTERCEPTOR (TYPICAL; 320 GALLON MINIMUM)



PLAN VIEW

(MH FRAMES, COVERS & RINGS NOT SHOWN)



SECTION A-A

NOTES:

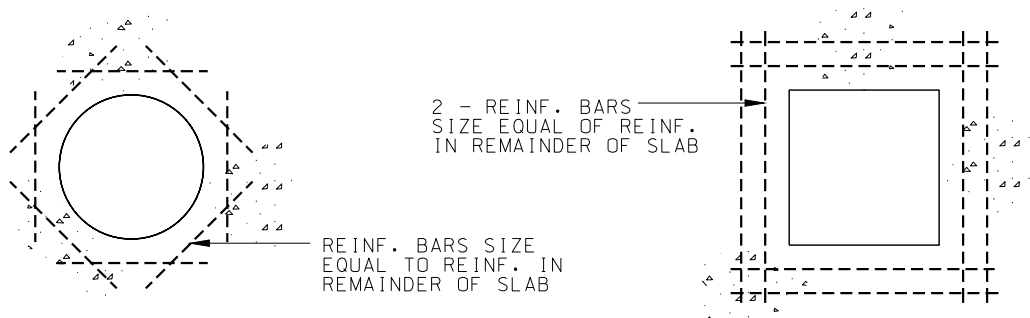
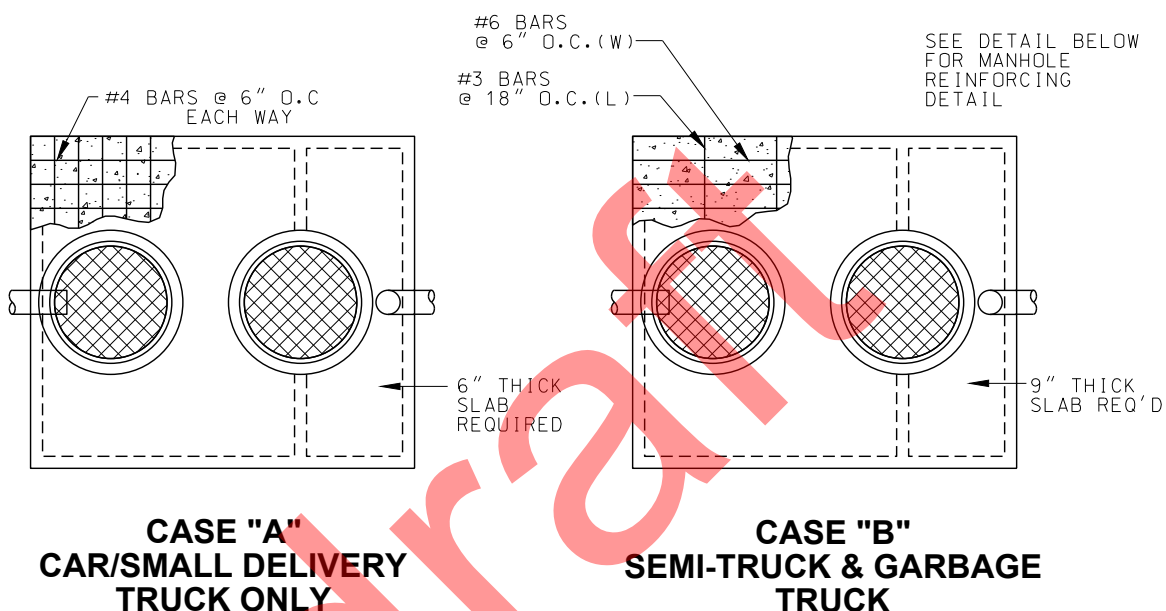
1. INTERCEPTOR SHALL BE PLACED ON A MINIMUM OF 6" TYPE I BEDDING MATERIAL, COMPACTED TO 95% RC.
2. ALL ELEVATIONS SHALL BE APPROVED BY CCCSD PRIOR TO INSTALLATION.
3. SAND-OIL INTERCEPTORS ARE NOT INTENDED FOR THE INTRODUCTION OF DOMESTIC SEWAGE. LOCATION AND TRIBUTARY DISCHARGE SOURCES SHALL BE APPROVED BY CCCSD PRIOR TO INSTALLATION.
4. INTERCEPTOR LOCATED IN AN AREA SUBJECT TO TRAFFIC MUST BE H-20 TRAFFIC RATED. NON-PRECAST INTERCEPTORS ACCEPTED UPON SPECIAL APPROVAL.
5. ALL INLET AND OUTLET PIPES SHALL BE 6" DIAMETER.
6. SEE APPROVED MATERIALS LIST FOR TRAFFIC AND NON-TRAFFIC AREA PRECAST UTILITY BOXES AND GRATED LIDS. SEE DWG 19-08 & 19-09 FOR COVER REQUIREMENTS.

CENTRAL CONTRA COSTA SANITARY DISTRICT

MARTINEZ, CALIFORNIA

CONCRETE TRAFFIC SLABS FOR GREASE INTERCEPTORS OR SAND - OIL INTERCEPTORS

(REQUIRED FOR NON-TRAFFIC RATED INTERCEPTORS)



MANHOLE AREA REINFORCING DETAILS

CENTRAL CONTRA COSTA SANITARY DISTRICT

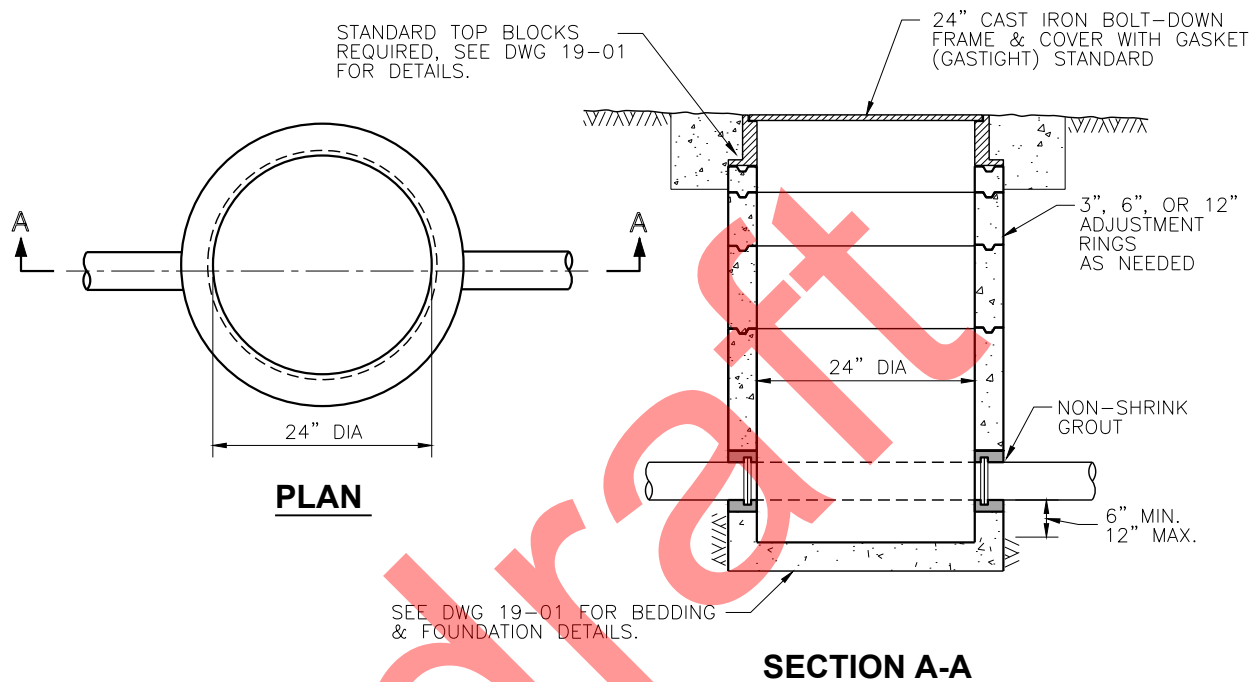
MARTINEZ, CALIFORNIA

PRECAST SAMPLING STRUCTURES

(SEE APPROVED MATERIALS LIST)

SAMPLING MANHOLE

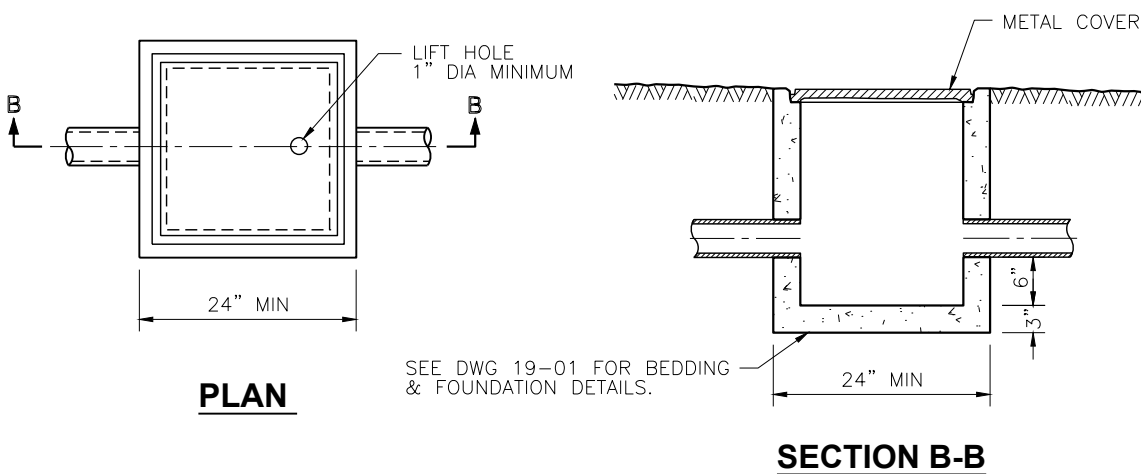
(OUTSIDE)



NOTE: 1. CAST IRON COVER SHALL READ "SANITARY SEWER".

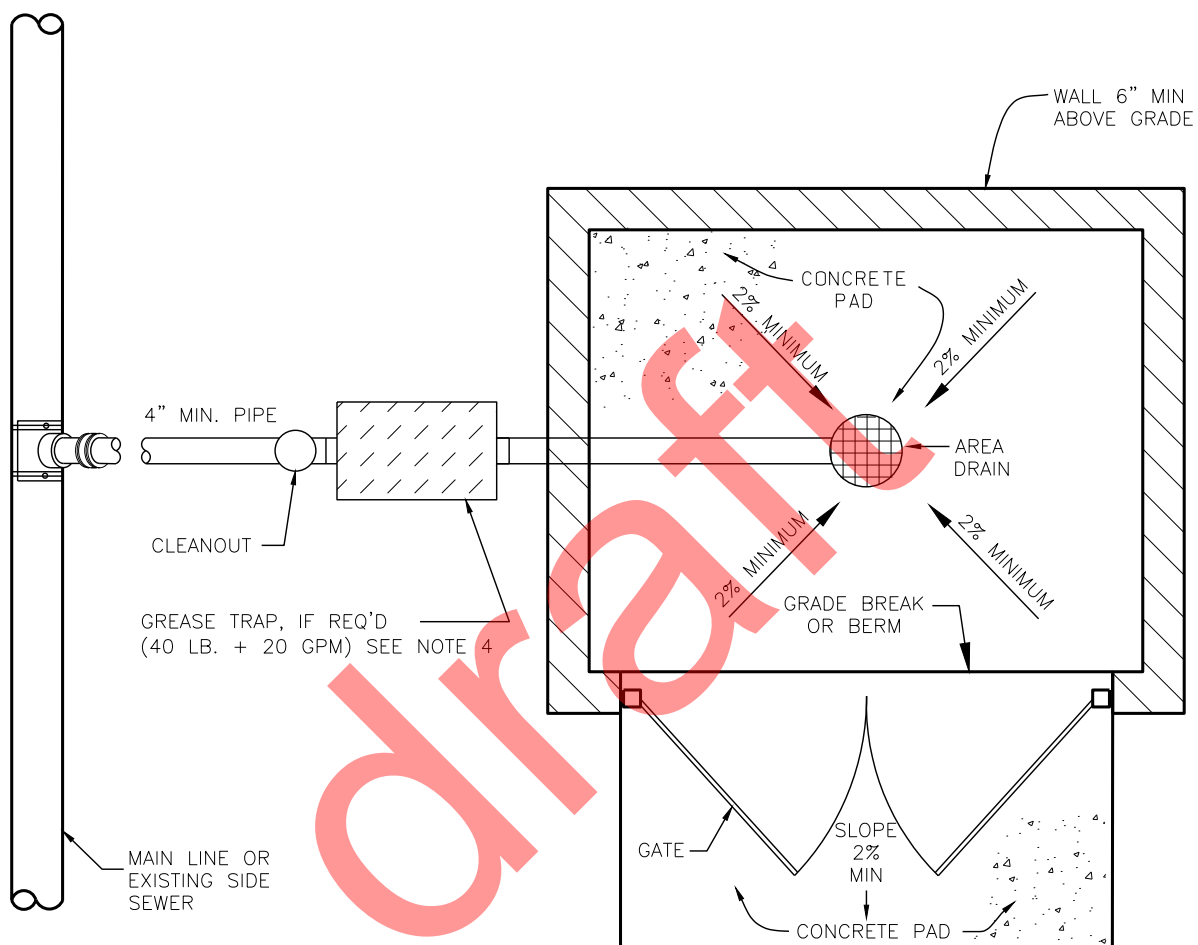
SAMPLING BOX

(INSIDE ONLY)



CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

TRASH ENCLOSURE DETAIL (TYPICAL)

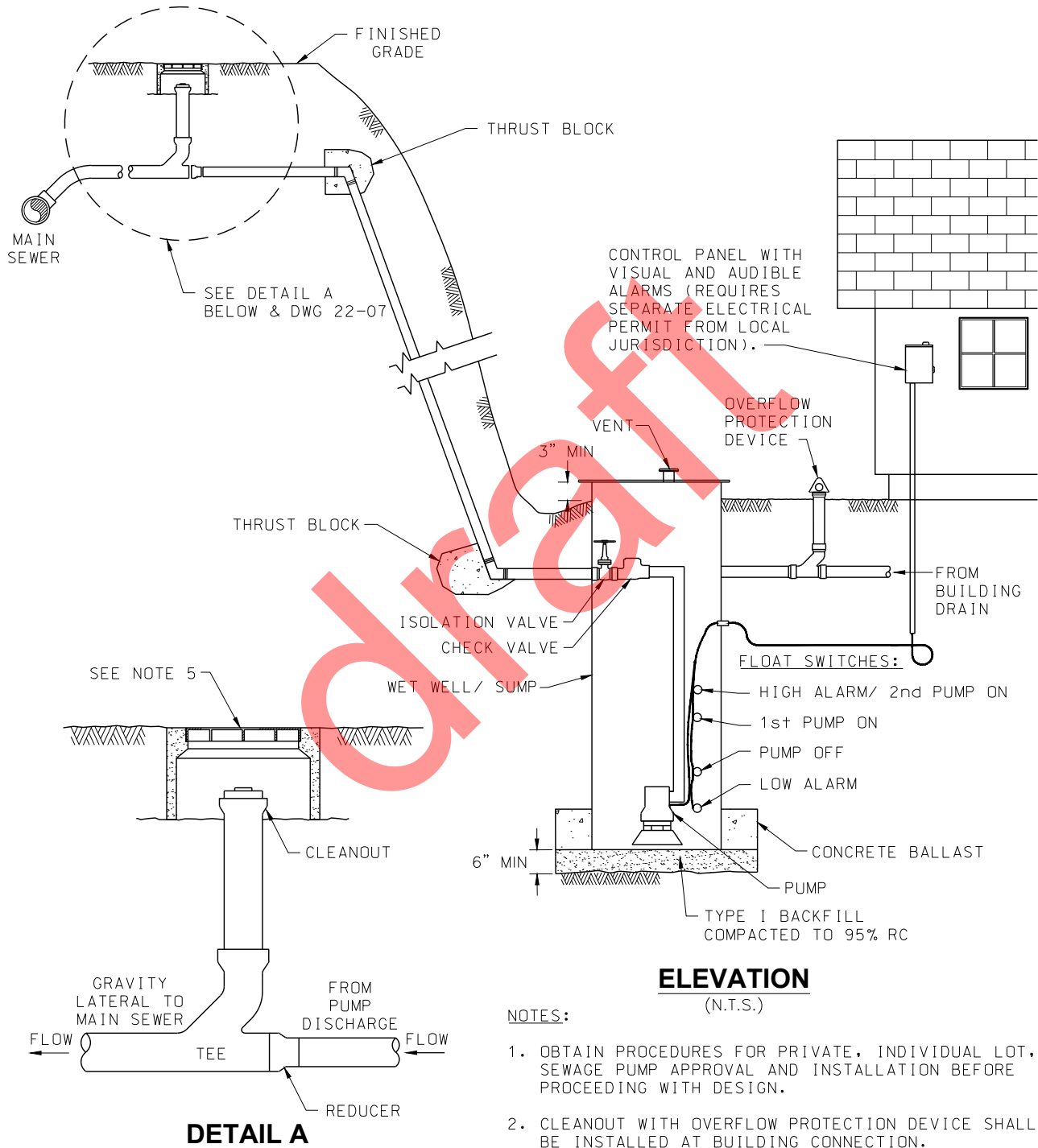


NOTES:

1. ROOF REQUIRED OVER ENTIRE ENCLOSURE WITH DOWNSPOUTS DIRECTED AWAY FROM ENCLOSURE.
2. A P-TRAP SHALL BE INSTALLED IMMEDIATELY DOWNSTREAM OF AREA DRAIN IF NO GREASE TRAP REQUIRED.
3. GREASE TRAP SHALL BE INSTALLED IF TRASH ENCLOSURE SERVES ANY COMMERCIAL FOOD SERVICE USE & AS DETERMINED BY ENVIRONMENTAL COMPLIANCE FOR ALL OTHER APPLICATIONS.
4. ALL PIPING TO BE 4" MIN. SIZE INCLUDING INLET/OUTLET OF GREASE TRAP.
5. LOCATION OF GREASE TRAP & C/O VARIES WITH APPLICATION.
6. IF INSTALLED OUTSIDE PF ENCLOSURE, TRAFFIC RATED LID IS REQUIRED.
7. MAY ALSO BE CONNECTED TO GREASE INTERCEPTOR

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

INDIVIDUAL LOT PUMPING SYSTEM (CCCSD REVIEW AND APPROVAL REQUIRED)



NOTES:

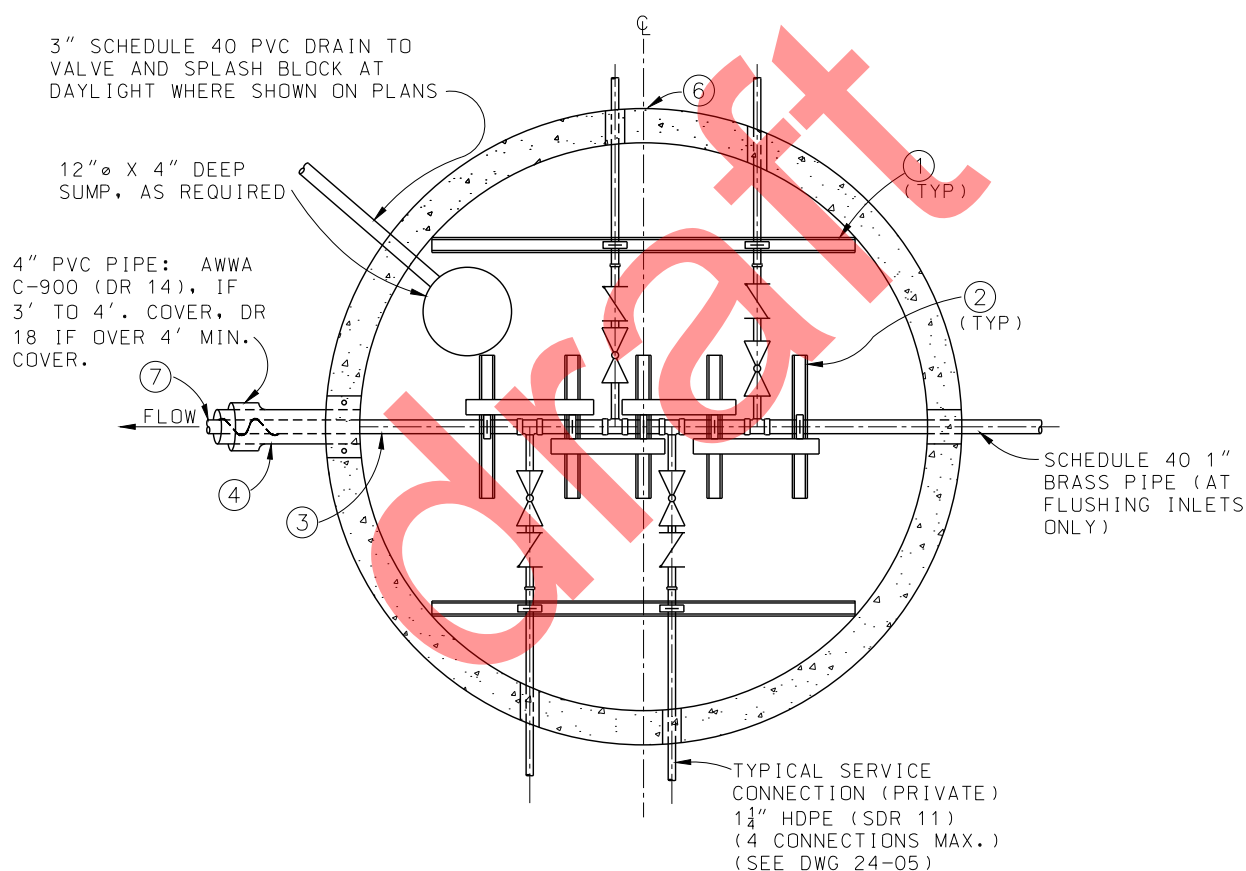
1. TEE SHALL BE WYE, SANITARY TEE , OR COMBO WYE.
2. FOR COMMERCIAL PROPERTIES, 6-INCH TEE, CLEANOUT, AND GRAVITY LINE IS REQUIRED.
3. SOLVENT WELD TYPE JOINTS SHALL BE USED FOR PVC PIPES.

NOTES:

1. OBTAIN PROCEDURES FOR PRIVATE, INDIVIDUAL LOT, SEWAGE PUMP APPROVAL AND INSTALLATION BEFORE PROCEEDING WITH DESIGN.
2. CLEANOUT WITH OVERFLOW PROTECTION DEVICE SHALL BE INSTALLED AT BUILDING CONNECTION.
3. PUMP INSTALLATION SHALL BE IN ACCORDANCE WITH SECTION 33 32 26.
4. SEE SECTION 31 23 16 FOR BEDDING AND BACKFILL REQUIREMENTS.
5. SEE APPROVED MATERIALS LIST FOR TRAFFIC AND NON-TRAFFIC AREA PRECAST UTILITY BOXES AND GRATED LIDS.

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MULTIPLE-USER, LOW-PRESSURE SEWER SYSTEM MANHOLE



PLAN

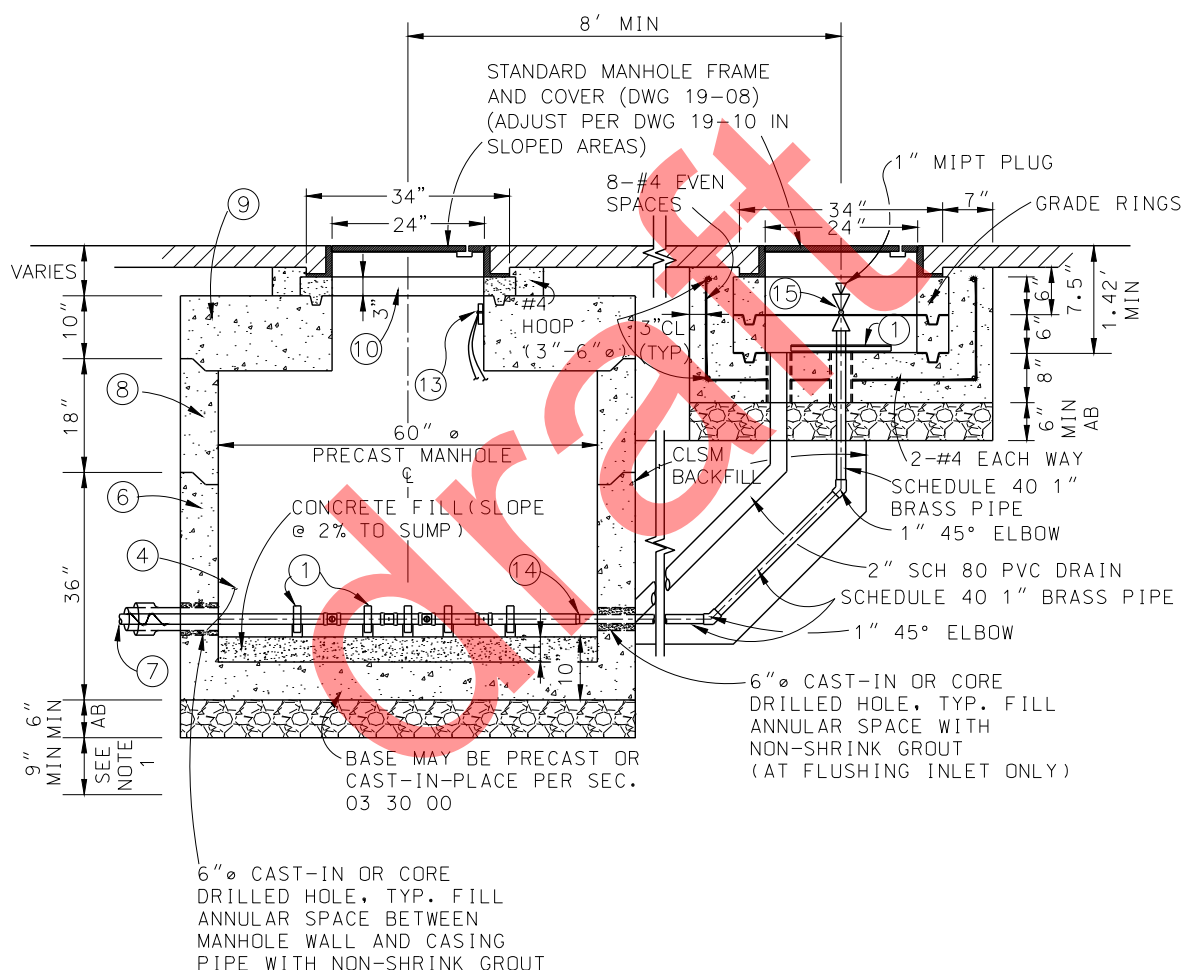
NOT TO SCALE

NOTE:

1. (XX) REFERS TO SPEC 33 31 26 MATERIAL LIST

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MULTIPLE-USER, LOW-PRESSURE SEWER SYSTEM FLUSHING INLET



SANITARY SEWER FORCE MANHOLE AND FLUSHING MANHOLE

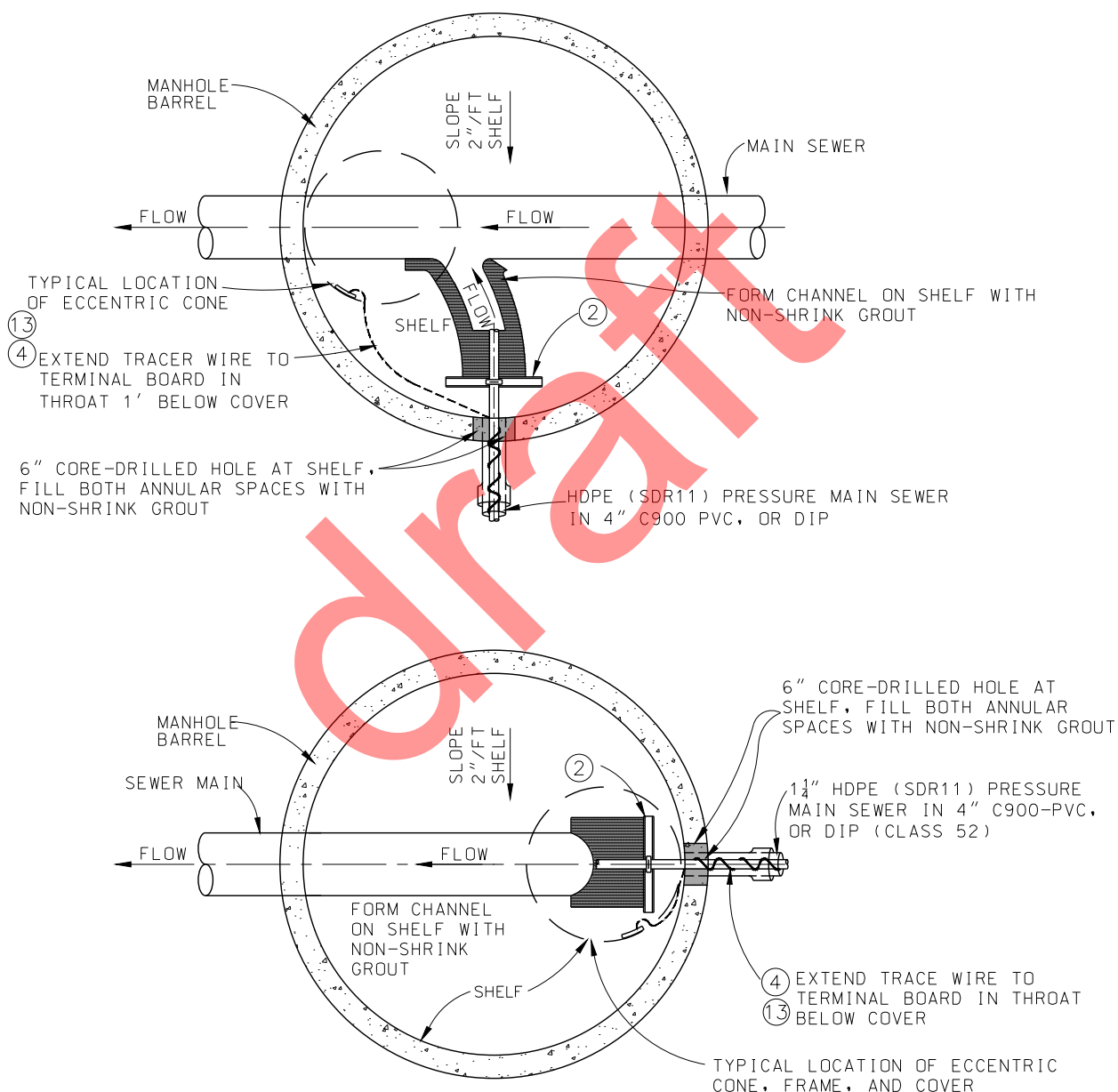
NOT TO SCALE

NOTES:

1. IF WATER OR SOFT GROUND IS PRESENT, PLACE COARSE BEDDING MATERIAL IN GEOTEXTILE WRAP (12" OVERLAP AT FABRIC ENDS)
2. (XX) REFERS TO SPEC 33 31 26 MATERIAL LIST

CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MULTIPLE-USER, LOW-PRESSURE SEWER SYSTEM CONNECTION AT GRAVITY MANHOLE



NOTES:

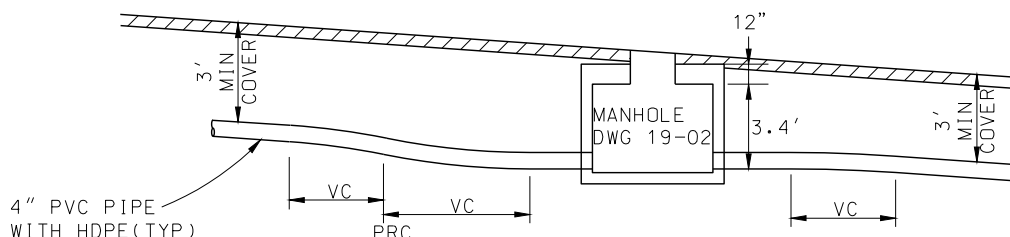
1. STANDARD MANHOLE DETAILS ARE SHOWN ON DWG 19-01
2. (XX) REFERS TO SPEC 33 31 26 MATERIAL LIST

CONNECTION MANHOLE

NOT TO SCALE

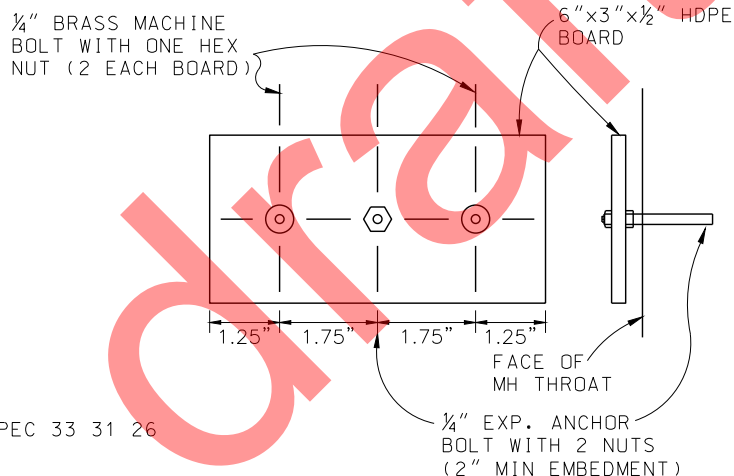
CENTRAL CONTRA COSTA SANITARY DISTRICT MARTINEZ, CALIFORNIA

MULTIPLE-USER, LOW-PRESSURE SEWER SYSTEM MISCELLANEOUS DETAILS



TYPICAL PROFILE AT MANHOLE

NOT TO SCALE

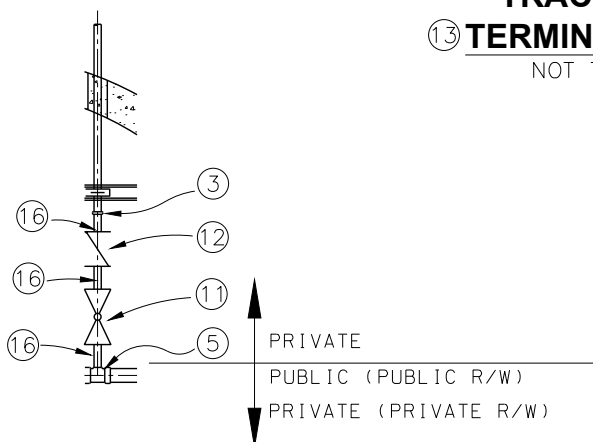


NOTE:

1. (XX) REFERS TO SPEC 33 31 26 MATERIAL LIST

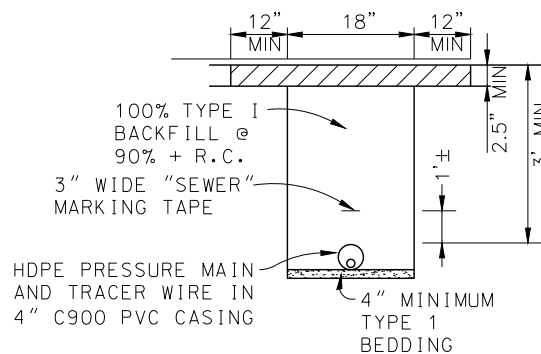
TRACER WIRE TERMINAL BOARD

NOT TO SCALE



TYPICAL SERVICE CONNECTION DETAIL

NOT TO SCALE



TRENCH DETAIL

NOT TO SCALE

Part VIII. Glossary

Section 25. Acronyms, Abbreviations and Terms

Wherever in these Specifications, or in any documents or instruments where these Specifications are referenced, any of the following acronyms, abbreviations, or terms is used, the intent and meaning shall be interpreted as stated in the following sections unless the context clearly indicates that another meaning is intended.

25-01 Acronyms and Abbreviations

<i>Acronym</i>	<i>Definition</i>
AASHTO	American Association of State Highway and Transportation Officials
AB	Aggregate Base
AC	Asphalt Concrete
ACI	American Concrete Institute
ANSI	American National Standards Institute
APN	Assessor's Parcel Number
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BC	Beginning of Horizontal Curve
BVC	Beginning of Vertical Curve
CAD	Computer Aided Design
Cal/OSHA	California Division of Occupational Safety and Health Act
Caltrans	State of California, Department of Transportation
CCTV	Closed Circuit Television
Central San	Central Contra Costa Sanitary District, also sometimes referred to as the District or CCCSD
CISPI	Cast Iron Soil Pipe Institute
CLSM	Controlled Low Strength Material
CPC	California Plumbing Code - The California Plumbing Code adopted by the State of California Building Standards Commission, latest edition.
CRSI	Concrete Reinforcing Steel Institute
CTM	California Test Method
DR	Dimension Ratio (pipe O.D. divided by minimum wall thickness)
EC	End of Horizontal Curve
EVC	End of Vertical Curve
FNPT	Female National Pipe Thread
FUE	Fixture Unit Equivalents - The unit equivalent of plumbing fixtures as tabulated in the Uniform Plumbing Code.
GOE	Grant of Easement
gpd	Gallons per Day
gpm	Gallons per Minute

GRD	Grease Removal Device
GWI	Groundwater Infiltration
HDD	Horizontal Direction Drilling
HGI	Hydromechanical Grease Interceptor
HWA	High Water Alarm
HWL	High Water Level
I.D.	Inside Diameter
ILPS	Individual Lot Pumping Systems
IOD	Irrevocable Offer of Dedication- a legal document used to create easements
ISO	International Standards Organization
LWA	Low Water Alarm
LWL	Low Water Level
MH	Manhole
MNPT	Male National Pipe Thread
MULPSS	Multiple User Low Pressure Sewer System
NEMA	National Electrical Manufacturers Association
NRTE	Nationally Recognized Testing Entity
O.D.	Outside Diameter
OPD	Overflow Protection Device (See also District Code §9.15)
PSSE	Private Sanitary Sewer Easement
PTFE	Polytetrafluorethylene (Teflon)
PUE	Public Utility Easement
RC	Relative Compaction- The percentage ratio of the field dry density of the soil or soil aggregate (determined by ASTM D6938) to the maximum dry density as determined by laboratory test ASTM D1557.
RI	Rodding Inlet - a temporary access structure to a main sewer
RUE	Residential Unit Equivalent
RV	Recreational Vehicle
ROW	Right-of-way
RWQCB	Regional Water Quality Control Board
SDR	Standard Dimension Ratio (pipe O.D. divided by minimum wall thickness)
SSE	Sanitary Sewer Easement
TMH	Trunk Manhole
UL	Underwriters Laboratory
UPC	Uniform Plumbing Code
USA	Underground Services Alert
VOC	Volatile Organic Compound
<i>Pipe Types</i>	
ABS	Acrylonitrile Butadiene Styrene
CI or CIP	Cast Iron Soil Pipe or Cast-Iron Pipe
CIPP	Cured-In-Place Pipe
DI or DIP	Ductile Iron Pipe

<i>HDPE</i>	High Density Polyethylene
<i>PE</i>	Polyethylene
<i>PVC</i>	Polyvinyl Chloride
<i>RCP</i>	Reinforced Concrete Pipe
<i>VC or VCP</i>	Vitrified Clay Pipe

25-02 Terms

Annexation - The inclusion of property within Central San boundaries by proper legal procedures.

Accessory Dwelling Unit (ADU)- a self-contained, residential unit located on the same lot as an existing single-family home and includes a kitchen, bathroom, and sleeping area; where a kitchen is defined as a space with a sink outside of a bathroom. If the ADU is 1200 square feet or greater, then it will be treated as a separate residential unit on the property.

Approved Materials List - The current list of approved materials allowed by Central San for use in the construction and/or repair of sanitary sewers in accordance with these Specifications.

Bedding and Backfill – Material, herein specified, used to replace material excavated from trenches during sewer installation. Terms used to differentiate between zones of Bedding and Backfill are:

Pipe Zone: the portion of the trench excavation between the bottom of the trench or the top of required foundation material and a horizontal plane 12” above the highest point on the outside surface of the pipe barrel excepting bells.

- Bedding is that portion of the Pipe Zone between the bottom of the trench or the top of required foundation material and the lowest point on the outside surface of the pipe barrel excepting bells;
- Haunching is that portion of the Pipe Zone between the top of the Bedding and the horizontal centerline of the pipe;
- Shading is that portion of the Pipe Zone between the top of the haunching and a horizontal plane 12” above the highest point on the outside surface of the pipe barrel excepting bells.

Trench Zone: the portion of the trench excavation between the top of the shading and the ground surface in unpaved areas, and the horizontal plane at lowest point of the pavement structural section in paved areas.

- Trench Backfill is that portion of the Trench Zone between the top of the shading and the ground surface in unpaved areas or a horizontal plane 2 feet below the lowest point of the pavement structural section in paved areas;
- Final Backfill is that portion of the Trench Zone in paved areas between the top of the trench backfill and the lowest point of the pavement structural section.

Board of Directors - The governing body of Central San.

Building Drain - The building drain is the lowest part of a wastewater piping system and connects other wastewater pipes from within a building with the side sewer.

Central San - The Central Contra Costa Sanitary District, Contra Costa County, California, and its employees, and/or authorized representatives.

City - Any incorporated municipality lying partly or entirely within Central San.

Contractor - Any contractor who meets Central San requirements and is licensed by the State of California to enter into contracts for and to perform the work of installing sewers under Central San jurisdiction.

County - The County of Contra Costa, State of California.

Cut Sheets - Sheets of tabulated data, indicating stations, structures, fittings, angle points, beginnings of curves, points on curves, ends of curves, sewer slopes, staking offsets, various elevations, offset cuts, and sewer depth.

Definition of Words - Wherever, in these Specifications, the words directed, required, permitted, ordered, designated, or words of like importance are used, they shall be understood to mean the direction, requirement, permission, or order of designation of Central San. Similarly, the words approved, acceptable, satisfactory, shall mean approved by, acceptable to, or satisfactory to Central San.

District - The Central Contra Costa Sanitary District, Contra Costa County, California, and its employees, and/or authorized representatives.

DWG # - Refers to the drawing as numbered in Part VI. Standard Drawings.

Easements - Rights in real property granted or dedicated to Central San for the purposes stated in the document establishing the easement. Generally, these rights include the right to construct, reconstruct, renew, alter, operate, maintain, inspect, repair and replace Central San Facilities with the reasonable right of access to such easements for these purposes over the remaining lands of the grantor. See also [District Code §7.15](#).

Existing Building/Structure – a structure that has a finalized building permit at least three years prior to the date of application with Central San

Final Inspection - The formal written acceptance by Central San of an entire job which has been completed in all aspects in accordance with the Plans and Specifications and any modifications thereof previously issued.

Inspector - The person for Central San duly authorized and responsible for inspections and enforcement of Central San regulations relating to construction of public and private sewers, including pipelines, structures, materials, instruments, and appurtenances.

Job Engineer - The Engineer licensed by the State of California as a civil engineer, under whose direction Plans, profiles, and details for the work are prepared and submitted to Central San for review.

Owner - Any individual, partnership, firm, or corporation by whom the Job Engineer has been retained or who, as the Property Owner, is making arrangements with Central San.

Parcel Number - An arbitrary number assigned to each parcel of right-of-way, including easements and miscellaneous encroachments, as shown in the right-of-way log and/or on the sewer construction plans.

Paved Surface - Any form of pavement used on street, sidewalk, or other areas composed of concrete, asphalt, oil, brick, or treated crushed rock or any combination of said forms of pavement having a dense, cohesive, stable surface.

Permits or Licenses - Documents indicating permission or authorization to perform specific work under specific conditions at specific locations.

Person - Any individual, firm, company, corporation, or association.

Plans - Construction plans, including system maps, sewer plans and profiles, cross sections, detail drawings, etc., or reproductions thereof, which show the location, character, dimensions, and details for the work to be done and which constitute a supplement to these Specifications.

Plumbing System - Plumbing fixtures and traps, waste and vent pipes, and all sewer pipes within a building and extending to the house or side sewer connection two feet outside the foundation line or building wall.

Profile - Cross-sectional detail (side view) drawing which show the vertical relationship between the sewer line invert, the ground surface at time of construction and the finish surface, and other existing and/or proposed underground facilities.

Property Owner - The person who holds record title to a parcel of property.

Private Sewer - A sewer owned, operated, and maintained by the Property Owner (i.e. not owned by Central San).

Public Sewer - A sewer located in a public right-of-way, easement or dedicated reservation which has been accepted by Central San or is maintained and controlled by the Central San.

Right-of-way - All land or interest therein which by deed, conveyance, agreement, easement, dedication, usage, or process of law is reserved for or dedicated to the use of the general public, within which Central San shall have the right to construct, alter, replace, repair, maintain, and operate sewer pipes, appurtenances, and appliances together with the reasonable right of access to such easement for said purposes over the remaining lands of the grantor.

Roadway - All right-of-way dedicated, granted, used, or to be used for vehicle movement.

Sanitary District - The Central Contra Costa Sanitary District, Contra Costa County, California.

Sanitary Sewer System Map - Scale maps on the first sheet or sheets of the Plans showing the relationship and ties between the properties to be improved and the nearest intersection of existing county or city improved road on each side of the property. The system maps also show all proposed sewer improvements and all parcels to be served by the improvements.

Section - Any reference to a Section which is not accompanied by further reference refers to a Section or Sections of these Specifications.

Sewers: A pipe or conduit for holding and carrying sewage, and includes manholes, rodding inlets, pressure relief valves and all other facilities appurtenant which are necessary or convenient to the holding or carrying of sewage.

- Trunk Sewers - a public sewer which is 12" or more in diameter and accommodates more than one main sewer
- Main Sewer - a sewer which has one or more side sewers connected to it
- Side Sewer - the privately owned and maintained sewer which connects the plumbing system of a building to the main sewer. The side sewer begins at the point-of-connection to the main sewer and terminates at the point-of-connection to the building plumbing system 2-feet outside the foundation line or building wall. "Side sewer" includes the lateral sewer and the building sewer:
 - Lateral Sewer - that portion of the side sewer which is within the public right-of-way, which may also be referred to as the "lower lateral"
 - Building Sewer - that portion of the side sewer from the lateral sewer to its connection to the building plumbing system, which may also be referred to as the "upper lateral"

Single-Family Residence (SFR) - A single living structure designed to accommodate one family.

Special Approval - Approval given by Central San, either in writing or as approved on the plans, for special construction considerations which may not meet the regulations and/or standards set forth in these Specifications or District Code.

Specifications - The Central San Standard Specifications for Design and Construction, latest edition.

Standard Drawings - The drawings of structures or devices commonly used on Central San work and referred to on the plans and in these Specifications.

State - The State of California

State Standard Specifications - The Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (Caltrans), current edition.

Streets or Roads - Any public or private highway, road, street, avenue, alley, way, easement, or right-of-way used or to be used for vehicle movement.

Structures - Those structures or devices commonly used in Central San work such as manholes, rodding inlets, etc., as mentioned in these Specifications.

Subcontractor - Any individual, partnership, firm, or corporation entering into a contract with the Contractor to perform part of the work.

Superintendent - The representative of the Contractor, present and responsible for the work at all times.

Surveyor - A Professional Land Surveyor or Professional Engineer (Civil) licensed by the State of California to perform land surveying.

Travelled Way - The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

Variance – A variance is a deviation from District Code or Specifications for Design and Construction requested by an Applicant during the design or plan review stage. Any variances requested at the time of permitting or construction shall be through a *Special Approval* only.

Work - All work to be done under Central San permit or inspection, in accordance with the Plans, these Specifications, and/or permit conditions.

Part IX. Index

- 100 linear feet of trench, 72, 128
- 11.25°, 162
- 24 hours, 92, 101, 145
- AASHTO, 134, 137, 149, 178, 261
- AB, 136, 137, 261
- abandonment, 7, 74
- ABS, 166, 167, 188, 195, 262
- AC, 134, 136, 137, 140, 261
- Acceptance of Proposed Public Facilities, 76, 93
- ACI, 82, 83, 84, 85, 87, 88, 90, 91, 261
- Acrylonitrile Butadiene Styrene. See ABS
- Aggregate Base. See AB
- alignment, 8, 18, 42, 44, 50, 95, 106, 151
- all-weather access road, 47, 140, 141
- amalgam separator, 25
- American Association of State Highway and Transportation Officials. See AASHTO
- American Concrete Institute. See ACI
- American National Standards Institute. See ANSI
- American Society of Mechanical Engineers. See ASME
- American Society of Testing and Materials. See ASTM
- American Water Works Association. See AWWA
- American Welding Society. See AWS
- angle of intersection, 18
- annexation, 4, 263
 - request and petition, 55
- ANSI, 21, 104, 162, 261
- APN, 4, 50, 261
- Applicant, 7, 17, 29, 31, 33, 38, 41, 140, 185, 193
- application, 7, 30
 - Building Permit Plan Review and Encroachment Verification, 9
 - Service Request Applications, 9
- Application
 - air test, 9
 - Dye Test, 9
 - Public Sewer Locating, 9
 - Pump Review, 8
 - Right-of-Way, 9
 - Surveying, 9
- Approved Materials List, 18, 40, 77, 78, 87, 88, 94, 97, 104, 105, 107, 119, 120, 149, 151, 156, 158, 164, 166, 172, 180, 182, 183, 186, 187, 189, 190, 191, 194, 195, 196, 198, 263
- Arborist Report, 55
- arc length, 40
- ASME, 22, 261
- Asphalt Concrete. See AC
- Assessor's Parcel Number. See APN
- ASTM, 78, 82, 83, 87, 88, 94, 95, 99, 100, 101, 104, 106, 107, 119, 120, 121, 123, 124, 125, 132, 134, 136, 137, 142, 143, 145, 148, 149, 155, 160, 161, 163, 164, 165, 166, 167, 168, 169, 170, 173, 175, 176, 177, 179, 180, 261, 262
- AWS, 104, 106, 107, 162, 261
- AWWA, 142, 145, 157, 158, 160, 161, 162, 163, 164, 173, 175, 176, 261
- backfill
 - final backfill, 126, 131, 132, 263
 - trench backfill, 96, 131, 132, 136, 263
- BC, 261
- bedding, 124, 125, 263
- Beginning of Horizontal Curve. See BC
- Beginning of Vertical Curve. See BVC
- benchmark, 34, 184
- Board of Directors, 50, 51, 264
- bolts, 104, 105, 107, 162, 171, 204
- boring and jacking, 16, 186, 194
- building drain, 264

building sewer, 266
 building waste plumbing, 17, 18
 BVC, 261
 C900, 19, 41, 42, 164
 CAD, 261
 California Division of Occupational Safety and Health Act. See OSHA
 California Plumbing Code. See CPC
 California Test Method. See CTM
 Caltrans, 71, 124, 134, 135, 137, 138, 140, 261, 267
 Capacity Study, 35, 55
 car wash, 23
 casings, 41
 Cast Iron Pipe. See CI or CIP
 Cast Iron Soil Pipe Institute. See CISPI
 CCTV, 10, 16, 31, 68, 76, 142, 143, 146, 261
 centerline, 42, 43, 49, 50, 59, 130
 Central San, 48, 50, 105, 261, 264
 Central San job number, 50
 Central San's emergency dispatch, 75
 Certificate of Compliance, 79
 Certification Report, 123
 check dam, 46
 check valve, 20, 196, 198, 204
 CI, 262
 CIP, 155, 156, 262
 CIPP, 16, 17, 186, 262
 CISPI, 261
 Class 2 Aggregate Base, 124, 126, 130
 Class 52, 42, 158
 cleanout, 8, 191, 204, 205
 clearance, 18
 vertical and horizontal, 39
 Closed Circuit Television. See CCTV
 Closure Report, 50
 CLSM, 94, 95, 96, 125, 130, 261
 Coarse Bedding Material, 125, 132, 150
 cold or hot mix temporary asphalt, 133
 commercial sewer, 18
 Competent Person, 69, 127
 Computer Aided Design. See CAD
 Concrete Reinforcing Steel Institute. See CRSI
 connections to existing structure, 45
 Contra Costa County Fire Protection District, 140
 Contra Costa County Health Services Department, 21
 Contra Costa Local Agency Formation Commission, 4
 Controlled Low Strength Material. See CLSM
 Corner Record or Record of Survey, 3
 coupling, 156, 162
 cover
 allowable cover, 19, 42
 bolt-down manhole frames and covers, 46
 minimum cover, 18, 185, 193
 covers
 manhole, 138
 temporary, 149, 152
 vault, 138
 covers and frames
 cast iron, 106
 CPC, 15, 261
 creek, 42, 43, 44, 75
 sewer crossings at creeks, 43
 top of creek bank, 42
 CRSI, 82, 83, 261
 CTM, 125, 261
 cul-de-sac, 45
 Cured-In-Place Pipe. See CIPP
 curve
 curve data, 40, 204
 horizontal, 40
 vertical, 39, 40
 cut sheet, 58, 59, 60, 70, 184, 264
 cut stakes, 58, 59, 184
 datum, 34
 deflection at structures, 45
 deflection/delta angle, 40
 dental, 25
 DI, 42, 262
 diatomaceous earth filters, 28
 Dimension Ratio. See DR
 DIP, 40, 43, 145, 157, 262

directional drilling, 168, 172
dishwasher, 21, 22
District Code, 1, 2, 4, 5, 10, 11, 12, 20,
21, 25, 26, 35, 48, 49, 63, 67, 68,
69, 76, 189, 191, 262, 264, 266, 267
DR, 42, 261
DR-14, 197
drain rock/foundation rock, 125, 126
drainage fixture units, 21
drop across structure, 44
Ductile Iron Pipe. See DI or DIP
dump stations, 46
Durability Index, 125
DWG 19-01, 18, 45, 148, 150, 152,
153, 187
DWG 19-02, 45
DWG 19-05, 181
DWG 19-06, 45
DWG 19-08, 106
DWG 19-09, 46
DWG 19-11, 152
DWG 19-12, 149
DWG 19-13, 152
DWG 19-14, 153
DWG 20-01, 35, 178
DWG 20-05, 46, 127, 164
DWG 20-06, 131
DWG 20-07, 39
DWG 20-08, 141
DWG 21-01, 40, 165, 178, 181
DWG 21-03, 127
DWG 21-04, 46, 182, 189
DWG 21-08, 143
DWG 22-01, 18, 59
DWG 22-05, 190
DWG 22-07, 19
DWG 22-08, 191, 195
DWG 23-01, 27
DWG 23-02, 21, 23
DWG 23-04, 22, 24
DWG 23-05, 25
DWG 23-06, 27
DWG 24-01, 205
DWG 24-02, 45, 196, 198, 199
DWG 24-03, 45, 199
DWG 24-04, 197

easement, 4, 7, 15, 29, 42, 43, 48, 49,
50, 51, 52, 53, 59, 71, 150, 152,
191, 264
EC, 261
electrofusion coupling, 172
emergency, 122
emergency work, 10
encroachments, 15
End of Horizontal Curve. See EC
End of Vertical Curve. See EVC
enforcement, 1
Engineer, 1
Geotechnical Engineer, 39, 43, 132
Job Engineer, 34, 35, 36, 41, 43, 49,
51, 58, 59, 70, 184, 192, 265
Professional Engineer, 23, 24, 33,
55, 57, 73, 123
enzymes, 21, 22, 24
EVC, 261
expiration, 9, 10, 33, 55
exterior air conditioning unit, 27
fees, 10, 27, 31
connection, 8, 30
inspection, 146
inspection charges and permit, 3
permit, 26
plan review, 58
re-television inspection, 147
Female National Pipe Thread. See
FNPT
filter backwash, 28
Final Inspection, 75, 76, 123, 264
Final Review for Construction, 61
fittings
deflection fittings, 162
Fixture Unit Equivalents. See FUE
floor drain, 21, 23, 26
flow control fitting, 22, 24
flow restrictor, 28
flushing inlet, 45, 196, 198, 199
FNPT, 198, 261
food service, 21, 27
frames and covers, 143, 148, 149,
151, 153
FUE, 17, 261
Gallons per Day. See gpd

Gallons per Minute. See gpm
 garbage disposal, 22
 gasket, 149, 151, 159, 162, 164, 165, 167, 173, 178, 180
 Geotechnical Report, 42, 55
 geotextile, 119, 120, 121, 129, 138, 150
 foundation rock, 119, 121, 126
 paving, 120, 121, 122
 GOE, 261
 gpd, 261
 gpm, 17, 22, 24, 200, 261
 Grant Deed, 49, 53
 Grant of Easement. See GOE
 GRD, 23, 262
 grease interceptor, 8, 21, 22, 25, 27
 Grease Removal Device. See GRD
 grease trap, 8, 21, 22, 23, 27
 grinder, 22
 Groundwater Infiltration. See GWI
 GWI, 262
 H-20, 22, 24, 97, 106, 129, 149, 178, 190, 202
 Hair/Fiber/Lint Traps, 25
 haunching, 126, 130, 263
 HDD, 16, 34, 185, 193, 262
 HDPE, 16, 42, 143, 168, 170, 171, 172, 197, 198, 199, 202, 263
 HGI, 22, 262
 High Density Polyethylene. See HDPE
 High Water Alarm. See HWA
 High Water Level. See HWL
 hillside, 42, 43, 129
 Horizontal Direction Drilling. See HDD
 hubless pipe, 156
 HWA, 202, 203, 262
 HWL, 203, 262
 Hydromechanical Grease Interceptor. See HGI
 I.D., 262
 ILPS, 196, See Individual Lot Pumping Systems
 indemnify, 12
 Individual Lot Pumping Systems, 15, 196, 200, 262
 Inside Diameter. See I.D.
 inspection, 3, 10, 16, 21, 22, 24, 31, 67, 68, 76, 77, 90, 105, 109, 120, 142, 146, 173, 174, 176, 183, 186, 187, 194, 201
 Inspector, 7, 10, 12, 31, 67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 90, 100, 105, 108, 123, 124, 125, 127, 128, 129, 142, 143, 144, 145, 146, 147, 150, 151, 153, 155, 161, 170, 174, 184, 185, 187, 192, 193, 195, 200, 201, 264
 insurance
 general liability insurance, 11
 workers' compensation insurance, 11
 interceptor, 21, 22, 23, 24, 25
 International Standards Organization. See ISO
 IOD, 49, 50, 262
 Irrevocable Offer of Dedication. See IOD
 ISO, 25, 262
 joint deflections, 165, 178
 lateral sewer, 8, 18, 192, 266
 Low Water Alarm. See LWA
 Low Water Level. See LWL
 LWA, 203, 262
 LWL, 200, 262
 main sewer, 8, 9, 17, 18, 21, 24, 30, 31, 33, 36, 37, 39, 42, 45, 46, 55, 58, 63, 71, 74, 75, 78, 144, 150, 170, 171, 186, 187, 188, 193, 194, 195, 196, 199, 262, 266
 main sewer extension, 33, 55, 58, 63, 71, 78, 123
 Male National Pipe Thread. See MNPT
 manhole, 8, 17, 31, 45, 106, 121, 128, 136, 144, 145, 148, 149, 150, 151, 152, 153, 197, 262
 connection of new sewer to the existing sewer system, 38
 connection to existing, 45, 187
 downward adjustment, 153
 future sewer line extensions, 40
 installed at creek crossings, 44

lateral connections, 18
 located on slopes, 152
 metering, 46
 MULPSS manholes, 45, 196, 198, 199
 precast, 148, 149, 150, 151, 198
 protect openings during construction, 151
 side sewer connection to public sewers over 12" in diameter, 17
 special cul-de-sac, 45
 SS markings, 106
 standard, 33
 stationing of, 45
 trunk, 46, 262
 upward adjustment, 153
 VCP entering and leaving, 181
 maximum allowable deflection, 18
 MH. See manhole
 microbes, 21, 22, 24
 MNPT, 198, 262
 MULPSS, 45, 196, 198, 262
 Multi-Family Residence, 36
 Multiple User Low Pressure Sewer System. See MULPSS
 NACE, 111
 National Electrical Manufacturers Association. See NEMA
 Nationally Recognized Testing Entity. See NRTE
 native material, 125
 NAVD88, 34
 NEMA, 202, 204, 262
 NGVD29, 34
 no sag, 16
 nominal diameter, 85, 144, 149
 non-domestic, 21, 24
 NRTE, 201, 202, 203, 262
 O.D., 178, 261, 262
 OPD, 15, 20, 190, 191, 192, 203, 262
 open-cut, 15, 34, 184, 185, 193
 optimum moisture content, 124, 131
 OSHA, 12, 69, 128, 182, 200, 261
 outdoor area, 26
 outdoor shower area, 28
 Outside Diameter. See O.D.
 Overflow Protection Device. See OPD
 Owner, 29, 31, 48, 51, 67, 71, 265
 Property Owner, 1, 4, 7, 10, 20, 29, 48, 49, 52, 68, 72, 127, 190, 191, 192, 201, 265
 Owner's Sewer/Recycled Water Improvement Agreement, 58
 parcel number, 265
 parking structure, 26
 passive overflow drain, 28
 PE, 263
 permit
 Abandonment/Demolition/Sewer Capping, 7, 191
 Building Connection Permit, 30
 City/County permit, 31
 Effective Period, 9, 10
 encroachment permit, 12, 71, 75, 83, 90, 95, 98, 102, 106, 110, 120, 127, 129, 132, 134, 135, 143, 150, 156, 158, 162, 167, 171, 177, 180, 199, 203
 Excavation Permit, 3, 12, 127
 Grease and/or Sand-Oil Interceptor, 8
 Industrial User Permit, 26, 27
 Manhole Only (Public), 8
 new connection, 7
 Recycled Water Connections Only, 9
 Recycled Water Main Extensions, 8
 Sewer Extension Permit, 51, 55
 Side Sewer Building Connection, 30
 Side Sewer Extension, 8
 Side Sewer Repairs and Alterations, 8
 Side Sewer Tap and Lateral, 8
 Special Discharge Permit, 17, 28
 Trash Enclosure, 8
 Permitted Industrial User, 25
 pet waste, 28
 pipe anchor, 46
 pipe bursting, 16, 168, 172, 186, 194
 pipe zone, 130, 263
 Plans, 264, 265, 266, 267
 Final, 57, 61, 69

plaster trap, 25
 plugs, 31, 40, 142, 144, 145, 146, 150
 temporary, 149
 plumbing system, 265
 plywood, 10, 129, 152
 point-of-connection, 1, 8, 17, 18, 19,
 38, 74, 184, 186, 187, 192, 194,
 195, 200
 pollution prevention, 74
 Polyethylene. See PE
 Polytetrafluorethylene. See PTFE or
 Teflon
 Polyvinyl Chloride. See PVC
 pothole, 70
 pressure main sewer, 199
 pretreatment devices, 25
 Private Main Sewer Systems, 33, 55,
 63, 106
 Private Sanitary Sewer Easement.
 See PSSE
 profile, 265
 Project Cost Estimate, 57
 Project Security Deposit, 57
 PSSE, 262
 PTFE, 198, 262
 p-trap, 28
 public sewer, 1, 2, 4, 7, 17, 27, 33, 51,
 52, 106, 191, 265
 Public Utility Easement. See PUE
 PUE, 262
 PVC, 16, 42, 143, 163, 164, 165, 166,
 175, 188, 195, 197, 198, 202, 204,
 263
 C900, 42, 163, 164, 197
 C905, 42, 163, 164
 schedule 80, 197
 radius, 40, 106, 141, 165, 172, 178,
 181, 186, 194
 RC. See relative compaction
 RCP, 145, 173, 175, 177, 178, 195,
 263
 Record of Survey, 53
 Recreational Vehicle. See RV
 Regional Water Quality Control Board.
 See RWQCB
 Reinforced Concrete Pipe. See RC or
 RCP
 reinforced concrete utility box, 20
 relative compaction, 98, 128, 129, 132,
 140, 150, 262
 relative density, 124, 137
 repair couplings, 187, 188, 195
 Residential Unit Equivalent. See RUE
 Review for Construction, 69
 RI. See rodding inlet
 right-of-way, 12, 71, 72, 134, 262, 265
 Right-of-Way Submittals, 55
 RMA. See Road Maintenance and
 Access Agreements
 roadway, 265
 rodding inlet, 8, 45, 149, 150, 153,
 154, 262
 ROW. See right-of-way
 RUE, 17, 262
 RV, 27, 46, 262
 RWQCB, 74, 262
 sampling structure, 22, 24, 25
 sand filter, 28
 sand-oil interceptor, 8, 23, 24, 25, 26
 Sanitary Sewer Easement. See SSE
 Sanitary Sewer System Map, 266
 scale, 85, 107, 108, 109, 143, 173,
 196
 schedule 40, 167, 175, 197, 204
 Schedule 40, 19, 115
 SDR, 262
 SDR-11, 197, 204
 SDR-17, 16, 19, 42, 169
 SDR-26, 18, 19, 41, 42, 164, 165
 separator, 23, 24, 25, 111
 septic tank, 191
 septic tanks and leach fields, 2
 sewage pumping systems, 46
 Sewer Service Charges, 27
 shading, 126, 130, 263
 shell building, 25
 side sewer, 4, 7, 8, 17, 18, 21, 24, 71,
 123, 145, 190, 191, 192, 193, 195,
 200, 204, 205, 266
 Single-Family Residence, 36, 266
 sink

floor sink, 21
 mop sink, 21, 23
 siphons, 46
 slope, 17, 42
 solids separation/filtration system, 28
 spa, 27, 28
Special Approval, 8, 17, 18, 34, 266
 Special Structures, 46
 Specifications, 266
 SSE, 9, 262
 stakes, 70
 Standard Dimension Ratio. *See* SDR
 Standard Drawings, 105, 106, 150, 151, 266
 State of California, Department of Transportation. *See* Caltrans
 stationing, 45, 59
 steel pipe, 16, 43, 160, 161, 162
 stub, 150
 subbase, 41
 Subcontractor, 267
 subdivision, 72, 75, 192
 subdivision map, 49, 51
 subdrain, 43
 Superintendent, 267
 survey monuments, 3, 50, 138
 Surveyor, 3, 50, 58, 59, 267
 suspended pipe, 41
 swimming pool, 27, 28
 taps, 8, 17, 172, 195
 T-cut, 136
 tees, 8, 17, 194, 199
 Teflon, 198, 262
 test
 air or hydrostatic testing, 195
 air test, 31, 144, 191
 CCTV inspection, 142, 146, 147, 191, 195
 compaction testing, 123, 124, 131, 137
 hydrostatic testing, 145
 manhole, 145
 pipeline deflection test, 143
 pipeline leakage test, 144
 vacuum testing, 146, 148
 time-restrictions, 68
 T-lock, 202
 TMH. *See* manhole:trunk
 tracer wire, 197
 trash compactor, 21
 trash enclosure, 8, 21, 24, 25, 27
 trench dam, 46
 trench plate, 10, 71, 73, 96
 Trench Zone, 126, 131, 132, 263
 trunk sewer, 8, 38, 42, 145, 266
 Type 316 stainless steel, 104, 105, 171, 175
 Type I Bedding and Backfill Material, 98, 124, 126, 130, 140, 151
 Type III Bedding and Backfill Material, 125, 126
 UL, 201, 262
 Underground Services Alert. *See* USA
 Underwriters Laboratory. *See* UL
 Uniform Plumbing Code. *See* UPC, *See* UPC
 unpermitted, 10
 UPC, 21, 22, 23, 262
 USA, 69, 70, 262
 utility equipment area, 27
 Variance, 17, 21, 22, 23, 24, 33, 38, 44, 267
 VC, 42, 263
 VCP, 145, 179, 180, 181, 188, 195, 263
 vehicle service, 23, 27
 Vitrified Clay Pipe. *See* VC or VCP
 VOC, 109, 262
 Volatile Organic Compound. *See* VOC
 warning tape, 130
 warranty period, 76, 147
 wash area, 21, 24, 27
 wyes, 8, 17, 45, 194, 195, 205