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May 27, 2021

Leo Cosentini
Division of Water Quality
State Water Resources Control Board
PO Box 1977
Sacramento, CA 95812-1977

Subject: Certification Application for Full Capture Trash Control Device

Reference: Listing on State Water Boards Certified Full Capture Systems List

Full Capture Device: Contech CDS® System

Dear Mr. Consentini,

Please accept this application letter for the Contech CDS® system as a full capture trash control device.

CDS® General Description

The CDS system has been used in California for over 20 years for the purpose of trash, sediment and oil removal from stormwater flows. The technology gets its name from the "Continuous Deflective Separation" effect that is created by directing influent flows into the separation cylinder tangentially to the unique cylindrical screen. Over the range of treatment flow rates, the velocity of flow parallel to the screen face is greater than the velocity of water passing through the screen apertures. This causes trash and other gross solids to be deflected from the screen face toward the center of the separation chamber, effectively eliminating screen blockage.

Prior Approvals

The CDS system was the original "Full Capture System" used in the Los Angeles region at the time that the first Trash TMDLs were adopted in the Los Angeles region. Trash generation rates were established in these TMDLs primarily based on the trash accumulation within CDS systems. Since TMDLs compliance is determined based on a reduction of trash as compared to baseline loads, the CDS system essentially became the definition of a full capture system. Rather than creating a sole specification around a proprietary product, the term "full trash capture system" was coined and the performance specification that was ultimately adopted in the California Trash Amendments was developed. To avoid insinuating a preference for a particular proprietary system, the "CDS" name was replaced by the generic term 'vortex separator" was used in most TMDL documentation. However, at the time, there were no other vortex separators available with 5 mm or finer screen.

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The Los Angeles Regional Water Quality Control Board created a Full Trash Capture system verification program whereby new technologies were evaluated relative to the full trash capture standard. The CDS system was not required to go through this program since it effectively was the definition of full trash capture by which other devices would be judged. Instead, the Los Angeles Water Board stated that "For the purpose of the trash TMDLs, the Los Angeles Regional Board considers Vortex Separation Systems to be full capture devices". Subsequently, some new trash capture system designs were tested upstream of a CDS system, with the contents of the downstream CDS system representing trash that had not been captured by the tested devices.

The CDS system was also included in the San Francisco Estuary Institute full capture trash system list that was adopted as part of the Statewide Trash Amendments. Since the first installation in California in 1998, many thousands of CDS systems have been installed in California and throughout the United States for the purpose of trash, sediment and oil removal.

This application is not a request for approval of the CDS system since the system is already approved. Rather, it provides updated device information in a format that is similar to fact sheets for other, more recently approved systems. It also includes a verification letter from the Mosquito and Vector Control Association of California.

Contact Information

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Contech Website

The Contech Engineered Solutions web site is: www.conteches.com

The CDS® Stormwater Treatment web page can be found at: www.conteches.com/CDS

CDS® Manufacturing Sites

CDS systems installed in California will be manufactured at one of the following locations:

Precon Products North
707-426-4450
3855 Bithell Ln
Suisun City, 94585

Pre-Con Products Ltd
805-527-0841
240 W Los Angeles Ave
Simi Valley, 93065

Cook Concrete
530-243-2562
5461 Eastside Rd
Redding, 96001

Summary of Field/Lab Testing Results

Caltrans BMP Retrofit Pilot Program

Caltrans monitored two CDS units as part of the BMP Retrofit Pilot Program. These units treated runoff from elevated sections of the I-210 freeway in Los Angeles County and were assessed for trash removal. Regarding CDS system trash removal performance, the report concluded: "They were highly successful at removing gross pollutants, capturing an average of 88 percent, with bypass of this material occurring mainly when the flow capacity of the units was exceeded." The systems were also assessed for mosquito breeding. After mosquitos were found in the units the manhole lids were sealed and a reduction in mosquito breeding was observed.

Cooperative Research Centre (CRC) Case Studies
Australia

The Cooperative Research Centre (CRC) for Catchment Hydrology conducted several monitoring programs to test the performance of various storm water gross pollutants trapping devices.

The Stormwater Gross Pollutants Industrial Report (Allison R. et al. 1997) demonstrates that CDS devices are efficient gross pollutant traps. During three months of monitoring, practically all gross pollutants transported by stormwater were trapped by the CDS device (i.e. 100 percent removal rate).

Gross Pollutants Captured in CDS Systems

In the report "From Roads to Rivers, Gross Pollutant Removal from Urban Waterways" (Allison, R. et al 1999), an extensive 18-month field study was completed to determine transport of pollutants in storm water and the trapping efficiency of various storm water treatment systems under typical conditions. The performance of CDS devices was assessed in terms of its trapping efficiency for gross pollutants, its influence on priority water quality parameters, the hydraulic characteristics of the unit, and the required maintenance for long term operation. The field studies suggest that CDS unit is an efficient gross pollutant trap. During 12 months of monitoring 100% material greater than the minimum aperture size of the separation screen (4.7-mm) was retained in the separation chamber and the hydraulic impedance of the unit appears to be quite low compared to other trapping techniques.

Indian River Lagoon
Brevard County, Florida

Stormwater sedimentation is a primary source of pollutant to the Indian River Lagoon in Brevard County, Florida. The Indian River Lagoon is an estuary of national significance and is part of the National Estuary Program. Pollutants targeted in the Lagoon by the State of Florida are suspended solids, phosphorous, and nitrogen. Suspended solids and turbidity reduce sunlight penetration in the Lagoon which negatively impacts sea grass growth. Phosphorous and nitrogen are nutrients which promote algae growth and reduce oxygen levels in the Lagoon.

In July, 1997, Brevard County's Stormwater Utility Program installed a 9 cfs CDS unit with a 4700 micron screen opening along a ditch at the north end of Brentwood Drive, north of Cocoa and close to the Indian River. This was the first United States installation of the CDS technology. Over an 18-month period, 5 storm events were monitored for 6 parameters: pH, TSS, BOD, COD, turbidity and total phosphorous. In addition, sediment samples were collected and tested for 61 parameters. The monitoring program reported in "CDS Unit for Sediment Control in Brevard County, Florida" removal efficiencies of 52% and 31% for TSS and phosphorus respectively.

Laboratory Verification and Certification
New Jersey Department of Environmental Protection, New Jersey Corporation for Advanced Technology

The CDS system was tested in the laboratory for TSS removal following the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device". Testing was verified by NJCAT and the CDS was certified for 50 % TSS removal at a maximum treatment flow rate of 0.93 cfs in a 4' diameter system.

Manasquan Savings Bank
Toms River, NJ
A CDS system was tested at a typical field installation in Toms River, NJ following the Technology Acceptance Reciprocity Partnership Tier II Protocol. Testing was subsequently verified by NJCAT. The CDS system achieved an overall TSS removal efficiency of 95%.

CDS Limitations, and Operational, Sizing, and Maintenance Considerations

Limitations:

The CDS system is typically an end of pipe system that is generally not suitable as a retrofit to an existing catch basin. However, the grate inlet CDS configuration can replace an existing area drain and catch basin. More commonly, the CDS is installed downstream of multiple inlets where it is designed to treat the peak 1-year, 1-hour flow rate from the entire upstream catchment area.

CDS units require special engineering consideration when placed in a tidal application or where tailwater is expected. In all cases, positive drainage must be maintained from the inlet to the outlet. In some tidal applications, installation of a flap valve or a duckbill valve on the outlet pipe will be sufficient to prevent tide surges from entering the unit. Where tailwater is expected, internal CDS components may be modified, for example, increasing the height of the bypass weir and modifying the geometry at the inlet to the separation chamber to ensure that the design flow rate is treated.

Typical CDS systems require at least 48" between the inlet pipe invert and the finished grade. Some design modification may be possible to fit shallower applications, for example shortening the height of the fiberglass separation cylinder and casting the frame and cover into the top slab.

Operation:

The CDS hydrodynamic separator uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment, and hydrocarbons from stormwater runoff. At the heart of the CDS system is a unique screening technology used to capture and retain trash and debris. The screen face is louvered so that it is smooth in the downstream direction. The effect created is called "Continuous Deflective Separation." The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder. This results in a screen that is self-cleaning and provides 100% removal of floatables and neutrally buoyant material debris 4.7 mm or larger, without blinding. In addition to trash removal, oil is retained upstream of the hydrocarbon baffle and settleable solids are retained in the sump below the separation chamber.

The CDS system is available in inline, offline and grate inlet configurations. Offline configurations include an external bypass weir that diverts stormwater exceeding the design treatment capacity of the system around the unit. Inline CDS units include an inlet flume that collects incoming stormwater and directs flows up the design treatment capacity through the separation chamber. Flows exceeding the design treatment capacity are diverted to the outlet over an internal weir without passing through the separation chamber. The grate inlet configuration conveys stormwater runoff from an area drain into the separation chamber without requiring an inlet pipe.

Sizing:

The CDS system can be sized to target various sediment gradations from about 50 microns to about 200 microns with the design hydraulic loading rate of the system increasing with target particle diameter. This scaling approach has been demonstrated in lab testing with silica-based sediment. In applications where sediment removal is required in addition to trash removal, CDS system sizing will generally be dictated by the target sediment gradation. Maximum trash removal flow rates are established through analysis of the forces normal to and parallel to the separation screen. Essentially, the force parallel to the screen face must be greater than the force perpendicular to the screen face such that the continuous deflective separation effect is maintained. This maximum trash treatment flow rate is about 1.4x greater than the maximum treatment flow rate that would be selected to target 80% removal of 125 micron particles.

Inspection and Maintenance:

Inspection is the key to an effective maintenance program. Trash generation rates vary widely from year to year and site to site. The initial inspection frequency should be semi-annual at a minimum. Inspection

Inspections should be performed more frequently where high trash loads are expected. CDS systems should be cleaned when the sump has filled to within 75% of capacity or when the separation chamber is filled with floating trash to within 50% of capacity. Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection and cleanout of the separation chamber and sump, and another allows inspection and cleanout of sediment captured and retained behind the screen. A vacuum truck is recommended for cleanout of the CDS unit which can be easily accomplished in less than 30 minutes for most installations.

Once a typical maintenance interval has been established, inspection should be scheduled twice as frequently.

Installation History and Municipal Contacts

Since the first CDS installation in California in 1998, thousands of CDS systems have been installed in the state for the purpose of trash, sediment and oil removal.

Municipal References:

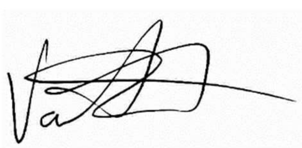
Elisa Wilfong
Water Pollution Control Administrator
City of Hayward
Elisa.Wilfong@hayward-ca.gov

Tristan Le
Senior Civil Engineer
Port of Long Beach
Tristan.le@polb.com

Signature of authorized representative

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signatory:



Vaikko Allen
Director – Stormwater Regulatory Management
Contech Engineered Solutions, LLC

CDS® FULL TRASH CAPTURE CONTROL DEVICE CERTIFICATION APPLICATION

Submitted to the California State Water Resources Control Board
May 27, 2021

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Appendix A – Example CDS Hydraulic Calculations

Appendix B – California CDS installation Case Studies

Appendix C– CDS Contractor Installation Instructions

Appendix D – CDS Inspection and Maintenance Guide

Appendix E - MVCAC vector control accessibility design verification request letter

3 PHYSICAL DESCRIPTION

a. Trash Capture

The CDS is a stormwater treatment device intended to remove pollutants, including suspended solids, trash and debris and floating oils from stormwater runoff. The CDS unit is typically comprised of a manhole that houses flow and screening controls that provide a combination of swirly concentration and continuous deflective separation.

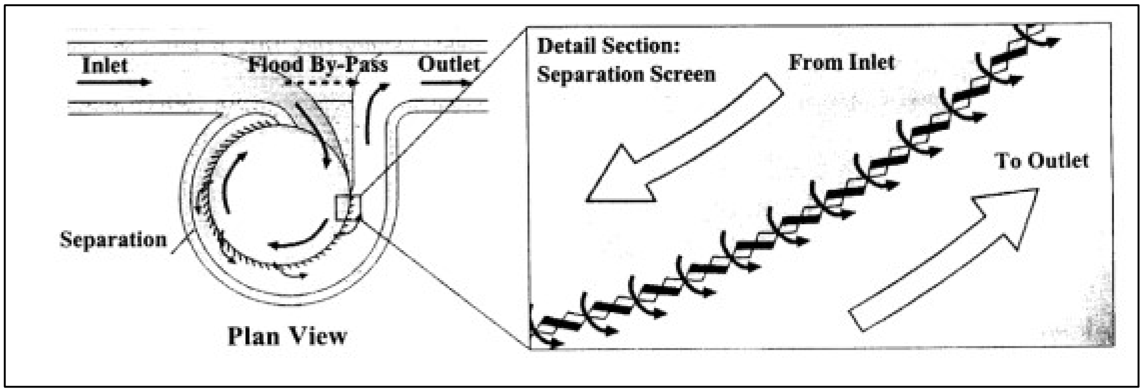

Figure 1 - Schematic Representation of the CDS Solid Separation Mechanism

When stormwater runoff enters the CDS unit, treatment flows are routed through one of two inlet flumes into the separation cylinder. During high intensity rain events, the water surface elevation in the system rises. Once influent flow rates exceed the treatment capacity of the inlet flumes, a portion of flow begins to overtop the weirs at the top of the flumes which serve as an internal bypass. Flows routed over the internal bypass are conveyed to the outlet. The water and associated gross pollutants contained within the separation cylinder are kept in continuous circular motion by the energy generated by the incoming flow. This “continuous deflective separation” effect represented in Figure 1, enhances sediment removal, provides 100 % removal of trash larger than 4.7 mm in diameter, and prevents captured materials from blocking the screen. A perforated screen plate allows the filtered water to pass through to a volute return system and then to the outlet pipe. Sediment, dense trash and debris and other settleable materials settle in the sump storage area. Floating trash is retained within the separation cylinder. Floating liquids, like oil, are retained upstream of the oil baffle. All of these materials can be removed periodically, typically using a vacuum truck.

Figure 2 is a schematic representation of a typical CDS unit including critical components. For more details on the functionality of the CDS, including drawings, videos and maintenance procedures, please visit the Contech web site at: www.conteches.com/CDS.

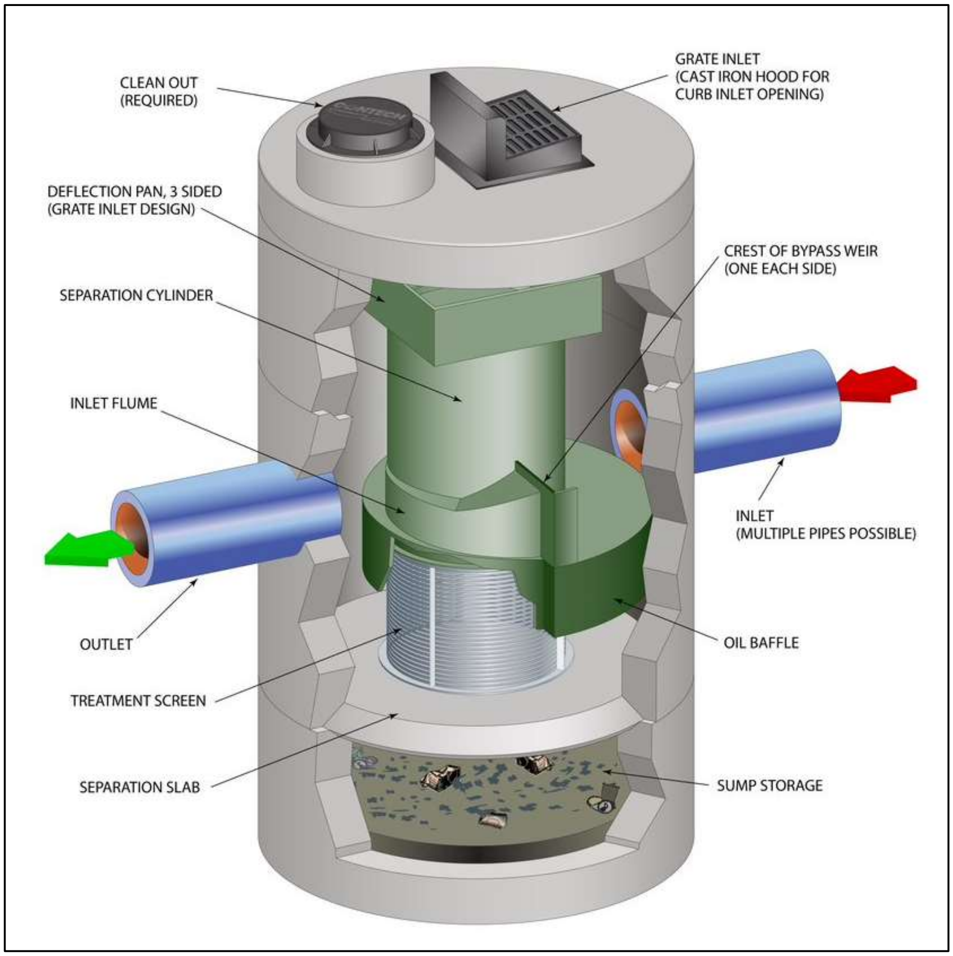

Figure 2 – Inline CDS system component diagram (shown with optional grate inlet)

b. Peak flows and trash storage volumes

CDS system sizing is a function of screen area, manhole diameter and influent configuration. In all cases, the peak trash removal design flow rate will result in a velocity parallel to the screen that is greater than the velocity of water perpendicular to the screen. This ensures that the continuous deflective separation (CDS) effect remains in effect through the range of operating flows, such that any trash contacting the separation screen is swept from the face of the screen and directed toward the center of the separation cylinder. A list of standard CDS system sizes, peak trash treatment flow rates and trash capture volumes is provided in Table 1. Non-standard CDS models, if necessary, will be sized to provide similar hydraulic conditions in the separation cylinder and at the screen face to facilitate screen clearing by continuous deflective separation. CDS systems may also be sized to treat the water quality flow rate at a lower hydraulic loading rate to achieve greater sediment and oil removal performance. Under no circumstances will the trash treatment design flow rates be exceeded during the design storm.

c. Hydraulic capacity

1. Standard sizes

Table 1 includes CDS design trash capture flow rates for standard models. In California, the peak 1-year, 1-hour flow rate generated by a particular catchment area should not exceed the design trash capture flow rate for the given model. Please note that sediment capture design flow rates for each model are lower than trash capture rates for the same model. This is because sedimentation is a fundamentally different unit process that requires lower velocities within the CDS system. Screening effectiveness is less susceptible to flow rate fluctuations as long as the capacity of the screen is not reached or exceeded.

The hydraulic capacity of the CDS screen greatly exceeds the design trash capture flow rate for each model. The design trash or sediment capture flow rate of each CDS system is determined by a combination of the bypass weir length and height, and the inlet throat dimensions. Example hydraulic calculations are included in Appendix A. For trash removal, these dimensions are set such that bypass begins after the design trash capture flow rate in Table 1 is reached. The design trash capture flow rate is set below the point where the velocity of water flowing through the screen approaches the velocity of flow parallel to the screen face. This ensures that captured materials are cleared from the face of the screen by the force of the incoming flow. Thus, captured materials that float are trapped in the separation cylinder without impeding system flow rates. Settleable materials, including waterlogged trash and dense sediment, are stored in the sump storage area. Storage of captured materials in this area will not impact screen hydraulic capacity. If standard inspection and maintenance guidance in Appendix D is followed, CDS treatment capacity will not be affected by trash accumulation.

Standard CDS® Models and Design Trash Capture Flow Rates			
	CDS Model	Design Trash Capture Flow Rate	
		cfs	L/s
Precast	CDS2015-4	1.0	28
	CDS2015-5	1.0	28
	CDS2020-5	1.5	44
	CDS2025-5	2.2	63
	CDS3020-6	2.8	79
	CDS3025-6	3.5	99
	CDS3030-6	4.2	119
	CDS3035-6	5.3	151
	CDS4030-8	6.3	178
	CDS4040-8	8.4	238
	CDS4045-8	10.5	297
	CDS5640-10	12.6	357
	CDS5653-10	19.6	555
	CDS5668-10	26.6	753
	CDS5678-10	35.0	991
	CDS9280-12	56.0	1586
	CDS9290-12	72.0	2039
	CDS92100-12	88.0	2492
Cast In Place	CDS150134-22	270	7646
	CDS200164-26	378	10704
	CDS240160-32	420	11893

Table 1 – Standard CDS® Models and Design Trash Capture Flow Rates

2. Alternative configurations

The treatment capacity of nonstandard CDS configurations will be established based on the screen diameter, screen height and manhole diameter such that flow patterns are similar to standard models.

d. Standard CDS model sizes and capacities

Design trash capture flow rates, sump storage capacity and screen cylinder volumes for standard CDS models are listed in Table 1. Within CDS units, settleable materials are contained in the sump and floating and neutrally buoyant materials are retained within the separation cylinder. In typical urban applications, the sump materials are a mix of sediment, waterlogged organic materials and captured trash. Captured floating materials 5 mm and greater in diameter are stored in the separation chamber and are predominately comprised of trash in typical urban installations, including Styrofoam, plastic bottles, balls, and other materials. During a storm, the water surface elevation in the unit rises and this floating mat of trash will rise within the separation cylinder, above the separation screen. As a result, even with a floating trash storage volume equivalent to the volume within the screen section, the CDS system may continue to function normally depending on the composition of captured trash.

The maximum potential trash storage volume is the sum of the sump capacity and the screen cylinder volume However, it should be noted that these volumes are likely to fill at different rates and will contain significant amounts of non-trash particulate material including sediment and organic matter. To be consistent with the maintenance indicators described in Section 5, the maximum trash capture volume listed in Table 2 is the sum of 75% of the sump volume and 50% of the volume inside the screen cylinder.

Standard CDS® Models and Capacities												
	CDS Model	Typical Internal Manhole Diameter		Screen Diameter/Height		Typical Sump Capacity		Screen Cylinder Volume		Maximum Trash Capture Volume	
		ft	m	ft	m	yd³	m³	yd³	m³	yd³	m³
Precast	CDS2015-4	4	1.2	2.0/1.5	0.6/0.5	0.9	0.7	0.17	0.13	0.79	0.60
Precast	CDS2015-5	5	1.5	2.0/1.5	0.6/0.5	1.5	1.1	0.17	0.13	1.2	0.90
Precast	CDS2020-5	5	1.5	2.0/2.0	0.6/0.6	1.5	1.1	0.23	0.18	1.2	0.92
Precast	CDS2025-5	5	1.5	2.0/2.5	0.6/0.8	1.5	1.1	0.29	0.22	1.2	0.95
Precast	CDS3020-6	6	1.9	3.0/2.0	0.9/0.6	2.1	1.6	0.52	0.40	1.8	1.4
Precast	CDS3025-6	6	1.9	3.0/2.5	0.9/0.8	2.1	1.6	0.65	0.50	1.9	1.5
Precast	CDS3030-6	6	1.9	3.0/3.0	0.9/0.9	2.1	1.6	0.79	0.60	2.0	1.5
Precast	CDS3035-6	6	1.9	3.0/3.5	0.9/1.1	2.1	1.6	0.92	0.70	2.0	1.6
Precast	CDS4030-8	8	2.5	4.0/3.0	1.2/0.9	5.6	4.3	1.4	1.1	4.9	3.7
Precast	CDS4040-8	8	2.5	4.0/4.0	1.2/1.2	5.6	4.3	1.9	1.4	5.1	3.9
Precast	CDS4045-8	8	2.5	4.0/4.5	1.2/1.4	5.6	4.3	2.1	1.6	5.2	4.0
Precast	CDS5640-10	10	3.1	5.6/4.0	1.7/1.2	8.7	6.7	2.9	2.2	8.0	6.1
Precast	CDS5653-10	10	3.1	5.6/5.3	1.7/1.6	8.7	6.7	3.9	2.9	8.5	6.5
Precast	CDS5668-10	10	3.1	5.6/6.8	1.7/2.1	8.7	6.7	4.9	3.8	9.0	6.9
Precast	CDS5678-10	10	3.1	5.6/7.8	1.7/2.4	8.7	6.7	5.7	4.3	9.4	7.2
Precast	CDS9280-12	12	3.7	4.0/3.0	1.2/0.9	16.8	12.8	1.4	1.1	13.3	10.2
Precast	CDS9290-12	12	3.7	4.0/4.0	1.2/1.2	16.8	12.8	1.9	1.4	13.5	10.3
Precast	CDS92100-12	12	3.7	4.0/4.5	1.2/1.4	16.8	12.8	2.1	1.6	13.6	10.4
Cast In Place	CDS150134-22	22	6.8	15.0/13.4	4.6/4.1	56.3	43.0	87.7	67.1	86.1	65.8
Cast In Place	CDS200164-26	26	8.0	20.0/16.4	6.1/5.0	78.7	60.2	190.8	145.9	154	118
Cast In Place	CDS240160-32	32	9.9	24.0/16.0	7.3/4.9	119.1	91.1	268.1	205.0	223	171

Table 2 – Standard CDS® Models and Capacities

e. Design drawings

The CDS system is available in an inline or offline configuration. An example inline standard drawing is included in Figure 3. Additionally, the inline configuration is available with an integrated inlet as shown in Figure 2, which eliminates the need for a separate inlet structure. A standard detail for the grate inlet version of the CDS is shown in Figure 4. The purpose of an offline configuration is to provide greater bypass flow capacity. An example standard detail of an offline CDS system is shown in Figure 5, which also includes bypass and junction manholes.

Current CDS system standard drawings can be found on the Contech web site at: https://www.conteches.com/technical-guides/search?filter=RNNY5KKCP1.

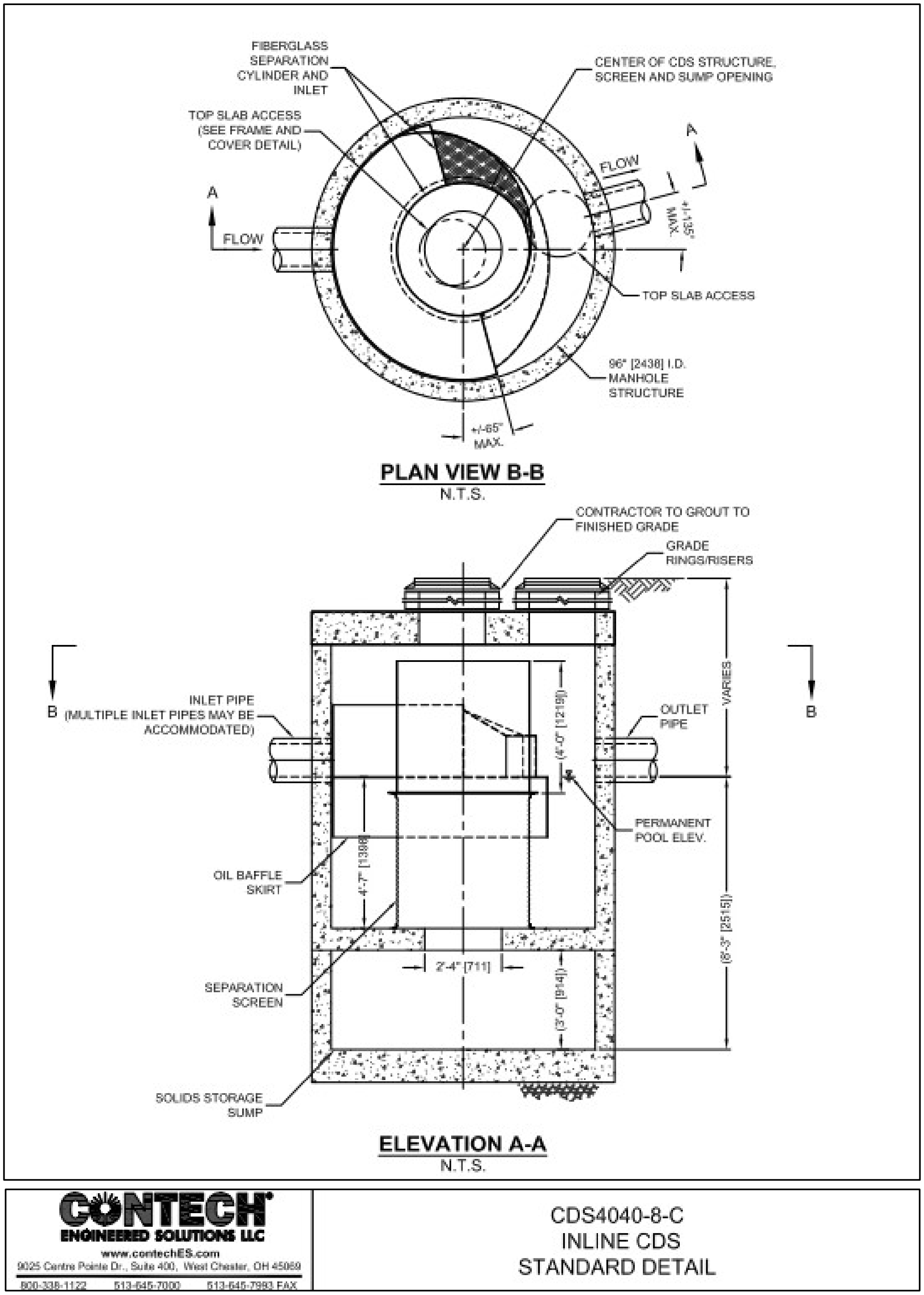

Figure 3 – Example Inline CDS Standard Detail

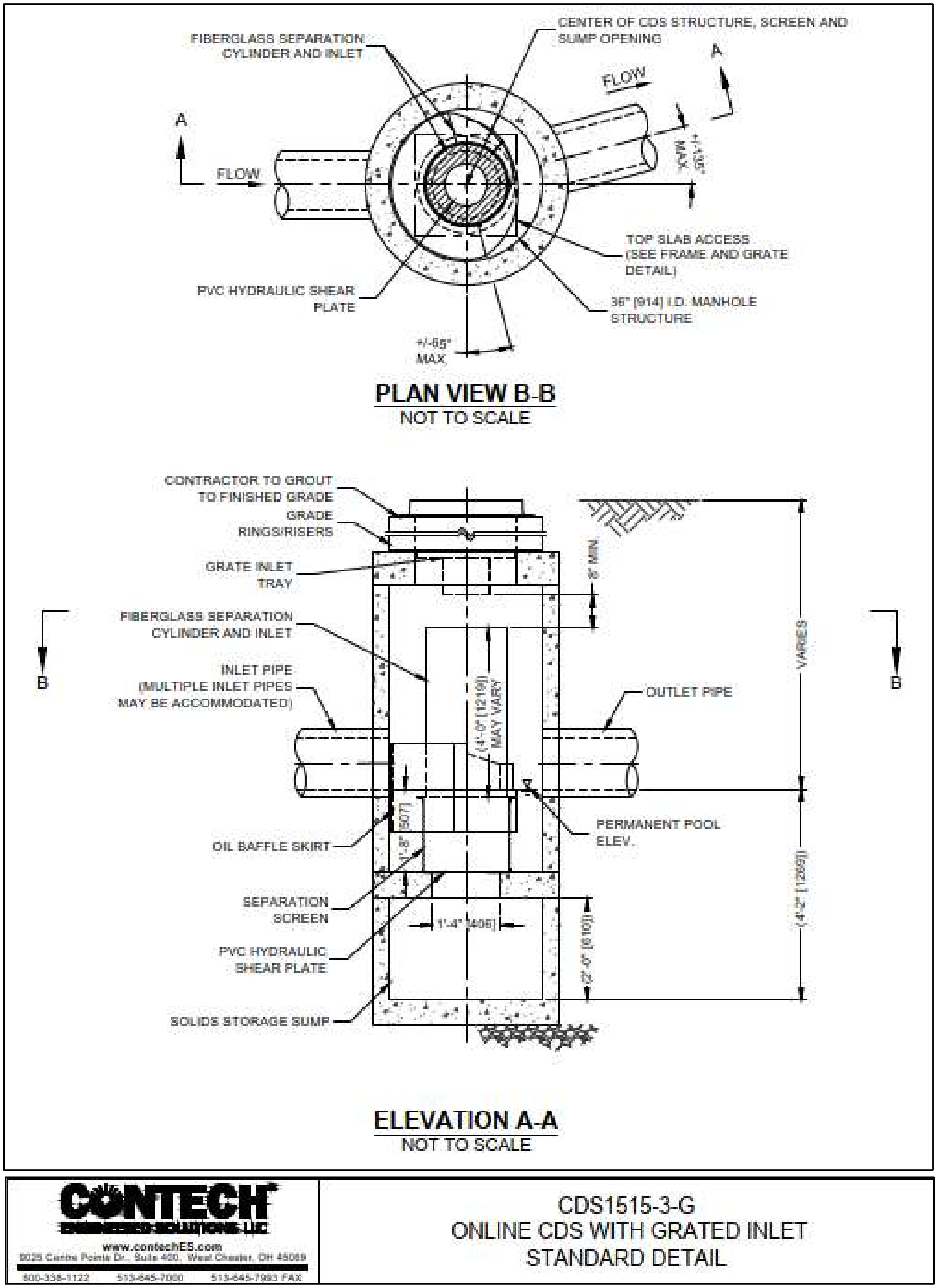

Figure 4 – Example Grate Inlet CDS detail

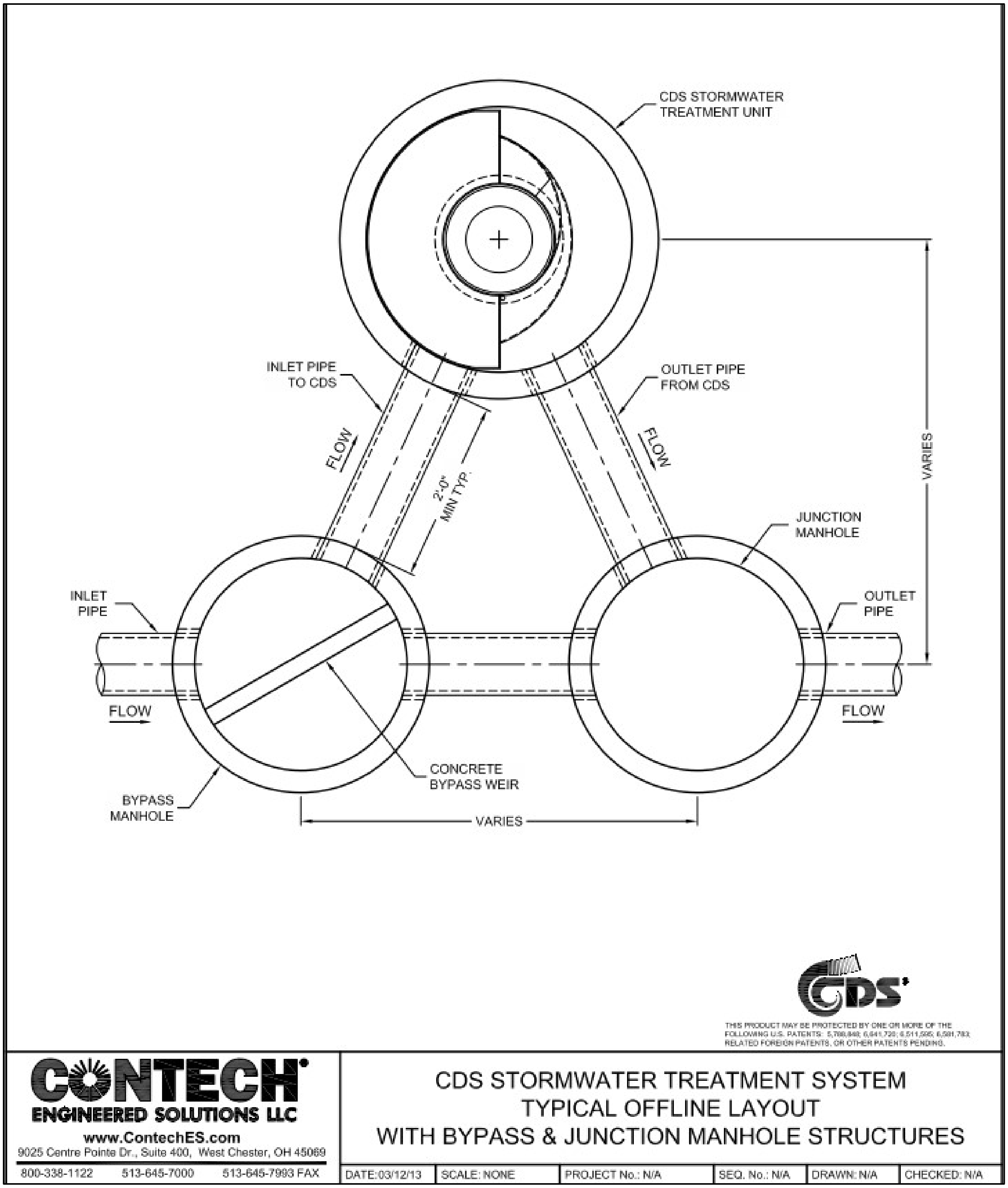

Figure 5 - Example Offline CDS Standard Detail

f. Alternative configurations

The CDS may available in other configurations as necessary to conform to site constraints. For example, in some cases an existing channel or box culvert can be retrofitted with a bypass weir to direct low flows to an offline CDS system. In some applications, the CDS system has been used to screen trash and debris prior to pumping runoff to the sanitary sewer or a downstream treatment system and has been configured to allow installation of a pump outside of the separation cylinder. There is also a downspout CDS configuration designed to treat roof runoff.

g. Internal bypass

The inline configuration of the CDS system has a bypass weir set at an elevation such that flows, up to and including the design treatment flow rate, are directed into the separation chamber. Influent flows exceeding this rate pass over the bypass weir and around the separation cylinder. An example hydraulic design summary including bypass calculations is included in Appendix A.

h. Previously trapped trash

The CDS system will not resuspend trash. In both the inline and offline configurations, the separation cylinder is located downstream of a bypass weir which directs any flows not screened by the treatment screen around the stored trash, rather than through the separation cylinder. In the unlikely event that the screen becomes blocked, water will bypass the separation chamber and previously captured trash will be retained.

i. Calibration feature

The CDS system does not have a calibration feature.

j. Photos

Example CDS project case studies from the State of California are included in Appendix B. Additional CDS system case studies from around the United States can be found on the Contech web site at:
https://www.conteches.com/knowledge-center/case-studies/search?filter=08DV04355M

Figure 6 - Typical inline installation

Figure 7 - Typical offline CDS installation

k. Material type

The CDS is comprised of the following standard materials:

- Structure: Concrete ASTM C478 – 88a and ASTM C33, C39, and C150
- Internal housing: Fiberglass per National Bureau of Standards PS-15
- Separation screen: stainless steel ASTM A316L
- Fasteners: Stainless steel A316
- Manhole cover and frame: Cast iron ASTM Designation 48-30.

l. Design life

The estimated design life of the CDS is at least 50 years.

4 INSTALLATION GUIDANCE

a. Standard device installation procedures

CDS precast components will be delivered to the site via a flatbed transport. The contractor shall provide equipment at the site that has adequate lifting capacity to unload the precast components. The installation sequence requires the solids storage sump to be installed first, followed by the CDS section, additional riser sections (if necessary), top slab with the appropriate traffic covers (to be placed in accordance with the manufacturer's specifications), and (if necessary) grade rings and/or grout to match grade. The CDS section is delivered to the project site with all internal components preinstalled by Contech. If the size of the CDS unit requires that internal component installation be performed at the project site, Contech will make appropriate arrangements with the contractor prior to the installations of the manhole. Standard contractor installation instructions are provided in Appendix C.

b. Description of device installation limitations and/or non-standard device installation procedures

The contractor shall excavate and, where necessary, shall provide dewatering and shoring in accordance with project specifications provided by the engineer. The subgrade shall be composed to withstand a design loading of 2000 pounds per square foot.

c. Methods for diagnosing and correcting installation errors

Assuming that Contech installation guidance and construction plans/specifications are followed, no installation errors are anticipated. Any installation errors must be corrected prior to top slab installation and backfill.

5 OPERATION AND MAINTENANCE INFORMATION

Complete operation and maintenance instructions are included in Appendix D in the "CDS® Inspection and Maintenance Guide".

a. Inspection procedures and frequency considerations

Inspection is the key to appropriate maintenance pacing. Pollutant transport and deposition may vary from year to year. Regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary for CDS units installed in high trash loading areas. In general, inspection events should be twice as frequent as maintenance events. The most appropriate inspection interval for a particular site can be determined over time based on prior inspection and maintenance history.

Inspection is performed by opening the manhole access covers to inspect the contents of the systems. No confined space entry is required. More complete inspection instructions can be found in Appendix D.

b. Maintenance frequency

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. In areas of high trash generation, more frequent maintenance will be required. Street sweeping or other source control efforts may extend maintenance intervals. The CDS system should be maintained when the height of the sediment pile in the sediment storage sump exceeds 75% of the total sump height. Floating trash should be removed before it accumulates to within half the volume of the screen cylinder volume listed in Table 2.

Local full capture device maintenance requirements should be followed regarding the point at which maintenance is required. For example, many jurisdictions require that accumulated trash be removed before it reaches half the maximum storage volume. Trash will continue to accumulate in the unit well past this point, but the hydraulic capacity of the unit may be reduced. Additional non-standard models may be available to accommodate site constraints or unique configurations.

c. Maintenance procedures

A typical cleaning usually is done by a two person team using a vacuum truck, a manhole pick or similar tool, and the tools normally found on a vacuum truck. The vacuum truck hose is extended into the CDS unit and the water, trash and sediment are vacuumed out. A small system can be cleaned in approximately 30 minutes. Large systems, including those with a diversion box, can take longer, depending on the capacity of the vacuum truck. Non-routine pollutants (i.e. other than trash and sediment), including large volumes of oil or grease, lumber, etc. require more extensive procedures. All cleaning activities can be performed without entering the unit.

The CDS screen and other internal components should be power washed once the CDS unit is substantially emptied. The power wash rinse water should be vacuumed from the storage sump to ensure that all captured pollutants are removed.

d. Essential equipment and materials for proper maintenance

Maintenance typically requires a two-person team, a vacuum truck, a manhole pick or similar tool, and the tools normally found on a vacuum truck. No confined space entry is required.

e. Description of the effects of deferred maintenance

If maintenance is not performed as recommended, the treatment capacity of the unit will eventually be reduced as sediment and trash accumulate in the separation cylinder and impede flow through the separation screen.

f. Repair procedures for the device's structural and screening components.

The CDS system components are expected to last for at least 50 years without replacement. Screen components should not need to be replaced if subjected to typical trash loads and design flow rates. If necessary, the separation screen can be cut out and removed through the manhole access point over the separation cylinder. A new screen could be installed by passing screen sections through the manhole access point and fastening in place.

6 VECTOR CONTROL ACCESSIBILITY

a. CDS application for vector control accessibility design verification

A letter requesting design vector control accessibility design verification was submitted via email to the Mosquito Vector Control Association of California on March 29, 2021. A copy of this letter is provided in Appendix E.

b. CDS vector control access and vector deterrence

In 2019, Contech changed default CDS manhole covers to a non-vented design (Figure 2) with recessed pick holes that do not penetrate the entire depth of the cover. This prevents mosquito passage into and out of the system through these inspection and maintenance points.

c. The MVCAC Letter of Verification

An accessibility design verification letter was received from the Mosquito Vector Control Association of California on April 29, 2021. That letter states:

"The Association has reviewed the conceptual drawings for the Contech CDS and verifies that provisions have been included in the designs that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes."

A full copy of this verification letter is provided in Appendix F.

7 RELIABILITY

a. Estimated design life

The CDS system has no replaceable parts and has a design life of at least 50 years.

b. Warranty information

Contech guarantees CDS units against all manufacturer originated defects in materials or workmanship for a period of twelve months from the date of delivery to the owner for installation. Contech will upon its determination, repair, correct or replace any manufacturer originated defects advised in writing to Contech within this twelve-month warranty period. The use of CDS units shall be limited to the application for which it was specifically designed.

c. Customer support information

Customer support for all Contech products and applications is available by email at: info@conteches.com. All stormwater related email inquiries and requests sent to this address will be routed to the appropriate Contech Stormwater Consultant. Customers can also use the "find your local contact" tool and access other contact information on the Contech website at: https://www.conteches.com/connect.

8 FIELD/LAB TESTING INFORMATION AND ANALYSIS

a. Field/lab testing information

I. CALTRANS BMP RETROFIT PILOT PROGRAM

Caltrans monitored two CDS units as part of the BMP Retrofit Pilot Program[i]. These units treated runoff from elevated sections of the I-210 freeway in Los Angeles County and were assessed for trash removal. Regarding CDS system trash removal performance, the report concluded: "They were highly successful at removing gross pollutants, capturing an average of 88 percent, with bypass of this material occurring mainly when the flow capacity of the units was exceeded." The systems were also assessed for mosquito breeding. After mosquitos were found in the units the manhole lids were sealed and a reduction in mosquito breeding was observed.

II. Cooperative Research Centre Case Studies

The Cooperative Research Centre (CRC) for Catchment Hydrology conducted several monitoring programs to test the performance of various storm water gross pollutants trapping devices. The Stormwater Gross Pollutants Industrial Report[ii] demonstrates that CDS devices are efficient gross pollutant traps. During three months of monitoring, practically all gross pollutants transported by stormwater were trapped by the CDS device (i.e. 100 percent removal rate).

Figure 8 - Gross Pollutants Captured in the CDS Units Sump

In the report "From Roads to Rivers, Gross Pollutant Removal from Urban Waterways[iii]", an extensive 18-month field study was completed to determine transport of pollutants in storm water and the trapping efficiency of various storm water treatment systems under typical conditions. The performance of CDS devices was assessed in terms of its trapping efficiency for gross pollutants, its influence on priority water quality parameters, the hydraulic characteristics of the unit, and the required maintenance for long term operation. The field studies suggest that CDS unit is an efficient gross pollutant trap. During 12 months of monitoring 100% material greater than the minimum aperture size of the separation screen (4.7-mm) was retained in the separation chamber and the hydraulic impedance of the unit was quite low compared to other trapping techniques.

III. Indian River Lagoon, Brevard County, Florida

Stormwater sedimentation is a primary source of pollutant to the Indian River Lagoon in Brevard County, Florida. The Indian River Lagoon is an estuary of national significance and is part of the National Estuary Program. Pollutants targeted in the Lagoon by the State of Florida are suspended solids, phosphorous, and nitrogen. Suspended solids and turbidity reduce sunlight penetration in the Lagoon which negatively impacts sea grass growth. Phosphorous and nitrogen are nutrients which promote algae growth and reduce oxygen levels in the Lagoon.

In July, 1997, Brevard County's Stormwater Utility Program installed a 9 cfs CDS unit with a 4700 micron screen opening along a ditch at the north end of Brentwood Drive, north of Cocoa and close to the Indian River. This was the first United

States installation of the CDS technology. Over an 18-month period, 5 storm events were monitored for 6 parameters: pH, TSS, BOD, COD, turbidity and total phosphorous. In addition, sediment samples were collected and tested for 61 parameters. The monitoring program reported in "CDS Unit for Sediment Control in Brevard County, Florida[iv]" removal efficiencies of 52% and 31% for TSS and phosphorus respectively.

IV. NEW JERSEY LABORATORY VERIFICATION AND CERTIFICATION

The CDS system was tested in the laboratory for TSS removal following the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device[v]". Testing was verified by NJCAT[vi] and the CDS was certified for 50 % TSS removal at a maximum treatment flow rate of 0.93 cfs in a 4' diameter system by the New Jersey Department of Environmental Protection[vii].

V. MANASQUAN SAVINGS BANK, TOMS RIVER, NJ

A CDS system was tested at a typical field installation in Toms River, NJ following the Technology Acceptance Reciprocity Partnership Tier II Protocol[viii]. Testing results were subsequently verified by NJCAT[ix]. The CDS system achieved an overall TSS removal efficiency of 95%.

9 REFERENCES

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[ii] Allison, R., Chiew, F., McMahon, T. 1997. Stormwater Gross Pollutants: Industry Report. CRC for Catchment Hydrology, Clayton, Victoria, Australia.

[iii] Allison R.A., Walker T.A., Chiew F.H.S., O'Neill I.C. and McMahon T.A. (1998). *From Roads to Rivers, - Gross Pollutant Removal from Urban Waterways,* Technical Report 98/6, Cooperative Research Centre for Catchment Hydrology, 97p.

[iv] Strynchuck, Justin, Royal, John and England, Gordon, *The Use of a CDS Unit for Sediment Control in Brevard County,* Brevard County Surface Water Improvement

[v] New Jersey Department of Environmental Protection. 2021. New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device. Available online at: https://www.nj.gov/dep/stormwater/pdf/2021_hds_protocol_final_version.pdf

[vi] NJ CAT Verification Report: http://www.njcat.org/uploads/newDocs/CDSVerificationReportFinal1.pdf

[vii] NJ DEP https://www.nj.gov/dep/stormwater/pdf/CDS_Certification_20170317.pdf

[viii] Technology Acceptance Reciprocity Partnership. 2003. The Technology Acceptance Reciprocity Partnership Protocol for Stormwater Best Management Practice Demonstrations. Available online at: https://www.mass.gov/doc/stormwater-best-management-practice-demonstration-tier-ii-protocol-for-interstate-reciprocity/download

[ix] NJCAT TARP Tier II: http://www.njcat.org/uploads/newDocs/NJCATTECHNOLOGYVERIFICATIONMSBCDSFINAL81012.pdf

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APPENDIX A – EXAMPLE CDS HYDRAULIC CALCULATIONS

HYDRAULIC DESIGN SUMMARY
FOR INLINE MODEL
CDS4030

The following hydraulic summary supports the design of the CDS model proposed on the DOWNTOWN MONTEREY - FRANKLIN STREET FTC project located in MONTEREY, CA . The attached hydraulic calculations supporting the proposed CDS structure's design serve two purposes.

1. To ensure the proposed CDS model will achieve the design treatment capacity under the site-specific hydraulic conditions.

   The proposed CDS model CDS4030 unit is designed to process a treatment flow of 6.3-cfs. Under the site-specific conditions, the proposed 23-inch tall diversion weir will generate the operational energy necessary to achieve the 6.3-cfs design treatment flow rate.

2. To quantify the hydraulic losses introduced to the conveyance system under peak design conditions.

   A flow of 19-cfs represents the peak discharge generated by the contributing drainage area for a design storm having a 50 year return interval. Under these peak design conditions, all of the 19-cfs flow is assumed to be conveyed over the diversion weir. This conservative assumption predicts the worst-case resulting hydraulic condition and preserves the integrity of this calculation even if the structure is not properly maintained.

   Based on the information provided, the proposed CDS model CDS4030 is predicted to increase the upstream Hydraulic Gradeline (ΔHGL) by 1.28 ft for the above cited peak design flow.

$$\Delta HGL = H_{CDS} = 1.28 \text{ ft}$$

   The effective headloss coefficient across the proposed CDS model CDS4030 for the 50-year storm event may be estimated as a function of the velocity in the downstream pipe.

where,

K_{CDS} = CDS Headloss Coefficient:

$= H_{CDS} / [\ V_{d/s}^2 / 2 \cdot g\ ]$

$= 5.80$

   If a software program is being used to develop the Hydraulic Gradeline (HGL) for the upstream conveyance system, the values listed above for HCDS and/or KCDS can be used as either a headloss factor to be multipled by the downstream velocity head, or input the headloss amount for the proposed CDS model at the corresponding node.

Reference: Contech Engineered Solutions CDS Design - Ver 2.2

INLINE
HYDRAULIC CALCULATIONS
WNTOWN MONTEREY - FRANKLIN STREET I
MONTEREY, CA
668603-10

DESIGN PARAMETERS

CDS Model No. =	CDS4030	
Design Treatment Flow =	**6.3**	cfs
Peak Design Flow =	19.00	cfs
Peak Design Return Interval =	50	year
Rim Elevation @ US Structure	12.49	ft

DETAILED CALCULATIONS

TREATMENT FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = 8.05 ft (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 2.87 fps

h_1 = 0.13 ft

$EGL_1 = EL_0 + h_1$

= 8.18 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 85 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. =	36	in
S_{PIPE} =	0.0011	ft/ft
n =	0.012	

Flow Characteristics

d_F =	1.05	ft
A_F =	2.20	sf
P_W =	3.79	ft
R =	0.58	ft

Head Loss Through Downstream Pipe, h_2 (cont.'d)

S_{EGL} = 0.00110 ft / ft

h_2 = 0.0937 ft

EGL_2' = $EGL_1 + h_2$
= 8.28 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 7.10 ft

d_c = 0.80 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$
= 8.17 ft

Identify Controling EGL

Friction based EGL controls.
EGL_2 = 8.28 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,
k = 0.20
V = Q / A
= 2.87 fps (area based on flow depth)

h_3 = 0.03 ft

EGL_3' = $EGL_2 + h_3$
= 8.30 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,
k = 1.00
A_{Baffle} = **8.80** sf
V = Q / Abaffle
= 0.72 fps

h_4 = 0.0080 ft

EGL_4 = $EGL_3 + h_4$
= 8.31 ft

Check Standard Weir Elevation

HL_{CDS} = 0.67 ft

EL_W' = $EGL_4 + HL_{CDS}$
= 8.98 ft

H_W' = $EL_W' - EL_{CDS\ INV.}$
= 1.88 ft, or 22.55 in

Std. Weir Height = 23.0 in
Status **OK**

Use H_W = **23** in, or 1.92 ft

EL_W = $EL_{CDS\ INV.} + H_W$
= 9.02 ft

PEAK CONVEYANCE FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = **9.02** ft (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 3.77 fps

h_1 = 0.22 ft

$EGL_1 = EL_0 + h_1$

= 9.24 ft

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 85 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 36 in

S_{PIPE} = 0.0011 ft/ft

n = 0.012

Flow Characteristics

d_n = 2.01 ft

A_F = 5.04 sf

P_W = 5.76 ft

R = 0.88 ft

S_{EGL} = 0.0011 ft / ft

h_2 = 0.09 ft

$EGL_2' = EGL_1 + h_2$

= 9.33 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 7.10 ft

d_c = 1.39 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 9.04 ft

Identify Controling EGL

Friction based EGL controls.

EGL_2 = 9.33 ft

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

$k =$ 0.20

$V = Q / A_F$

$=$ 3.77 fps (area based on flow depth)

$h_3 =$ 0.04 ft

$EGL_3 = EGL_2 + h_3$

$=$ 9.38 ft

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

$k =$ 0.00 (Skirted-baffle model)

$A_{Baffle} =$ 8.80 sf

$V = Q / A_{Baffle}$

$=$ 2.16 fps

$h_4 =$ 0.00 ft

$EGL_4 = EGL_3 + h_4$

$=$ 9.38 ft

$HGL_4 = EGL_4 - [V_P^2 / (2*g)]$

$=$ 9.16 ft

Head over Diversion Weir, h_5

Elevation of Weir

$EL_{Weir} =$ 9.02 ft (established above)

Headloss for Free Discharge Condition

$h_{5a} = [Q / (C * L)]^{2/3}$

where,

$C =$ 3.1

$L =$ 4.00 ft

$h_{5a} =$ 1.33 ft

$EGL_{5a} = EL_{Weir} + h_{5a}$

$=$ 10.35 ft

Headloss for Submerged Condition

$d_{Sub} =$ 0.14 ft (depth of submergence)

$h_{5b} =$ 1.20 ft (separate submerged weir calc.)

$EGL_{5b} = EGL_4 + h_{5b}$

$=$ 10.58 ft

Identify EGL U/S of Weir

The discharge condition is Submerged, therefore

$EGL_5 =$ 10.58 ft

Expansion Loss from U/S Pipe, h_6

$h_6 = k * [V^2 / (2*g)]$

where,

$k =$ 0.30

$V = Q / A_F$

$=$ 2.69 fps

$h_6 =$ 0.03 ft

$EGL_6 = EGL_5 + h_6$

$=$ 10.62 ft

Head Loss Through Upstream Pipe, h_7

Friction Losses, h_7

$h_7 = S_{EGL} * L$

where,

$L =$ 175 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 36 in

$S_{PIPE} =$ 0.0011 ft/ft

$n =$ 0.012

Flow Characteristics

$d_n =$ 3.00 ft

$A_F =$ 7.07 sf

$P_W =$ 9.42 ft

$R =$ 0.75 ft

$S_{EGL} =$ 0.0007 ft / ft

$h_7 =$ 0.12 ft

$EGL_7' = EGL_6 + h_7$

$=$ 10.74 ft

Check Entrance Condition for Critical Depth Control

$EL_{U/S\ Inv.} =$ 7.29 ft

$d_c =$ 1.39 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

$=$ 9.13 ft

Identify Controling EGL

Friction based EGL controls.

$EGL_7 =$ 10.74 ft

$HGL_7 = EGL_7 - [V^2 / (2*g)]$

$=$ 10.62 ft

Freeboard = 1.87 ft (at first upstream structure)

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APPENDIX B – CALIFORNIA CDS INSTALLATION CASE STUDIES

San Jose Trash Capture

San Jose, California

Stormwater Treatment

Owner:
City of San Jose

Engineer:
BKF

Installation:
Spring, 2017

Technical Description:

- (7) CDS® hydrodynamic separators

California is widely known for its waterways. Millions of tourists and locals flock to these waters every year to swim, play, fish and relax in the sun, resulting in an economic boon for California. Unfortunately, trash generated by human activity on land is washed by rain into gutters and storm drains and makes its way into streams, creeks, rivers and, eventually, the ocean. Cigarette butts, paper, plastic bags, plastic food containers, cans and bottles have all been found in California waters and on beaches following stormwater runoff.

In 2015, the California State Water Board addressed the issue by adopting amendments to their Ocean and Inland Water Plans, commonly known as the "Trash Amendments," which mandate that trash discharged from every city, county and CalTrans stormwater system is significantly reduced to protect local waterways.

The Bay Area has had trash capture regulations (C10) since 2009. Under C10, San Jose and other Bay Area cities must reduce certain percentages of trash by milestone dates in 2015, 2017, 2018, and 2022. The Trash Amendments require cities to install devices or other measures over a 10-year period beginning in 2019, with 2018 intended to be a year for planning and design.

To tackle the issue of trash, the city of San Jose has implemented a series of initiatives, including cracking down on illegal dumping, shoreline cleanups, ordinances for single use plastic bags and foam food containers, installing new public litter cans, and additional street sweeping.

San Jose Trash Capture

San Jose, California

In the spring of 2017, the City installed nine CDS® hydrodynamic separators from Contech to meet their latest deadline for trash capture. The CDS is a hydrodynamic separator that uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment and hydrocarbons from stormwater runoff. CDS captures and retains 100% of floatables and neutrally buoyant debris, effectively removes sediment, and uses a non-blocking screening technology that facilitates easier maintenance.

The city had experience with CDS, having previously installed systems in 15 key locations. After installing the first two CDS units specifically for trash capture in 2010, the City examined the long-term lifecycle costs for using numerous individual catch basin screens compared to a small number of large devices like the CDS. While the CDS units were found to be more expensive initially, their significantly lower maintenance costs and long history of reliability made them the choice for the city's ongoing trash control efforts.

The city had less than a year to identify installation sites, perform hydraulic analysis, size and design the CDS units, prepare specifications for bid, sign contracts, retrofit their drainage system with the CDS units, and restore the city streets. Contech worked closely with City Public Works engineers and consulting firm BKF throughout the process, and provided hydraulic analysis for multiple scenarios before final designs were agreed upon.

The CDS units included four 12-foot-diameter units with diversion vaults, two twin 12-foot diameter units with diversion vaults, and one 18-foot-diameter unit with a segmented diversion vault. Existing drainage pipes required special designs to prevent upstream flooding. Box culverts were used at two sites instead of standard rectangular diversion vaults to fit within a limited footprint. Total combined flow treated by the nine CDS units is over 550 cfs. Over 5,000 acres of high-density urban San Jose is now protected by CDS units, and trash within these drainage areas will no longer make it into San Francisco Bay.

Most installation activities occurred within a six-week period in April and May of 2017, with two contractors, each working on three sites performing the installations. All installations were retrofits within a crowded urban area. Large trucks, overhead clearance for the cranes, and neighborhood access all had to be managed. One site required partial installation until the electric utility could relocate buried high voltage lines. Following the relocation, the site was re-excavated, and the remaining components were installed.

A Contech Project Coordinator worked to manage all delivery schedules, while a Contech Field Representative was on site providing the contractors support during the installations. The installations required over 60 trucks scheduled across a dozen installation dates, and each installation date changed multiple times. Most loads were oversize with a flag car, which meant they weren't allowed on the highway in the morning and required six different staging areas throughout the congested city so the trucks could arrive overnight.

Before the trucks could even be loaded, the 38 screen sections had to be fabricated, the 54 fiberglass pieces had to be built, and over 90 concrete pieces had to be poured. Complicating all of this were design changes made during construction, with three of the sites having changes close to the day of installation. Two contractors worked through conflicting schedules to handle the installations. Despite all these challenges, the team met the June 30 deadline, surprising many city officials who thought the goal was not achievable.

City of Pacific Grove

Pacific Grove, California

Owner:

The City of Pacific Grove

Installation:

.

Monterey Bay is one of the nation's spectacular marine sanctuaries. Pollution carried by urban runoff to the Bay is a huge threat to the water quality and the marine life. In an effort to protect Monterey Bay, the California central costal community has made extensive efforts to manage runoff at the bay.

Technical Description:

- Product Used:
- CDS®

One might not typically think of runoff treatment being needed during periods of dry weather. However, water still flows off paved areas during this time from activities such as landscape irrigation, car washing, and the cleaning of sidewalks and driveways, carrying pollutants with it. That's why the City of Pacific Grove, Cal., which borders the Bay, constructed a diversion system that would direct dry weather runoff from the storm drain system into the sanitary sewer system throughout their seven-month dry period.

The diversion system was designed to accommodate dry weather flow from two mixed-use drainage basins, where each system accepted runoff from numerous storm drain interceptor manholes distributed throughout.

Previously the runoff from these two drainage basins was discharged directly into Monterey Bay through two drainage pipes. Now two pump stations divert the dry-weather runoff into the sanitary sewer system. Two CDS units, from Contech Engineered Solutions were installed to pretreat the runoff prior to diversion.

The first drainage area is 7.42 acres with a treatment requirement for the water quality flow, which a 2-year, 1-hour storm. An inline CDS unit was used with a design treatment capacity of 2.0-cfs and peak capacity of 6.13 cfs. The unit was retrofitted on the existing 24" RCP drainage pipe.

The second drainage area is approximately 220 acres, and the design of the CDS unit was based on a hydraulic analysis of the existing drainage system. An offline CDS unit was designed with a treatment capacity of 6.0 cfs and peak capacity of 150-cfs. This offline unit was retrofitted on the existing 48" RCP storm drain.

City of Pacific Grove

Pacific Grove, California

The Result

Using the CDS system in the dry weather flows diversion system provides the City with advanced pre-treatment of polluted runoff. The system will effectively remove trash, debris as well as sediments from the runoff before it is pumped to the sanitary sewer system. The CDS units not only protect the pumping structure from abrasion due to debris and coarser sediment, but also reduce the solids load to the sanitary sewer facility, which cannot be achieved using a typical wastewater screening device.

Compared to the traditional physical screening device for pre-treatment in the wastewater facility, the CDS technology provides high efficiency, a non-blocking screen, and has no power requirements or moving parts.

During wet weather conditions, the CDS device will also function as the stormwater treatment device to remove trash, debris, sediments and particulate pollutants (phosphorous, metals, etc.) that are carried in stormwater runoff.

I-210 Highway

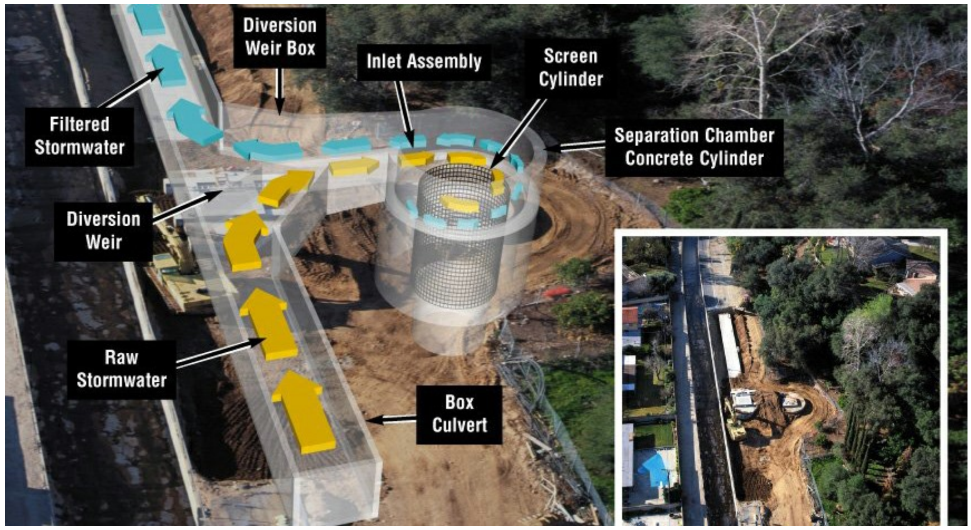
Los Angeles, California

Stormwater Treatment

Owner:
California Department of Transportation

Engineer:
California Department of Transportation

Installation:
2003



The California Department of Transportation (Caltrans) builds and maintains some of the world's busiest highways, including the I-210, a major east—west state highway in the Greater Los Angeles area. The eight-lane freeway bisects numerous densely populated suburban communities so traffic is usually heavy, well in excess of 100,000 vehicles per day.

Technical Description:

- (5) CDS® hydrodynamic separators

The highway is drained by a reinforced concrete box culvert measuring 3 x 1.5 meters. In L.A.'s arid climate, rainfall events are infrequent but often intense, and the runoff is usually packed with all kinds of pollutants and trash. Stormwater runoff from I-210 contains the usual debris: cups, cans, plastic and paper. And like most highways, it also has a toxic mix of metals such as beryllium from tires, aluminum from auto chassis parts, iron from engines and copper from brake linings.

Caltrans looked at several options for cleaning the highway's stormwater runoff. Installing screens or baskets at stormwater drains was quickly ruled out. Such devices require cleaning after almost every rain event, and the drains are located within a few feet of high-speed traffic. The high level of maintenance and the safety factor for workers made this option unacceptable.

An end-of-line cleaning process was preferred, but there were other factors affecting the decision. Volumetric-type devices that catch and hold large amounts of water for a long time were considered, but in this densely populated area it would have required Caltrans to displace several homes, and it would have cost millions of dollars. Caltrans was also interested in a system that would minimize maintenance events and costs.

I-210 Highway

Los Angeles, California

Ultimately, Caltrans selected a CDS hydrodynamic separator from Contech Engineered Solutions. The CDS uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment, and hydrocarbons from stormwater runoff. The CDS system is entirely self-operating, relying on water hydraulics, gravity, and a non-blocking screen.

One of the biggest benefits of the CDS technology in this application was that Caltrans could fit a CDS unit into a small patch of land that could be easily and affordably obtained. There are actually five CDS units incorporated into the new I-210 freeway system, one of which is the largest CDS unit ever installed in the U.S. The pit excavated for the largest unit was 40 ft wide, 40 ft long and 38 ft deep. The cylindrical screen assembly on the unit is 15 ft in diam. by 15 ft tall. The unit is designed to filter a "first flush" runoff event of 175 cfs (78,400 gpm).

Gold Line Maintenance and Operations Campus

Monrovia, California

Stormwater Management

Owner:
Metro Gold Line Foothill Extension Construction Authority

Engineer:
Parsons Corporation

Installation:
.

The Foothill Gold Line (also known as the Gold Line Foothill Extension) is a 24-mile extension of the Metro Gold Line light rail corridor in Los Angeles, California. The expansion necessitated the need for a new Maintenance and Operations (M&O) Campus, which was built on 24 acres in the city of Monrovia. The M&O facility will be used for servicing, cleaning, painting, and storing light rail vehicles for Metro's growing fleet.

Technical Description:

- (108) ChamberMaxx® stormwater chambers
- (3) CDS® hydrodynamic separators

The M&O will be one of the largest facilities in the entire Los Angeles County Metropolitan Transportation Authority (Metro) system and the only facility thus far that meets the U.S. Green Building Council's Leadership in Energy and Environmental Design Gold standards.

Engineers from Parsons designed a comprehensive stormwater management system that contributed to the sustainability of the site and contributes to the LEED certification standards. Stormwater from runoff from roofs, parking lots, and other impervious surfaces will be captured, treated, and infiltrated for groundwater recharge.

Corrugated Metal Pipe (CMP), often the material of choice for underground infiltration, could not be used due to concerns about conductivity from the many rail lines within the site. Hence, Contech's plastic solution, ChamberMaxx, was selected by the design team at Parsons Corporation. ChamberMaxx is a corrugated, open-bottom plastic infiltration chamber system that allows the treated water to be detained and infiltrated into the groundwater aquifers below.

Parsons worked with Contech engineers to design a system using three underground infiltration systems, two of which were constructed from Contech ChamberMaxx infiltration chambers.

Gold Line Maintenance and Operations Campus

Monrovia, California

Each system utilized 54 chambers to provide an infiltration volume of 5000 CF per system but were arranged in different layouts to accomodate specific site restraints.   One system was long and narrow (15.7 x 135.6) in the back of the facility and the other was rectangular (29.8 x 71.5), placed under a rear parking area.

All three infiltration systems were pretreated using CDS hydrodynamic separators. CDS uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment, and hydrocarbons from stormwater runoff. Pretreating with CDS will prolong the life of the ChamberMaxx infiltration systems by removing debris and sediment that can collect within the stone backfill voids. Pretreatment with CDS also aides in maintenance, as the CDS units are easier to clean and maintain compared to the infiltration system itself.

A community open house and dedication for the new facility took place in May 2015. The event was attended by elected officials at all levels of government, transportation officials, and hundreds of community stakeholders. The open house included exhibits of the technology used within the new facility, including an exhibit of the technology used in the stormwater management system.

Humboldt River Greenway

Los Angeles, California

Stormwater Treatment

Owner:
City of Los Angeles

Engineer:
City of Los Angeles

Contractor:
PPC

Installation:
April 2013

Technical Description:

- CDS® hydrodynamic separator

The Los Angeles River extends 52 miles through the LA region. The river has been encased in cement since the 1930s, in order to protect the fast-growing city from life-threatening floods. After undergoing scrutiny recently, the area has now become the focus of an extensive region-wide program to revitalize the area and create green space, while maintaining hydrologic and water quality requirements.

As part of this program, the Humboldt River Greenway project, located in the Lincoln Heights community between Avenues 18 and 19 in Los Angeles, became one of many Bureau of Engineering projects targeted for change. A small one-acre park was created in this former industrial field and includes daylighting the existing storm drain system (since it is buried underground) by constructing a stormwater greenway with a ”stream” ecosystem through a corridor along Humboldt Street. This project will enhance the water quality of the Los Angeles River by removing pollutants such as oil, bacteria and trash from the dry weather urban runoff. It will also provide natural habitat with the planting of native plants and a communal recreational space to promote the idea that urban streams are a valuable resource to be enjoyed by the community.

To address the stormwater runoff conditions that plagued the site, the City of Los Angeles chose a treatment solution from Contech Engineered Solutions. Specifically, a CDS hydrodynamic separation system was selected as the best solution for its ability to pre-treat runoff. The CDS system screens, separates and traps debris, sediment, oil and grease from the stormwater runoff before it reaches the Los Angeles River. In fact, the patented, non-blocking screen allows for 100% removal of floatables and neutrally buoyant material. In addition, the CDS system met the local requirement for “full trash capture," while also providing a high level of pretreatment in a treatment train based on the Low Impact Development (LID) design methodology.

The project was funded by the City of Los Angeles Sanitation Department of Public Works. The project was selected by Storm Water Solutions Magazine as one their Top 10 Projects of 2014.

Long Beach City College

Long Beach, California

Stormwater Detention

Owner:
Long Beach City College

Engineer:
KPFF Long Beach

Contractor:
Pima Construction

Installation:
October 2013

Long Beach City College (LBCC), established in 1927, is a community college located in Long Beach, California. LBCC serves the cities of Long Beach, Lakewood, Signal Hill, and Santa Catalina Island and has an enrollment of 25,000 students.

Technical Description:

- (2) CDS® hydrodynamic separators
- CMP Detention - 951 linear feet of 96" diameter polymer-coated CMP

LBCC has continued to implement new infrastructure and modernization projects, including a new stormwater runoff compliance project. New state law requires property owners to address water quality by controlling stormwater drainage and water conservation. This project implements drainage improvements to reduce runoff pollutants as required by law.

With the new system, stormwater from the central quad areas and surrounding buildings will be collected in an underground detention system. The engineers on the project, KPFF Long Beach, originally proposed a system using plastic crates. Contech worked closely with the engineer and the contractor, Pima Construction, to provide an alternative solution that included two CDS hydrodynamic separators and a detention system made from 951 linear feet of 96" diameter polymer-coated CMP designed to accommodate a 50-year storm event. Polymer coating was used to alleviate concerns about corrosion of the CMP associated with the high salt content of the reclaimed water.

The CDS units provide pretreatment by removing 100% of floatables and neutrally buoyant material without binding, protecting the detention system from solids occlusion and isolating sediment in a single structure for easy maintenance. The Contech solution provided a number of benefits over the crate system, including structural improvements, maintenance access, ease of installation, and elimination of the need for a liner, which has the potential for failure.

The stormwater runoff compliance project is scheduled to be completed in the summer of 2014.

Newport Boulevard Bioswale Improvements

Newport Beach, California

Stormwater Treatment

Owner:
City of Newport Beach

Engineer:
City of Newport Beach Public Works

Contractor:
Excel Paving

Installation:
December 2013

In 2006, a bioswale was constructed alongside Newport Boulevard in Newport Beach, California to treat an estimated 30,000 gallons per day (gpd) of urban runoff (400 acre watershed) before entering Newport Bay.

The bioswale proved effective in removing dissolved pollutants and bacteria. However, trash such as cigarette butts, food packaging, cans and bottles, and plastic waste was collecting in the bioswale; some of which was making its way into Newport Harbor. This trash not only detracted from the aesthetics of the bioswale and the harbor, it also posed a threat to marine life and the public health.

In 2012, the City of Newport Beach applied for a Measure M Grant to address this issue. The Measure M Grant Program is administered by the Orange County California Transportation Authority and is designed to mitigate the more visible forms of pollutants, such as litter and debris, that collect in storm drains prior to being deposited in waterways and the ocean.

The grant application was approved, and in December, 2013 a CDS hydrodynamic separator and a diversion structure were installed upstream of the bioswale. The CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff prior to entering the bioswale. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material, without clogging. It is also easy to clean and maintain.

This application represents a growing use of the CDS system to pretreat land-based BMPs.

Technical Description:

- CDS® hydrodynamic separator

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Permanente Creek Flood Protection Project McKelvey Park Detention Basin

Mountain View, California

Owner:
Santa Clara Valley Water District/City of Mountain View

Engineer:
Hatch Mott MacDonald

Contractor:
Kiewit

Installation:
November 2017

Technical Description:

- CDS ® Hydrodynamic Separator
- Storm Gate™ Bypass Structure

After years of planning and design, the Santa Clara Valley Water District constructed flood protection improvements along Permanente Creek in Mountain View, California. Known as the Permanente Creek Flood Protection Project, this design helped to improve stormwater quality in the area, assist in protecting residents downstream from flooding concerns, all while creating recreational opportunities and enhancing the environment.

The McKelvey Park Detention Basin Project is one of the elements of the Permanente Creek Flood Protection Project. It included the redevelopment of a 0.7-acre mini-park which doubles as a detention basin that will store large volumes of stormwater from Hale and Permanente Creeks during a 50-year flood event or larger.

Another important element of this project was the collection and treatment of stormwater from more than 160 acres of city roads, public spaces, and commercial properties in the area. Because the State of California has adopted trash amendments which require cities to install and maintain full capture trash removal devices or take a multi-tier equivalency approach to removing trash from stormwater runoff, the City of Mountain View opted to install a CDS hydrodynamic

Permanente Creek Flood Protection Project McKelvey Park Detention Basin

Mountain View, California

separation system to remove sediment and 100% of the trash and debris from stormwater runoff in this area surrounding McKelvey Park.

The City of Mountain View and the Consulting Engineer had several positive experiences with CDS, having installed them on numerous projects in the past. The City examined the long-term lifecycle costs for using multiple individual catch basin screens compared to a smaller number of large devices like the CDS. While the CDS systems are initially more expensive, they have significantly lower maintenance costs, excellent performance history and reliability, making CDS the City's choice for their ongoing trash control efforts.

The CDS system included a 12-foot diameter manhole with a 9' diameter, 8' tall separation screen, and an 8'x16' diversion vault treating over 47 cfs from 160 acres of high-density urban development.

Installation was completed in less than a week in a crowded urban area and a tight construction site. Large trucks, overhead clearance for the cranes, and street access all had to be managed. Contech played a vital role in the delivery and installation of the system. A Contech Project Coordinator worked on delivery schedules and coordination. Most loads were oversize with a pilot car, which meant they needed to comply with roadway curfews and detailed routing to the job site. A Contech Field Representative was also on-site, providing contractor support during the installation.

While many full capture screening devices require maintenance after every storm, the CDS typically only requires annual maintenance. Additionally, CDS can be maintained from the surface without the need for confined space entry. This allows the City to maintain the CDS with its own crews and equipment.

Contech held a maintenance demonstration of the CDS system in August of 2019. The event was attended by representatives from Contech, the City of Mountain View, Caltrans and other local municipalities. The event allowed attendees to see firsthand just how simple it is to maintain a CDS system. It also demonstrated the system's ability to capture and hold several cubic yards of sediment, trash and debris, even when experiencing extended periods of time in between maintenance events.

This portion of Mountain View is now covered by this CDS system, and trash within this drainage area will no longer be able to make its way into Permanente Creek and out to the San Francisco Bay.

Stanford University

Stanford, California

Stormwater Treatment

Owner:
Stanford University

Engineer:
Stanford University Utility Division

Installation:
.

Technical Description:
- CDS® hydrodynamic separator

Since its establishment in 1891, Stanford University has continued a vision for land use and resource management initiated by founders Jane and Leland Stanford. The 8,180 acre campus on the foothills and plains toward the center of the San Francisco peninsula has maintained the character reflected in its original design and charter, as two-thirds of the campus remains open or lightly developed.

The campus boasts over 43,000 trees, including the redwood that is the college team mascot for Cardinal athletics. It also has 1.4 million square feet of shrubs consisting of 800 different plant species, 1.2 million square feet of lawn, 190,000 LF of additional ground cover, a golf course, three dams and lakes, and 16 fountains.

Stanford's rich natural heritage must also blend in with 670 major campus buildings, accounting for 13.1 million square feet of educational space, as well as housing to accommodate nearly 20,000 students. This includes 46 miles of road, a 49-megawatt power plant, a central heating and cooling plant, a high-voltage distribution system, two water systems, 78 miles of water lines, and 2,300 automatic irrigation valves to help maintain this pristine merger of man and nature. Such an atmosphere creates great beauty, but also puts tremendous pressure on architects, developers and engineers who must perform under intense scrutiny. They can be challenged by mandates to minimize the required development footprint and maintain ecological integrity during growth, especially when dealing with stormwater runoff. "Stanford is divided into two watersheds. These are primarily Matadero and San Francisquito Creek, along with a couple of other small tributaries" says Karla Tompkins, a civil engineer with the utility division of Stanford. "The Matadero area has a grassy swale which was built to help channel runoff"

The San Francisquito area gets a lot of loading attention and concern, as it drains directly into San Francisco Bay. The University installed a CDS hydrodynamic separator from Contech to protect this watershed. The CDS unit captures sediment, the primary pollutant in stormwater runoff, oil and grease from vehicles, and 100% of the manmade trash. Trash has become a significant concern in San Francisco Bay and the streams feeding it, so the CDS system is helping Stanford do its part to reduce that concern. Tompkins said, “It is one of the largest such units I have ever seen designed or used in my long professional career” The University is regulated by the San Francisco Bay Regional Water Quality Control Board, and governed by Santa Clara County along with 13 local communities and agencies in the Santa Clara Valley Water District. The physical viability of a solution is as vital as its performance. Tompkins notes such campus additions as the Contech product line proved essential to handle the increased flow to San Francisquito Creek generated by the recent renovation to the campus football stadium. Stanford has to undergo re-development in order to expand the campus. Limited space is available; so many stormwater treatment systems cannot be used. “Footprint size as well as adaptability for the natural protection of the trees and other plants is essential due to the very limited space and the unique stormwater demands of Stanford” Adds Tompkins A project like the football stadium redesign required the addition of over 10,000 square feet of impervious area, which meant documentation for approvals and blanket permit application be submitted. These requirements were paramount in the re-design of the football stadium.

Santa Clara County significantly restricted the grading work contain numerous protected trees. Therefore removal of the trees to make the project intimate with the surroundings made thearound the stadium because the adjacent hill slopes for expansion was not considered. The ability CDS product even more desirable. “These worked well because the underground units required less Tompkins. “We simply did not have the space for large, space than aboveground solutions” says aboveground, grassy retention areas”

The campus does utilize natural best management practices (BMPs) like swales where feasible, usually in combination with manufactured elements like the CDS and pump stations in a treatment train. This management strategy was deemed to be the most suitable and cost effective solution considering the pollutants expected from this site, including sediment, hydrocarbons, trash and debris. “The large size of the CDS installation generated a significant excess capacity. This allowed Stanford to create a bank for stormwater treatment flow” “The project was able to handle the football stadium runoff as well as allow for significant future development in-fill projects within the campus” notes Tompkins. “The 48-in. pipes of the unit provide significant drainage and the availability for additional pipe and flow. It was a great investment” “We are definitely looking at more regional stormwater and other environmental facilities, as opposed to individual project units” says Tompkins. “We are also encouraging projects that mix vegetative solutions with products like CDS that provide quality engineered solutions” “This will allow us to be even more socially conscious, and to encourage design without demanding excess and valuable space” Such future efforts as stormwater filtration and trash/sediment removal will require easy- to-install, small footprint, large flow, and large capacity solutions. Stanford University’s motto is “The Wind of Freedom Blows” That freedom ensures a bright environmental future for the institution and its students; and also for its salamanders!

Tobias Terrace Apartments

Van Nuys, California

Low Impact Development

Owner:
Meta Housing Corporation

Engineer:
KPFF Consulting Engineers

Contractor:
JBM Piping and Construction

Installation:
Summer 2012

Tobias Terrace Apartments is a new 56-unit, four-story multifamily residential housing development in Van Nuys, Los Angeles, CA. From the project's conception, Meta Housing Corporation's intent was to design a project that utilized the maximum of Low Impact Development and sustainable design principles. The original target was for the project to achieve a LEED® (Leadership in Energy and Environmental Design) for Homes Gold certification.

Technical Description:

- Products: CDS 2015 Perforated HDPE

An Integrated Development Plan was initially developed in order to target the highest possible levels of energy efficiency. Some of the sustainable features in the plan included a solar hot water system, efficient lighting/appliances and low-flow plumbing fixtures that would decrease water and thermal energy consumption.

While performing civil engineering services for the project, KPFF Consulting Engineers needed to continue to provide sustainable design solutions. KPFF chose to utilize the combination of a CDS® system and perforated HDPE (High Density Polyethylene) pipe for the project's stormwater management system, products offered by Contech Engineered Solutions. The two firms had worked successfully on a variety of past projects, and KPFF knew Contech was experienced both with providing sustainable design solutions and in winning approvals from local agencies.

The CDS® system uses continuous deflective separation to effectively screen, separate and trap debris, sediment and oil from stormwater runoff. Using the system can contribute to helping a project achieve a variety of LEED credits, including those involved with stormwater quality control, water efficiency, water efficient landscaping and use of recycled content and regional materials.

Tobias Terrace Apartments

Van Nuys, California

The project has actually exceeded its original expectation of pursuing a LEED for Homes Gold certification and is now pursuing a Platinum certification, the most prestigious level of LEED certification that a project can achieve.

Rolando Delgado
Area Engineer, Structures
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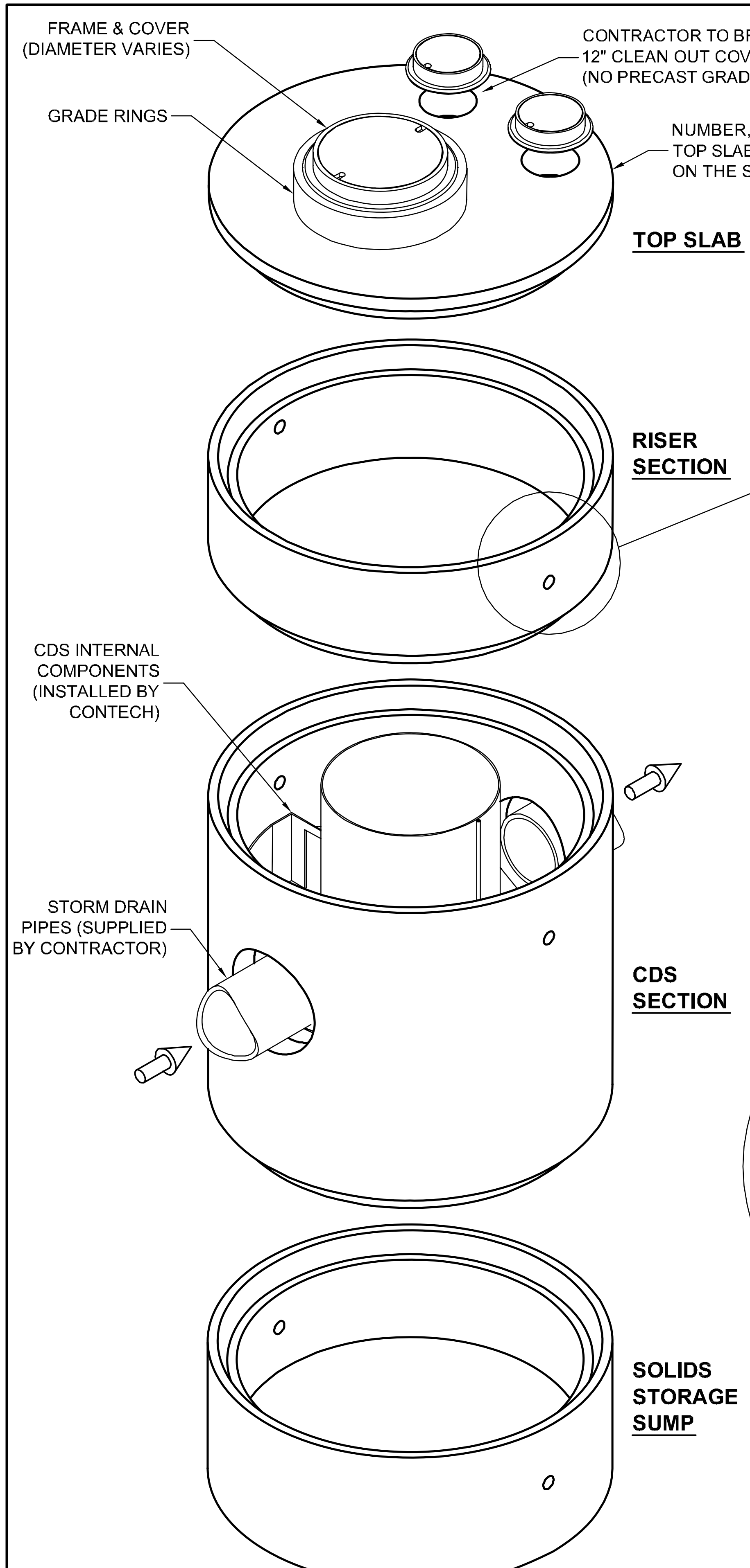
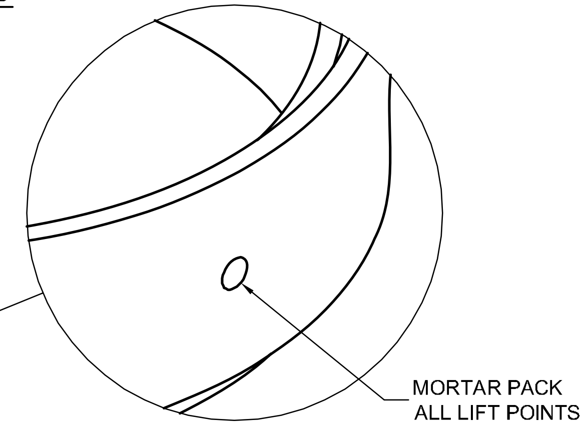
APPENDIX C– CDS CONTRACTOR INSTALLATION INSTRUCTIONS



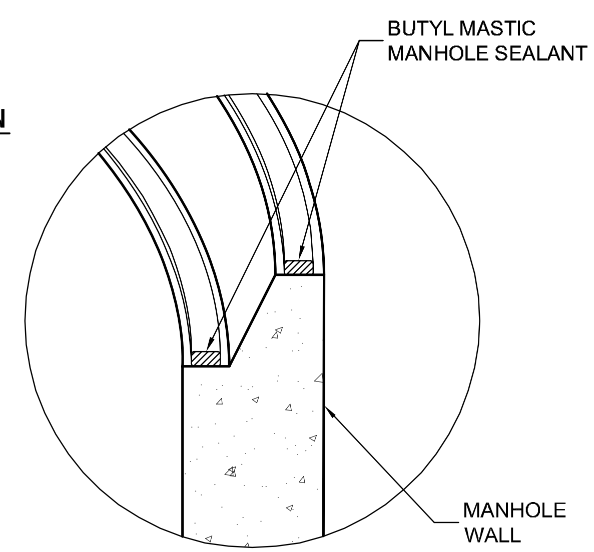
GENERIC MANHOLE DETAIL

DOES NOT REPRESENT ACTUAL UNIT



LIFT POINT DETAIL

LIFT POINT TYPE AND LOCATION WILL VARY BY PRECASTER (SEE GENERAL FINISHING REQUIREMENTS)



MASTIC PLACEMENT DETAIL

JOINT TYPE WILL VARY BY PRECASTER

CDS®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

INSTALLATION SPECIFICATIONS

THE CDS PRECAST COMPONENTS WILL BE DELIVERED TO THE PROJECT SITE VIA A FLATBED TRANSPORT. THE CONTRACTOR SHALL PROVIDE EQUIPMENT AT THE SITE THAT HAS ADEQUATE LIFTING CAPACITY TO UNLOAD THE PRECAST COMPONENTS. THE INSTALLATION SEQUENCE REQUIRES THE SOLIDS STORAGE SUMP TO BE INSTALLED FIRST, FOLLOWED BY THE CDS SECTION, ADDITIONAL RISER SECTIONS (IF NECESSARY), TOP SLAB WITH THE APPROPRIATE TRAFFIC COVERS (TO BE PLACED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS), AND (IF NECESSARY) GRADE RINGS AND/OR GROUT TO MATCH GRADE.

GENERAL FINISHING REQUIREMENTS:

THE PRECAST COMPONENTS ARE DELIVERED WITH LIFTING POINTS CAST INTO THE VARIOUS PIECES. WHERE CAVITIES WERE CREATED FOR LIFTING, SAID CAVITIES SHALL BE MORTAR PACKED AND FINISHED TO CONFORM TO THE SURFACE THAT WOULD HAVE OTHERWISE EXISTED HAD NOT THE LIFTING POINT BEEN CAST. WHERE PROTRUDING REBAR OR FABRICATED CABLE LOOPS HAVE BEEN USED TO PROVIDE FOR LIFTING, THOSE PROTRUDING REBAR OR FABRICATED CABLE LOOPS SHALL BE CUT FLUSH WITH THE NORMAL FINISHED SURFACE. ALL WORK THROUGHOUT THE INSTALLATION SHALL BE DONE TO A PROFESSIONAL STANDARD NORMALLY EXPECTED FOR THE CLASS OF WORK BEING PERFORMED.

EXCAVATION, DEWATERING AND SHORING:

THE CONTRACTOR SHALL EXCAVATE, DEWATER AND SHORE IN ACCORDANCE WITH THE APPLICABLE PROJECT SPECIFICATIONS FOR "EXCAVATION AND BACK-FILL", "DEWATERING AND SHORING", AS PROVIDED BY THE ENGINEER TO ENSURE A SAFE WORKING ENVIRONMENT.

IMPORTANT: AFTER EXCAVATION, AGGREGATE BASE COMPACTION AND PLACEMENT OF SUMP; PRIOR TO STACKING MANHOLE SECTIONS, CONFIRM DEPTH BELOW OUTLET PIPE INVERT TO OUTSIDE BOTTOM OF SUMP. (SEE SITE SPECIFIC DRAWINGS FOR DIMENSION)

1. SOLIDS STORAGE SUMP INSTALLATION

SUBGRADE SHALL BE ESTABLISHED AS SHOWN ON THE DRAWINGS. THE SUBGRADE MATERIAL SHALL BE COMPOSED TO WITHSTAND A DESIGN LOADING OF 2,000 POUNDS PER SQUARE FOOT (PSF). IT IS RECOMMENDED THAT THE HOLE BE OVER-EXCAVATED A MINIMUM OF 6" AND BACKFILLED WITH AGGREGATE BASE AND COMPACTED TO 95% TO MAKE SUBGRADE. THE BACKFILL MATERIAL AROUND THE BASE, SHALL BE PLACED AND COMPACTED ACHIEVING A MINIMUM COMPACTION OF 90% (OR AS SPECIFIED BY THE ENGINEER) WHEN TESTED BY ASTM DESIGNATION A1557. BACKFILL MATERIAL MAY BE A "MINIMAL COMPACTION EFFORT" MATERIAL SUCH AS 3/8" PEA GRAVEL OR CLEAN FILL SAND. THE CONTRACTOR MAY USE NATIVE MATERIAL IF THE MATERIAL PROVIDES AN ALLOWABLE BEARING PRESSURE OF 2,000 POUNDS PER SQUARE FOOT AND IF APPROVED BY THE ENGINEER. SAID NATIVE MATERIAL SHALL BE COMPACTED TO A MINIMUM RELATIVE DENSITY OF 90% WHEN TESTED BY ASTM DESIGNATION A1557 OR AS SPECIFIED BY THE ENGINEER. THE SUMP SHALL BE PLACED ON THE COMPACTED BASE, ELEVATION CONFIRMED, PLUMBED AND ALIGNED TO ENSURE THAT THE BALANCE OF THE UNIT WILL BE PROPERLY ALIGNED AND SITUATED AS ASSEMBLY OF THE REST OF THE PRECAST PIECES PROCEED.

2. CDS SECTION INSTALLATION

THE CDS SECTION IS DELIVERED TO THE PROJECT SITE WITH ALL INTERNAL COMPONENTS PRE-INSTALLED BY CONTECH. IF THE SIZE OF THE CDS UNIT REQUIRES THAT INTERNAL COMPONENT INSTALLATION BE PERFORMED AT THE PROJECT SITE, CONTECH WILL MAKE APPROPRIATE ARRANGEMENTS WITH THE CONTRACTOR PRIOR TO THE INSTALLATION OF THE MANHOLE.

PRIOR TO PLACEMENT OF THE CDS SECTION, THE CONTRACTOR SHALL PLACE A LAYER OF 3/4" INCH X 1 1/2" INCH MINIMUM BUTYL MASTIC MANHOLE SEALANT (DELIVERED WITH THE CDS UNIT) ON BOTH UPPER AND LOWER SHELVES OF THE SUMP SECTION TONGUE AND GROOVE JOINT. THE CDS SECTION RISER SHALL BE SET WITH THE PROPER ORIENTATION TO THE STORM DRAIN TO ENSURE CORRECT ALIGNMENT OF THE INLET AND OUTLET PIPE OPENINGS. IF THE INLET AND OUTLET OPENINGS ARE REVERSED, THE STORMWATER TREATMENT UNIT WILL NOT FUNCTION. IF IT IS UNCLEAR WHICH OPENING IS INLET AND WHICH OPENING IS OUTLET, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE BEFORE PROCEEDING.

IMPORTANT: APPLY LOAD TO MANHOLE SECTIONS TO COMPRESS BUTYL MASTIC SEALANT IF NECESSARY. UNIT MUST BE WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. SUGGESTED TO ALSO GROUT ALL JOINTS BELOW PIPE INVERT .

3. STORM DRAIN PIPE CONNECTION

SEAL STORM DRAIN INLET AND OUTLET PIPES TO CDS UNIT USING FLEXIBLE GASKETS OR GROUT-FILL MANHOLE OPENINGS IN ACCORDANCE WITH PROJECT SPECIFICATIONS.

4. ADDITIONAL RISER INSTALLATION

PRIOR TO PLACEMENT OF ADDITIONAL RISER SECTIONS, THE CONTRACTOR SHALL PLACE A LAYER OF BUTYL MASTIC SEALANT TO THE TONGUE AND GROOVE JOINT OF THE CDS SECTION AND SUBSEQUENT RISER SECTIONS IN THE MANNER DESCRIBED PREVIOUSLY. PLACE RISERS IN THE ORDER SHOWN ON THE SITE SPECIFIC DRAWINGS.

AT THIS POINT, THE CONTRACTOR MAY ELECT TO BACKFILL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATION, OR THE CONTRACTOR MAY ELECT TO CONTINUE WITH THE INSTALLATION OF THE TOP SLAB, AS DEEMED APPROPRIATE. THE BACKFILL MATERIAL AROUND THE CDS SECTION AND THE ADDITIONAL RISER SECTIONS SHALL BE PLACED AND COMPACTED ACHIEVING A MINIMUM COMPACTION OF 90% WHEN TESTED BY ASTM DESIGNATION A1557. BACKFILL MATERIAL MAY BE A "MINIMAL COMPACTION EFFORT" MATERIAL SUCH AS 3/8" PEA GRAVEL OR CLEAN FILL SAND. THE CONTRACTOR MAY USE NATIVE MATERIAL IF APPROVED BY THE ENGINEER IF SAID MATERIAL PROVIDES AN ALLOWABLE BEARING PRESSURE OF 2,000 POUNDS PER SQUARE FOOT. SAID NATIVE MATERIAL SHALL BE COMPACTED TO A MINIMUM RELATIVE DENSITY OF 90% WHEN TESTED BY ASTM DESIGNATION A1557.

5. TOP SLAB INSTALLATION

UPON COMPLETION OF THE RISER SECTIONS, THE CONCRETE MANHOLE TOP SLAB IS INSTALLED. BUTYL MASTIC IS PLACED ON THE TONGUE AND GROOVE JOINT AS DESCRIBED PREVIOUSLY. THE TOP SLAB IS ORIENTED AS INDICATED ON THE SITE SPECIFIC DRAWINGS. USE GROUT AND MANHOLE RINGS AS NECESSARY TO MATCH FINAL GRADE AND INSTALL THE PROVIDED MANHOLE FRAME AND COVERS AS SHOWN ON THE DRAWINGS. IF THE TOP SLAB ORIENTATION DOES NOT MATCH THE SITE SPECIFIC DRAWINGS, IT WILL BE IMPOSSIBLE TO INSPECT AND CLEAN THE STORMWATER TREATMENT UNIT.

6. BACKFILL

UPON COMPLETION OF THE CDS UNIT INSTALLATION,THE EXCAVATION SHALL BE BACKFILLED WITH AN AGGREGATE BASE MATERIAL, PEA GRAVEL, OR CONTROLLED DENSITY CEMENT BACKFILL. THE AGGREGATE BASE MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 90% COMPACTION OR AS SPECIFIED BY THE ENGINEER WHEN TESTED BY ASTM DESIGNATION A1557, UNLESS THE CDS UNIT IS TO RECEIVE TRAFFIC LOADINGS WHEREBY THE FOLLOWING CONDITIONS SHALL APPLY: FOR CDS UNITS INSTALLED IN A TRAVEL WAY, THE UPPER TWO FEET OF BACKFILL SHALL BE AGGREGATE BASE COMPACTED TO 95% (MINIMUM).

7. SITE CLEANUP

REMOVE ALL MATERIAL AND DEBRIS FROM THE INLET, SEPARATION CYLINDER, AND SUMP UPON COMPLETION OF INSTALLATION.

IMPORTANT: PRIOR TO PROJECT COMPLETION, CONTRACTOR SHALL FILL CDS UNIT WITH WATER TO FLOWLINE INVERT.

CONTECH® STORMWATER SOLUTIONS INC.
contechstormwater.com

CDS PRECAST CONCRETE
WATER QUALITY SYSTEM
CONTRACTOR INSTALLATION SPECIFICATIONS

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APPENDIX D – CDS INSPECTION AND MAINTENANCE GUIDE

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

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CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

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APPENDIX E - MVCAC VECTOR CONTROL ACCESSIBILITY DESIGN VERIFICATION REQUEST LETTER

Contech Engineered Solutions LLC
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March 26, 2021

Mosquito and Vector Control Association of California

RE: Request for verification of vector control accessibility for CDS® full capture trash device

Dear MVCAC,

Please accept this application for vector control accessibility verification for the CDS® system. The CDS system has been used for more than 20 years at thousands of locations in California to remove trash, oil and sediment from stormwater runoff. It was among the Full Capture Devices that were adopted with the California Trash Amendments. Contech Engineered Solutions recently received a letter from the California State Water Resources Control Board requesting that we provide a MVCAC verification letter to them for the CDS system.

The CDS system is a manhole-based, end-of-pipe treatment system that comes in a variety of configurations and sizes (Figure 1).

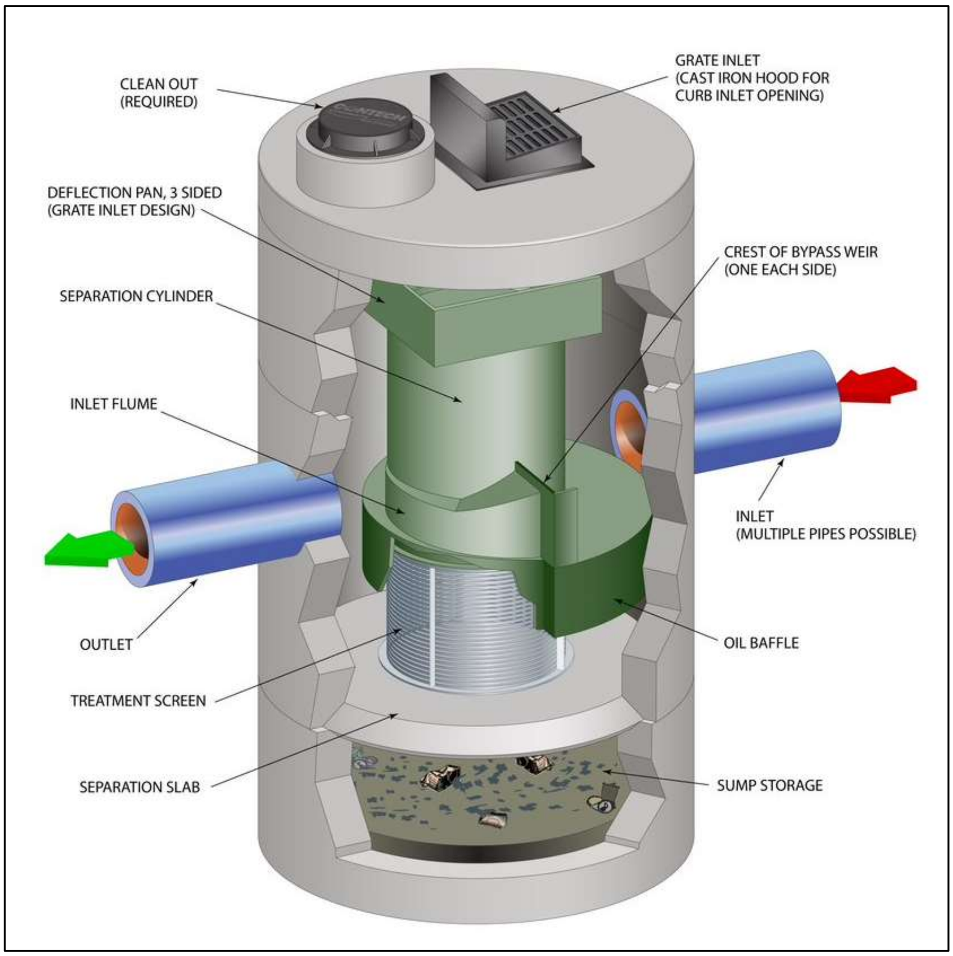

Figure 1 – CDS system with optional grate inlet

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Current CDS system information can be found on the Contech web site at: www.conteches.com/cds
Standard details of all CDS models are available on the Contech web site at:
https://www.conteches.com/technical-guides/search?filter=RNNY5KKCP1

All CDS units are manhole based and include a separation cylinder within which floating trash and debris are retained as well as oil and other buoyant liquids. Settleable materials like sediment and waterlogged trash are stored in the sump storage area. In all units, there is a manhole cover or grate inlet located over the sump storage area that can be removed to visually inspect the contents of the separation cylinder. Accumulation of materials in the sump storage area can be assessed through this same opening using a calibrated dipstick, tape measure or other measuring instrument. In all units, there is a second manhole cover located outside of the separation cylinder that can be opened to inspect and maintain any sediment that has accumulated outside of the sump area.

By opening the manhole covers on the CDS system, a vector control inspector will have direct visual access to all areas inside and outside of the separation cylinder. There is also ample room to sample for mosquito larvae and to deploy larvicide or other controls.

In 2019, we changed our default CDS manhole covers to a non-vented design (Figure 2) with recessed pick holes that do not penetrate the entire depth of the cover. This prevents mosquito passage into and out of the system through these inspection and maintenance points.

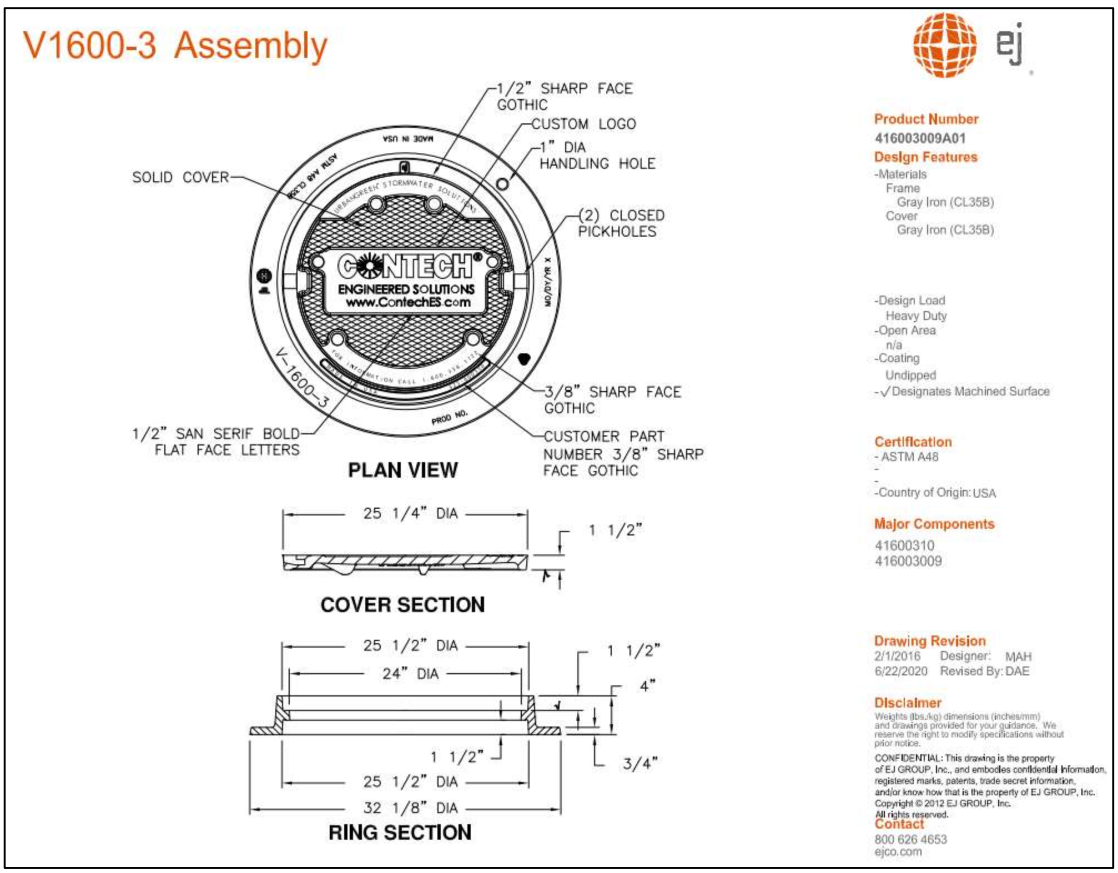

Figure 2 – Non-Vented Contech Manhole Cover

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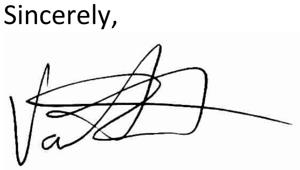
We understand that standing water in the sump of these units is not preferred from a vector control perspective. However, a wet sump is integral to the functionality of all hydrodynamic separators. We have explored various draindown options but have rejected them for several reasons:

- Wet sumps are necessary to store sediment and sinking trash between storm events and to keep trapped oil and other hydrocarbons elevated above the bottom of underflow baffles. They also provide some spill storage capacity in the event of an accident in the upstream drainage area.
- Our experience with screens, drain tiles or fabrics in the bottom of the sump has been that they rapidly clog and become ineffective almost immediately. If connected to the surrounding soil, they also introduce unacceptable soil and groundwater contamination issues since they would be draining from the most concentrated pollution zone in the system.
- Dewatering pumps located in the sump are not practical because they would export captured pollutants when working, and would be likely to clog rapidly. Disposal of pumped water to downstream storm sewers after a storm would be prohibited as a non-stormwater discharge. Any discharge of stormwater to a sanitary sewer would require special permits and would introduce backflow contamination risk.

We look forward to your verification of vector control accessibility for the CDS system. Please send any questions or correspondence to me at the email address below.

Sincerely,



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APPENDIX F - MVCAC VECTOR CONTROL ACCESSIBILITY DESIGN VERIFICATION LETTER

MVCAC
Mosquito and Vector Control Association of California

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Contech Engineered Solutions
9025 Centre Pointe Drive, Suite 400
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April 29, 2021

Dear Mr. Allen,

Thank you for the submission of the Contech CDS full trash capture device for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has reviewed the conceptual drawings for the Contech CDS and verifies that provisions have been included in the designs that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes.

While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with the Contech CDS as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example, if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,

Bob Achermann,
MVCAC Executive Director